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DISCUSSING THE 'GRANDMOTHER HYPOTHESIS'[1]

Jan Horský

The 'grandmother hypothesis' is connected with a distant evolutionary event of the emergence of menopause in human females and can be put to the test by (historical) demographic data for European society of the Early Modern Age and the Modern Age. Comparisons of case studies and micro-analytic probes into historical demography and cultural history of the 17th–19th c. allow us to draw certain conclusions: where the 'grandmother effect' (i.e. shorter inter-birth intervals in daughters or daughters-in-law alongside with a lower rate of infant and child mortality of grandchildren, in other words, fitter grandchildren) can be proven from a statistical point of view, in most cases, the effect is significantly weaker than the effect of other factors which influence infant and child mortality. Grandmothers participating in the care of their grandchildren may not have been a 'cultural pattern' (reflected as such by its actors), in any case, not to the degree to which a 'cultural pattern' was reflected in a regionally specific structure of households or the use of midwives' services. At least in the European populations of the 17th–19th c., we can find other institutions which seem to have had a stronger impact on infant and child mortality than grandmothers taking care of their grandchildren. In this period, the grandmother effect was geographically dispersed and, at least in some cases, linked to particular social groups or segments of society (in the Czech sample, for instance, the effect was linked to lower social classes). If the grandmother effect increasing the fitness of grandchildren is more pronounced with maternal grandmothers (which is yet to be generally proven), we must ask why cultural evolution 'chose' the adaptively less favourable option of patrilinear structure of family households. An example of such structure can be found in a consistent patrilocality of marriages and patrilineality of the family structure in classical antiquity, which, in the European environ-

1 This study is an output of the GA ČR 17-11983S grant *Testing the "Grandmother Hypothesis": Transgenerational Effect on Reproduction Based on Parish Registers from the 17th–19th Century Bohemia*. – Many thanks to Lily Císařovská for translation and Linda Hroníková for professional advice and proofreading.

ment, has survived until recently southeast of the so-called Hajnal Line. Research in demography and cultural history of the 17th–19th c. European society seems to strongly support the following claim, which from the perspective of evolutionary anthropology or evolutionary biology is merely a hypothetical supposition: The 'grandmother effect' may have been the cause of the menopause as an evolutionary adaptation. Nonetheless, while this phenomenon has been present in human population since ancient times (prehistory or antiquity), it was merely one of many mutually complementary, alternative, and more or less adaptive (i.e. fitness-increasing) forms of infant and child care.

Keywords: evolutionary anthropology, (historical) demography, cultural history, family, household, grandmother effect, infant mortality, cultural variants

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Introduction

It appears reasonable to suppose that the ancient event in human history assumed by the 'grandmother hypothesis', namely the formation of the menopause as an evolutionary adaptation, would have left traces observable even today or, at least, detectable until recently. Such traces should include, among other, certain demographic manifestations, namely shorter inter-birth intervals in daughters, or possibly daughters-in-law in the presence of grandmothers, and, at the same time, lower infant and child mortality rates. When searching for such traces in European and North American populations of the 17th to 19th c., historical demographers and historians of culture operate in a field shared with evolutionary anthropologists and biologists. From the perspective of cultural history and historical demography, the following study enquires whether the grandmother effect is, statistically speaking, comparably as strong as (stronger, or possibly weaker than) the impact of other factors influencing infant and child mortality. We shall view grandmothers assisting at the birth of their grandchildren and providing subsequent care as a possible cultural pattern and ask about its probable relations to other 'cultural patterns' which affected the family formation in history, especially the so-called European marriage patterns. Was grandmothers' care in the 17th–19th c. a consciously applied behavioural pattern intended at increasing the reproductive success of the family? Or was it rather overshadowed, from the participants' perspective, by other 'cultural patterns', such as the right

of inheritance, the principles of structure formation of family households, the institution of midwives, etc.?

Some case studies seem to indicate a difference between the influence of maternal grandmothers, and those of paternal grandmothers. For this reason, the following study will focus on Central and South-Eastern Europe which mostly overlaps with the territory of the former Habsburg Monarchy. This area is divided by the so-called Hajnal Line which separates two main fundamental forms of the historical formation of the family household. Among other features, the two forms revealed that, within the respective family households, the position of maternal grandmothers differed from the position of paternal grandmothers. We shall ask whether the impact of the 'grandmother effect' in these two large areas could be the same or not.

Any demographic data relevant to the testing of 'the grandmother hypothesis' affecting the European and North American societies shall be drawn from a period relatively abundant in available information on the one hand (i.e. since the 17th century), and, on the other hand, from a period preceding the times when marital fertility became significantly controlled and the care of the newborns and children widely available, i.e., before the end of the 19th century, since both modern regulation of fertility and medical care may significantly dampen any demographic manifestation of the grandmother effect. For this reason, we should focus more on rural populations where we have a statistically evaluable amount of data along with more transparent kinship ties than in urban communities.

Case study comparison shows that the 'grandmother effect' manifests itself only in some places and in certain social classes from the 17th to 19th c. We should therefore ask whether it was originally universally present in the human population, or whether it is more probable that, in human history, the 'grandmother effect' had existed since ancient times as merely one of the mutually complementary, alternative, adaptive approaches to child and infant care. This is one of the questions which can be put to evolutionary anthropology and evolutionary biology from a perspective of historical demography and cultural history.

'The grandmother effect'

Suggesting that the menopause evolved in connection with grandmothers caring for their grandchildren, the 'grandmother hypothesis' (coined by Georg G. Williams in the 1950s, currently explored by Kristen Hawkes and others) assumes a distant evolutionary event (change) that occurred in prehistoric and ancient times: it supposes that an increasing number of women who lived long enough

to become grandmothers actually participated in caring for their grandchildren and this led to a gradual evolutionary adaptation in the form of the menopause. It is possible that a practice that was originally passed on by a cultural intergenerational transfer eventually metamorphosed into genetic heredity. The 'grandmother hypothesis' is based on a theory of inclusive fitness, which assumes that individuals can increase their fitness not only by the direct reproduction but also by supporting the reproduction of their relatives with whom they share a part of their genes.

Living long enough after the menopause thus seems to offer an evolutionary advantage in the sense that grandmothers, unfettered by taking care of their own young children, can assist their daughters and/or daughters-in-law at birth and help with infant care, which may lead to shorter inter-birth intervals in their daughters or daughters-in-law and lower their grandchildren's rate of mortality in infancy and childhood. By improving their grandchildren' chances to live to adulthood they increase the likelihood of their own reproduction. This is what we understand as the 'grandmother effect'.[2]

This effect has often been studied in maternal grandmothers[3] but it may hold true for both maternal and paternal grandmothers alike. Nevertheless, some research shows that paternal grandmothers may, in fact, increase infant and child mortality above the average, even above the levels observed in situations where either both or no grandmothers are present.[4] The same study shows that the presence of paternal grandmothers may even increase the likelihood of still-

2 KRISTEN HAWKES, JAMES F. O'CONNELL, NICHOLAS G. BLURTON JONES, HELEN ALVAREZ, ERIC L. CHARNOV, *Grandmothering, menopause, and the evolution of human life histories*, Anthropology – Proceedings of the National Academy of Sciences 95/1998, no. 3, pp. 1336–1339; KRISTEN HAWKES, *Grandmothers and the Evolution of Human Longevity*, American Journal of Human Biology 15/2003, no. 3, pp. 380–400.

3 JAN HORSKÝ, JAN HAVLÍČEK, *Testování „hypotézy babiček'. Historicko-demografická perspektiva* [Testing the "Grandmother Hypothesis": Historical Demographic Perspective], Historická demografie 41/2017, no. 2, pp. 189–211, esp. pp. 189–194 [Project GA ČR č. 17-11983S]; ALICE VELKOVÁ, *Přítomnost babiček v předindustriálních rodinách a jejich možný vliv na plodnost dcer (na příkladu panství Šťáhlavy na přelomu 18. a 19. století)* [Presence of grandmothers in the pre-industrial families and their possible influence on fertility of their daughters: the example of the *Šťáhlavy* estate at the turn of the 18th and 19th centuries], Historická demografie 41/2017, no. 2, pp. 213–234, esp. pp. 213–215.

4 ECKART VOLAND, JAN BEISE, *Bilanzen des Alters – oder: Was lehren uns ostfriesischen Kirchenbücher über die Evolution von Großmüttern?*, Historical Social Research 30/2005, no. 3, pp. 205–218, esp. pp. 210–212.

birth,[5] however, comparative studies have not confirmed such negative effects of paternal grandmothers in general.[6] We will return to this topic further below.

The fundamental question to be examined is to what extent the demographic phenomena of the Early Modern Age can be viewed as relevant indicators of the origins of the menopause in the distant past. The next question to be discussed is whether 'the grandmother effect' could possibly differ in regions which are separated by the Hajnal Line. Finally, the attention will be focused on whether other cultural patterns of behaviour and institutions could have developed and replaced the 'grandmother effect'.

A note on methodology

It is often believed that a research task in the field of historiography is a description of the studied phenomena in as broad and factual a context as possible and that it is only from this perspective that such a context could both determine and interpret the quality of the issue studied. However, this approach is not the only possible method of historiographic investigation. Referring to Chris Lorenz,[7] two basic approaches can be distinguished in the fashion of Weber's ideal types.[8] The holistic approach, which Lorenz also calls Fall-Ansatz, is, broadly speaking, characteristic of historiography (in German it would be Geschichtsschreibung), while the analytical approach, which Lorenz also calls Variablen-Ansatz, frequently features those historiographic areas which comprise historical science (in German Geschichtswissenschaft). The Variablen-Ansatz is based on the observation of precisely defined variables. It selects the studied phenomena on the basis of explicit criteria of their selection. Although this makes it quite reductionist in comparison with Fall-Ansatz, it still enables us to quantify the studied phenomena and compare them both diachronically and synchronically between cultures. In our effort to test the 'grandmother hypothesis' by demographic phenomena, our approach must necessarily be based in the area of Variablen-Ansatz.

5 E. VOLAND, J. BEISE, *Bilanzen des Alters*, p. 214.

6 JONATHAN FOX, KAI WILLFÜHR, ALAIN GAGNON, LISA DILLON, ECKART VOLAND, *The consequences of sibling formation on survival and reproductive success across different ecological contexts: a comparison of the historical Krummhörn and Quebec populations*, The History of the Family 22/2017, no. 2–3, pp. 364–423.

7 CHRIS LORENZ, *Konstruktion der Vergangenheit. Eine Einführung in die Geschichtstheorie*, Köln-Weimar-Wien 1997, pp. 237–239.

8 Weber's ideal types. MAX WEBER, *Die „Objektivität' sozialwissenschaftlicher und sozialpolitischer Erkenntnis*, Archiv für Sozialwissenschaft und Sozialpolitik 19/1904, no. 1, pp. 22–87.

We are attempting to find some bygone (of 17th–19th c.) symptoms of a hypothetically assumed evolutionary event which happened a very long time ago. The connection between the observable symptoms and the ancient evolutionary event is constructed only theoretically. On theories in historical sciences, Thomas Welskopp states that they are 'formalized summarizations of important relations which transform empirically determinable regularities into statements about logical patterns of relations' („Es sind formalhafte Zusammenfassungen wichtiger Zusammenhänge, die empirisch festgestellte Regelmäßigkeiten in Aussagen über regelgesteuerte logische Beziehungsmuster verwandeln").[9]

We may, however, start with a yet broader specification. Hans Ulrich Wehler takes theories in history to be 'such explicit and consistent conceptual systems that – without being derived from the sources – serve to identify, uncover and explain problems of history' ("jene expliciten und konsistenten Begriffssysteme […], die – ohne aus der Quellen abgeleitet zu sein – der Identifizierung, Erschließung und Erklärung von historischen Problemen dienen". [10]

We could say, together with Max Weber,[11] that we are not necessarily looking for the ontic, substantial factual connections of objects or things ("sachliche" Zusammenhänge der "Dinge") but rather for the (conceivable) connections of problems (gedenklichen Zusammenhänge der Probleme). The connection of the phenomena which we have in mind here is, in the strongest meaning of the word, the Koselleck's 'theory of possible history'. „What makes history historical cannot be deduced from the sources alone: a theory of possible history is required for the sources to speak at all".[12]

Significant Phenomena and Deviations

In terms of (historical) demography, the 'grandmother effect' is manifested primarily (a) by lower infant and child mortality rates among grandchildren who

9 THOMAS WELSKOPP, *Theorien in der Geschichtswissenschaft*, in: Geschichte: Studium – Wissenschaft – Beruf, (edd.) GUNILLA BUDDE, DAGMAR FREIST, HILKE GUENTHER-ARNDT, Berlin 2008, pp. 138–157, esp. p. 139.

10 HANS-ULRICH WEHLER, *Anwendung von Theorien in der Geschichtswissenschaft*, in: Theorie und Erzählung in der Geschichte, (edd.) JÜRGEN KOCKA, THOMAS NIPPERDEY, München 1979, pp. 17–40, esp. pp. 17–18; CH. LORENZ, *Konstruktion der Vergangenheit*, p. 356.

11 M. WEBER, *Die „Objektivität' sozialwissenschaftlicher und sozialpolitischer Erkenntnis*, pp. 36–43.

12 REINHART KOSELLECK, *Futures Past. On the Semantic of Historical Time*, New York 2004, p. 151.

receive care from their grandmothers compared to grandchildren who do not receive such care, which is observed within the same local population, i.e. within the population of the same parish or estate; Secondly (b), lower mortality of children who receive care from their grandmothers should be associated with shorter inter-birth intervals of the daughters or daughters-in-law whose children are in the care of their grandmothers as opposed to those who do not receive any such care, and once again, this should apply for the same local population.[13] It should be emphasized that the latter effect contradicts the established tenet of historical demography stating that lower infant and child mortality correlates with longer inter-birth intervals and vice versa. In some populations, high infant and child mortality has generally been found to be closely associated with a high specific marital fertility rate (and thus shorter inter-birth intervals), while lower infant and child mortality tends to be associated with a lower specific marital fertility rate (and longer inter-birth intervals). These are two cultural complexes, quite distinct in some regions, with a long-term fixation. Both, however, can be a response to a relatively wide array of factors.[14]

Nevertheless, even without taking into account the 'grandmother effect', infant and child mortality rates varied considerably in a number of local German populations, for instance in the 18th and 19th c. the infant mortality in Laichingen was about three times higher than in Krummhörn and about two and a half times higher than in Belm, while in Donaukreis in the 1860s, the infant mortality

13 The reality could be much more variable, especially with regard to breastfeeding. For example, where mothers do not breastfeed their infants, a grandmother can improve the survival of her grandchildren, by carefully hand-feeding or improving her daughter's health in a variety of ways without affecting her birth intervals. Similarly, where children are breastfed then the presence of the grandmother may improve survival of children beyond the point of weaning, when their survival again has no effect on the interval until the next birth (e.g. REBECCA SEAR, DARYL P. SHANLEY, IAN A. MCGREGOR, RUTH MACE, The fitness of twin mothers: evidence from rural Gambia, Journal of evolutionary biology 14/2001, no. 3, pp. 433–443; REBECCA SEAR, RUTH MACE, IAN A. MCGREGOR, The Effects of Kin on Female Fertility in Rural Gambia, Evolution and Human Behavior 24/2003, no. 1, pp. 25–42).

14 ARTHUR E. IMHOF, *Einführung in die Historische Demographie*, München 1977, pp. 77–87; HANS MEDICK, *Weben und Überleben in Laichingen 1650–1900. Lokalgeschichte als allgemeine Geschichte*, Göttingen 1996, pp. 340–356; JÜRGEN SCHLUMBOHM, *Lebensläufe, Familien, Höfe. Die Bauern und Heuerleute des Osnabrückischen Kirchspiels Belm in proto-industrieller Zeit 1650–1860*, Göttingen 1994, pp. 140–153; MASSIMO LIVI BACCI, *The Population of Europe (The Making of Europe)*, Oxford 2000, pp. 140–151; J. HORSKÝ, J. HAVLÍČEK, *Testování „hypotézy babiček'*, pp. 203–206.

was about four times higher than in the region of Oldenburg.[15] However, do the differences in the infant mortality between the families receiving the benefit of

15 IRENE HARDACH-PINKE, *Zwischen Angst und Liebe. Die Mutter-Kind-Beziehung seit dem 18. Jahrhundert*, in: Zur Sozialgeschichte der Kindheit, (edd.) JOCHEN MARTIN, AUGUST NITSCHKE, KLAUS ARNOLD, Freiburg-München 1986, pp. 536–537; J. SCHLUMBOHM, *Lebensläufe, Familien, Höfe*, p. 153; H. MEDICK, *Weben und Überleben in Laichingen 1650–1900*, p. 356; J. FOX, K. WILLFÜHR, A. GAGNON, L. DILLON, E. VOLAND, *The consequences of sibling formation on survival and reproductive success across different ecological contexts*, p. 323. – As noted below in more detail, infant mortality levels are used as an indicator of a wider range of cultural variants by, for instance, Irene Hardach-Pinke, who also draws attention to their rather wide variation. In 1720–1820, i.e. during the period we are interested in, the mortality rate of children during the first year of life (per 1000 children born) stood at 122 in England, 195 in France, 236 in Germany, 220 in Spain, 187 in Sweden, and 255 in Switzerland (I. HARDACH-PINKE, *Zwischen Angst und Liebe*, p. 534). But that is a very superficial characterization. A more detailed analysis of data for Germany shows large differences. The data for individual districts covering the period of 1862–1866 show that the infant mortality rate during the first year of life (per 1000 children born) ranged from 428 in the district of Donaukreis, 420 in Oberbayern, and 412 in Schwaben, all the way to 115 in the district of Oldenburg, 144 in Arnsberg, and 151 in Minden (I. HARDACH-PINKE, *Zwischen Angst und Liebe*, pp. 536 to 537). An overview of the data for 71 German regions during the period of 1862–1900 (or until 1934) rather clearly shows that the lower infant mortality rate tended to be found in the north-German Protestant districts, while the highest infant mortality rates were found mostly in the south-German Catholic districts (I. HARDACH-PINKE, *Zwischen Angst und Liebe*, pp. 536–537). These data thus support a hypothesis that the differences in infant mortality rates may have been conditioned by denominations. Nevertheless, Hans Medick shows that in the 1658–1884 Laichingen, a Lutheran and Pietist town in Würtemberg, an average of 381 children died during the first year of life per every 1000 children born, whereby the values for the decades ranged from 152 to 486, with an overall increasing tendency. Moreover, the differences between various social groups were not significant: 335 was the average for labourers, 375 for farmers, and 383 for spinners (H. MEDICK, *Weben und Überleben in Laichingen 1650–1900*, pp. 356, 368). Jürgen Schlumbohm, on the other hand, has found a very low infant mortality rate for Belm, a denominationally mixed district in Osnabrück, where 152 children died in infancy for every 1000 children born in 1771–1858 (the levels for the decades ranged from 120 to 177). The differences between social status of the parents were not large (153 large farmers, 159 at smaller farms, and 149 among the landless and hired farm hands (*Heuerleute*). The differences among denominations were not large either: 163 when both parents were Catholic, 149 when both parents were Lutherans (J. SCHLUMBOHM, *Lebensläufe, Familien, Höfe*, pp. 153–154). More attention was subsequently paid to the connection between the infant and child mortality rate, the specific marital fertility rate (J. SCHLUMBOHM, *Lebensläufe, Familien, Höfe*, p. 142; H. MEDICK, *Weben und Überleben in Laichingen 1650–1900*, pp. 340–345), and children being breastfed by mothers or wet-nurses (EDWARD SHORTER, *Die große Umwälzung in den Mutter-Kind-Beziehungen vom 18. bis 20. Jahrhundert*, in: Zur Sozialgeschichte der Kindheit, /edd./ Jochen Martin, August Nitschke, Klaus Arnold, Freiburg-München 1986, pp. 517–518).

care from their (maternal) grandmothers and the families not receiving such care reach the same levels or are they significantly lower?

If these differences were of comparable size, then the criterion of grandmothers' care in general should be taken into account when considering the possible reasons for large differences between infant and child mortality in different local populations. For instance, in Krummhörn, where the grandmother effect was highly significant, infant mortality was very low (app. 128 per 1000), but then again, this is a locality in North-Western Germany, where these levels were comparably low in general. If, on the other hand, the grandmother effect resulted in lower significant differences it would imply that factors other than the grandmothers' care were involved and should be taken into account. But what would that mean from the perspective of evolutionary anthropology or evolutionary biology?

Analyses conducted by Eckart Voland and Jan Beise for Krummhörn for the period of 1720–1874 show that the infant mortality of children who enjoyed the care of their maternal grandmothers was only a few percent lower than that of infants who had either both grandmothers or no grandmother at all. On the other hand, the mortality of infants who were cared for by their paternal grandmothers was significantly (i.e. by tens of percent) higher than the mortality of infants who had either both grandmothers or none.[16] (At least in this possibly exceptional case), it would seem that the positive effect of maternal grandmothers is of the latter kind [ad (b):], in other words, that the differences are relatively small and their order of magnitude cannot be compared with the differences in infant mortality between various local populations. As far as the negative effect of paternal grandmothers is concerned, the first option [ad (a):] applies, that is, the difference is quite significant (although according to existing research, this particular case seems to be more of an exception).

For instance, analyses conducted by Alice Velková, Petr Tureček, and Jan Havlíček (which are part of the output of the Project, to which this study contributes as well)[17] for the Estate of Šťáhlavy in Western Bohemia have shown a positive

16 E. VOLAND, J. BEISE, *Bilanzen des Alters*, p. 211, Abb. 2.

17 JAN HAVLÍČEK, PETR TUREČEK, ALICE VELKOVÁ, *One but not two grandmothers increased child survival in poorer families in west Bohemian population, 1708–1834*, Behavioral Ecology 32/2021, pp. 1–13; ALICE VELKOVÁ, LUDMILA FIALOVÁ, *Study of Cohabitation of three-generational families on the Šťáhlavy estate in western Bohemia in 1820*, in: Jednostka, rodzina i struktury społeczne w perspektywie historycznej, (edd.) Piotr Łozowski, Radosław Poniat, Białystok 2020, pp. 321–332; JAN HORSKÝ, ALICE VELKOVÁ, *Influence of socio-economic status and household structure on the availability of grandmother care. Possibilities of research into the grandmother hypothesis in the Central-European historical family*, Historický časopis 68/2020,

influence of both maternal and paternal grandmothers, but only for one social class, namely the lodgers. Where children were cared for by a grandmother, the infant mortality reached $221^{0}/_{00}$, while where a grandmother was unavailable, the infant mortality stood at $237^{0}/_{00}$. This amounts to a difference of 1.6 per cent. Even so, the infant mortality rate of children for whom grandmother involvement could not be proven represents only approx. 107.5% of the infant mortality rate of children for whom grandmother care can be assumed. This difference may be seen as significant but compared to the differences in infant mortality in several local populations, its size is essentially negligible. Thus, the answer to the question outlined above remains open.

Geographically Scattered and Socially Conditioned Occurrence of the Grandmother Effect

We can draw on Hajnal's classic (now more than fifty years old typology of European marriage patterns and family structure, which is frequently criticised today, often justifiably.[18] In my opinion, however, this typology can still be used if it is taken as an ideal type, of which we can say, with Max Weber, that 'in its conceptual clarity, this thought pattern is nowhere to be found in reality, it is a utopia, and historiographic research should clearly determine in each individual case how close or how far from that ideal pattern reality stands'. „In seiner begrifflichen Reinheit ist dieses Gedankenbild nirgends in der Wirklichkeit empirisch vorfindbar, es ist eine Utopie, und für die historische Arbeit erwächst die Aufgabe, in jeden einzelnen Fall festzustellen, wie nahe oder wie fern die Wirklichkeit jenen Idealbilde steht".[19]

no. 5, pp. 769–796; ALICE VELKOVÁ, *Transgenerational Effect on Reproduction Based on Parish Registers from the 17th–19th Century Bohemia*, European Population Conference, Brussels 6.–9. 6. 2018; ALICE VELKOVÁ, *The Effect of Grandmothers on Their Grandchildren's Survival (West Bohemia, 1708–1834)*, 12th European Social Science History Conference, Belfast 4.–7. 4. 2018; PETR TUREČEK, ALICE VELKOVÁ, JAN HAVLÍČEK, *The Impact of Paternal and Maternal Grandmothers on Their Grandchildren Survival in 17–19th Century West Bohemia*, 5th International Conference of the Polish Society for Human and Evolution Sciences, Centre of Nex Technologies, Warsaw 24.–26. 9. 2018.

18 E.g., most recently by MIKOŁAJ SZOŁTYSEK, *Rethinking East-Central Europe. Family Systems and Co-Residence in the Polish-Lithuanian Commonwealth* 1. *Contexts and analyses*; 2. *Date quality assessments, documentation, and bibliography*, Bern-Berlin-Bruxelles-Frankfurt am Main--New York-Oxford-Wien 2015, pp. 41–109.

19 M. WEBER, *Die „Objektivität' sozialwissenschaftlicher und sozialpolitischer Erkenntnis*, p. 65.

Yet, the focus of such research 'historiographical work' may differ depending on its initial viewpoints. For example, as for the Hajnal South-Eastern family type (to be discussed in more detail below), there is a striking difference in the literature resulting from various ways of asking questions of the sources which are frequently sundry in nature. It is one thing to ask about the existence of certain formative structuring principles, such as a possible formation of a joint family, rigorous patrilinearity in the history of a family etc. Ethnography seeks to observe them in recent populations, or collect the memories of contemporary witnesses about their recent validity in this or that locality.[20] Yet, it is another thing to consider a real percentage of representations of households with complete family structures within a total of households in a particular local population.[21] Although it is possible to ethnographically determine that the joint family structure can be employed without qualification whenever there is a corresponding situation in the respective population, the joint family representation in the population need not be explicitly high in percentage terms.

With regard to discussing the 'grandmother hypothesis', it is crucial that we can trace a distinct tendency towards the patrilinear structure of family relations in the South European area. It is in this sense that the Hajnal typology can be used productively as an ideal type.

Taking the typology of the family historical development [22] into consideration, it could be assumed that the influence of grandmothers on the fitness of their grandchildren would differ in two large regions (or territories of two 'regional

20 MARIA TODOROVA, *On the Epistemological Value of Family Models: The Balkans within the European Pattern*, in: Family History Revisited. Comparative Perspectives, (edd.) Richard Wall, Tamara K. Hareven, Josef Ehmer, Newark-London 2001, pp. 242–256; LENKA J. BUDILOVÁ, *Od krevní msty k postsocialismu. Vývoj antropologického zájmu o Balkán* [From Blood Revenge to Postsocialism. The Development of Anthropological Engagements with the Balkans], Brno 2019, pp. 40–43, 134–136.

21 E.g. TAMÁS FARAGÓ, *Formen bäuerlicher Haushalts- und Arbeitsorganisation in Ungarn um die Mitte des 18. Jahrhunderts*, in: Familienstruktur und Arbeitsorganisation in ländlichen Gesellschaften, (edd.) Josef Ehmer, Michael Mitterauer, Wien-Köln-Graz 1986, pp. 103–183; M. SZOŁTYSEK, *Rethinking East-Central Europe*, pp. 41–109.

22 JOHN HAJNAL, *European marriage patterns in perspective*, in: Population in History, (edd.) David V. Glass, David E. C. Eversley, Chicago 1965; PETER LASLETT, RICHARD WALL (edd.), *Household and Family in Past Time*, Cambridge-London-New York-Melbourne 1972, pp. 1–89; MICHAEL MITTERAUER, *Historisch-anthropologische Familienforschung. Fragestellungen und Zugangsweisen*, Wien-Köln-Graz 1990, pp. 147–190; CHRISTOPHE DUHAMELLE, JÜRGEN SCHLUMBOHM, *Einleitung: Vom „europäischen Heiratsmuster' zu Strategien der Eheschließung?*, in: Eheschließungen im Europa des 18. und 19. Jahrhunderts. Muster und Strategien, (edd.) Christofer Duhamelle – Jürgen Schlumbohm, Göttingen 2003.

populations') separated by the Hajnal Line of St. Petersburg–Trieste. On the level of modelling of ideal types, the differences should be observable both on the level of family households (Haushaltsfamilien) and on the level of kinship networks (Verwandtschaftsfamilie).[23] If we consider a higher complexity of families, a lower age at marriage, especially in women, and a higher general availability of marriage to the southeast of the Hajnal Line, we may assume that grandmothers would have had a greater impact on their grandchildren. Nevertheless, everything is far more complicated, even on the level of mere modelling. The south-eastern type of family household, the so-called joint family, was formed in a patrilinear fashion, which means that sons stayed at the family farmsteads while daughters were married off. The grandchildren thus may have had greater contact with their grandmothers than the children in the Northwestern-type families but under this arrangement they were only in contact with their paternal grandmothers. If the grandmother effect works equally for maternal and paternal grandmothers, and if it is indeed universally present in human societies, then it should be more pronounced to the southeast of the Hajnal Line. If, on the other hand, the negative influence of paternal grandmothers, as found in the North-German Krummhörn,[24] is not merely a local exception but something which exists in various forms elsewhere, then the south-eastern family type would be the environment where different varieties of this phenomenon should occur. At the same time, however, we should be careful to distinguish this potential negative effect of paternal grandmothers from the negative effect of paternal grandfathers on child survival (negative effect […] on child survival), which is documented in a relatively large number of studies.[25]

Moreover, a possible positive effect of grandchildren's more intensive contact with their paternal grandmothers in family households of the south-eastern type could be weakened by the fact that in this arrangement, the grandmother – with the exception of the mother – is the only adult female in the household who shares some of her genes with her grandchildren. In the joint family, adult daughters, i.e. sisters of the father and aunts of the grandchildren in question, are married off and leave, while women from collateral married couples within

23 For the typological categories see ANDREAS GESTRICH, JENS-UWE KRAUSE, MICHAEL MITTERAUER, *Geschichte der Familie*, in: Europäische Kulturgeschichte I, (ed.) Andreas Gestrich, Stuttgart 2003, p. 160.

24 E. VOLAND, J. BEISE, *Bilanzen des Alters*, pp. 210–212.

25 REBECCA SEAR, DAVID COALL, *How Much Does Family Matter? Cooperative Breeding and the Demographic Transition*, Population and Development Revue 37/ 2011, no. 1, pp. 81 to 112, esp. p. 83.

the household are not genetically related to the grandchildren considered here since these are the offspring of the marriage of their brother(s)-in-law. The more collateral married couples within a joint family, the higher the number of adult women within the family to whom the theory of inclusive fitness cannot be applied. This makes the south-eastern family different from family structures of the north-western region, where extended families or stepfamilies (famille souche, Stammfamilie), or possibly Ausgedingefamilie, i.e., families including retired couples, were more frequent.[26] In such families, other related adult women (alloparents), who could take care of the children together with their mother and in a way replace the care of the grandmothers, were no exception. Especially childless aunts, genetically as closely related to their nephews and nieces as the children's grandmothers, could act as 'quasi-grandmothers' or 'surrogate grandmothers'.[27] Thus no clear-cut hypothesis as to whether the 'grandmother effect' was likely to be more pronounced in the north-western or the south-eastern historical family type can be made regarding the ideal-type modelling.

No clear-cut answers to this question are offered by individual empirical case studies either. Although the principles which structured families in the south-eastern region are a factor which could have allowed for the emergence of more complex family households, it does not necessarily imply that the actual representation of complex families in individual local populations was high.[28]

26 M. MITTERAUER, *Historisch-anthropologische Familienforschung*, pp. 87–130; ALICE KLÁŠTERSKÁ, *Forma sociálního zabezpečení na venkově v 18. a první polovině 19. století (Výměnek v pozemkových knihách vesnice Lhůty u Šťáhlav)* [The Nature of Social Security in Villages in the 18th and Early 19th Centuries /Excerpts from the Land Registers of the Village of Lhůta u Šťáhlav/], Historická demografie 21/1997, pp. 93–133.

27 ALICE VELKOVÁ, Child mortality in stepfamilies (West Bohemia, 1700–1850), 3rd European Society of Historical Demography Conference, Pécs 26.–29. 6. 2019.

28 T. FARAGÓ, *Formen bäuerlicher Haushalts- und Arbeitsorganisation in Ungarn um die Mitte des 18. Jahrhunderts*, pp. 103–183; M. MITTERAUER, *Historisch-anthropologische Familienforschung*, p. 158. – A case study for seven Hungarian villages in the eighteenth century shows that one of them, the village of Tököl, had an unequivocally south-eastern family structure. In 1747, 67.7% of households in Tököl were multiple family households, i.e.,they belonged to the fifth family type of Laslett which includes at least two married couples (P. LASLETT, R. WALL /edd./, *Household and Family in Past Time*, pp. 1–89). Nevertheless, even here most households included only two generations (56.3%), while 45.1% households in Tököl included three generations, and 1.4% four generations. But that sets Tököl apart from the six remaining villages, where the 18th-century households comprising three generations (in one case four generations) reached from 10.3% to 19.1% (T. FARAGÓ, *Formen bäuerlicher Haushalts- und Arbeitsorganisation in Ungarn um die Mitte des 18. Jahrhunderts*, pp. 126–127). Moreover, the demographic behaviour of the 18th–19th centuries may reveal certain features of transition from a traditional model of reproduction to a modern one, and may have been influenced by the movement of

Leaving aside the areas with extremely high mortality in general, such as Russia,[29] we find various areas with a relatively low (or very low) infant and child mortality rate in south-eastern Europe of the 18th–19th c., for instance, two Transylvanian Calvinist parishes where, within the context of the entire Europe of the second half of the 19th century, infant mortality was relatively (very) low.[30] Infant mortality in the Hungarian part of the Habsburg Monarchy, an area for which we have a sufficient amount of data to characterise a wider demographic context, was also relatively low. According to case studies of six Hungarian villages, infant mortality between 1765–1790 equalled to 191 for every 1000

people to newly settled areas, etc. For instance, Michael Mitterauer and Alexander Kagan have ascertained that in settlements of 1762–1763, situated in the area of Russian Yaroslavl (i.e. an area of a clearly south-eastern family structure), three-generational households amounted to about 25%, two-generational households equalled to 55%, and the proportion of 'complex families' stood at 30%, which means that not all complex families were three-generational (M. MITTERAUER, *Historisch-anthropologische Familienforschung*, p. 158). In principle, these values are similar to those we find at some manorial estates in the Czech Lands (A. VELKOVÁ, *Child mortality in stepfamilies /West Bohemia, 1700–1850/*; A. VELKOVÁ, L. FIALOVÁ, *Study of Cohabitation of three-generational families on the Šťáhlavy estate in western Bohemia in 1820*, pp. 321–332).

29 WLADIMIR BERELOWITCH, JACQUES DUPÂQUIER, IRENA GIEYSZTOR, *L'Europe orientale*, in: Histoire des populations de l'Europe II. La révolution démographique 1750–1914, (edd.) Jean-Pierre Bardet, Jacques Dupâquier, Paris 1998, pp. 487–512, esp. p. 501; for a comparative context see LUDMILA KÁRNÍKOVÁ, *Vývoj obyvatelstva v českých zemích 1754–1914* [*Population Development in the Czech Lands 1754–1914*], Praha 1965, pp. 332–334.

30 The mortality rate per 1000 children born in 1850–1900 in two Calvinist parishes stood at 143 and 131 for one-year olds, while the equivalent numbers in two Eastern Orthodox parishes were 157 and 238 (IZABELA GEORGIANA COROIAN, *Infant mortality in rural Transylvania: a case study on four parishes in the second half of the 19th century*, The Romanian Journal of Modern History 8/2017, no. 1–2, pp. 5–18, esp. p. 9). These numbers are low (see above), in comparison with Krummhörn for instance, a locality where a positive effect of maternal and a negative effect of paternal grandmothers was demonstrated. In Krummhörn of 1720–1874, infant mortality stood at 128 per 1000 children born. In Quebec, where the grandmother effect also manifested, the infant mortality rate stood at 224 of one-year olds per every 1000 children born in 1670 to 1799 (J. FOX, K. WILLFÜHR, A. GAGNON, L. DILLON, E. VOLAND, *The consequences of sibling formation on survival and reproductive success across different ecological contexts*, p. 323). In the district of Breslau (now Wroclaw), the 1862–1900 the infant mortality rate reached 268 and 282 per 1000 born, which was an average or slightly below average for Germany of that time (I. HARDACH-PINKE, *Zwischen Angst und Liebe*, pp. 536–537). It is up to further detailed comparative studies to decide to what extent the data for Transylvania correspond with the local south-eastern type of family structure and/or a possible role of (paternal) grandmothers within such households.

live-born children, in 1791–1820 it amounted to 208 per 1000 live births, in 1821–1850 it stood at to 206, and in 1851–1895 remained at 206 per 1000.[31]

In theory, we could hypothesize that these (relatively) low values of infant mortality in Transylvania and Hungary may have related to more intensive contacts (largely merely postulated by us) between grandchildren and their paternal grandmothers within the family households of the south-eastern type. Nevertheless, even a brief glance at other Hungarian data suggests that low infant mortality, especially in the Hungarian Calvinist environment, may have been related more to low specific marital fertility rate or low total marital fertility rate, the evidence of which is provable in the Hungarian environment.[32] Even a comparison with the infant mortality in the Czech Lands at around the same time[33] suggests that the situation in the Hungarian environment was more likely

31 RUDOLF ANDORKA, PAVLA HORSKÁ, ANNE-LISE HEAD-KÖNIG, *L'Europe centrale*, in: Histoire des populations de l'Europe II. La révolution démographique 1750–1914, (edd.) Jean-Pierre Bardet, Jacques Dupâquier, Paris 1998, pp. 427–461, esp. p. 431.

32 A probe into a village in an ethnically Ukrainian Greek Catholic environment shows an increase from 4.99 births per one married woman up to 49 of age in 1791–1820, to 6.25 births per woman in 1821–1850, and up to 8.67 births in 1851–1895. But such increases are exceptional. The other 12 case studies show stable or decreasing values. For instance, a sample of an ethnically Hungarian village of Calvinist denomination shows an average of 6.1 births per one married woman aged 20 to 49 in the period of 1730–1789. In the years of 1791–1820, the average reached 3.73, while in 1821–1850 it stood at 3.66, and in 1851–1895, the number of births per one married woman decreased to 2.73. In another east Hungarian Roman Catholic village, the index reached even 9.21 in the earliest period studied, but dropped to 7.4 and 7.5 during two subsequent periods (R. ANDORKA, P. HORSKÁ, A.-L. HEAD-KÖNIG, *L'Europe centrale*, p. 436). In Hungary as a whole, the total marital fertility rate, i.e. the number of births per annum and per one married woman of reproductive age (a figure which French scholars call fécondité legitime), was even lower. In 1880, it was 0.582, similar at 0.581 in 1890, but in 1900, it stood at 0.573, and by 1910 fell to 0.541 (R. ANDORKA, P. HORSKÁ, A.-L. HEAD-KÖNIG, *L'Europe centrale*, p. 427). These values are even lower than, for instance, in Germany, where the total marital fertility rate in a sample of selected villages ranged from 0.76 to 0.79 births per one married woman of reproductive age per year in 1800–1899 (PETER MARSCHALK, JACQUES DUPÂQUIER, *La grande mutation de la population allemande*, in: Histoire des populations de l'Europe II. La révolution démographique 1750–1914, /edd./ Jean-Pierre Bardet, Jacques Dupâquier, Paris 1998, pp. 398–425, esp. p. 413).

33 In case studies from the Czech environment, the 'total marital fertility rate' (i.e. an average of births per one married woman during her lifetime) seems to be higher in the 17th–18th c. than the rate indicated by the data from the Hungarian environment. It ranged from 8.3 (Domažlice, 2nd half of the 17th c.) to 10.6 (Břevnov, 2nd half of the 17th c.). Data on the specific marital fertility rate suggest shorter inter-birth intervals in the Czech environment (LUMÍR DOKOUPIL, LUDMILA FIALOVÁ, EDUARD MAUR, LUDMILA NESLÁDKOVÁ, *Přirozená měna obyvatelstva českých zemí v 17. a 18. století* [The natural currency of the population of the Czech

to be related to longer inter-birth intervals,[34] which is a regularly observed correlation of phenomena attested by (historical) demography for numerous local populations. In order to claim that lower infant mortality in south-eastern local populations was attributable to the grandmother effect, we would also have to find a tendency towards shorter inter-birth intervals. But that was simply not the case. Low infant mortality also prevents us from applying, from a macro-analytic perspective, a model of the negative impact of paternal grandmothers on regional populations southeast of the Hajnal Line.

lands in the 17th and 18th centuries], Praha 1999, pp. 434–444). Hungarian values for the total marital fertility rate are even lower than the figures for the same period in Cisleithania, where in 1880, the average stood at 0,677, in 1890 at 0.683, in 1900 at 0.670, and in 1910 at 0.588 births per one married woman per year (R. ANDORKA, P. HORSKÁ, A.-L. HEAD-KÖNIG, *L'Europe centrale*, p. 451). Nevertheless, these average values for Cisleithania could be very misleading, because the area included the Czech and Alpine regions with the north-western family structure, but also Galicia, Bukovina, and Dalmatia, where the family structure was markedly south-eastern. Even so, for instance in 1880, the marital fertility rates of Dalmatia (0.720), Galicia (0,659), and Bukovina (0.651) were not significantly different from the rates of Bohemia (0.675), Moravia (0.703), or Silesia (0.701). Nevertheless, in the Czech Lands, there was a larger difference between the marital (legitimate) fertility rate and the general fertility rate, i.e. the number of births per woman of reproductive age regardless of her marital status. For instance, in Bohemia, the marital fertility rate reached 0.675 whereas the general fertility rate was 0.398, while in Dalmatia, the equivalent figures were 0.720 versus 0.409, in Galicia 0.679 versus 0.463, and in Bukovina 0.651 versus 0.459 (R. ANDORKA, P. HORSKÁ, A.-L. HEAD-KÖNIG, *L'Europe centrale*, p. 451). The difference between the marital fertility rate and the general fertility rate can grow where the age at marriage is higher and where marriage is less accessible. On the other hand, it can be lowered by higher extramarital fertility. Both could be the case of Czech, and especially Alpine, lands as opposed to the more easterly and southern parts of Cisleithania. In 1750–1850, in some parts of the Alpine lands, the proportion of extramarital births reached 50% of all births (A. GESTRICH, J.-U. KRAUSE, M. MITTERAUER, *Geschichte der Familie*, p. 505).

34 Demographically speaking, the 'grandmother effect' should be provable by lower infant and child mortality rates of grandchildren who receive their grandmothers' care, and by simultaneously shorter inter-birth intervals of the grandmothers' daughters or daughters-in-law. Thus we should be able to prove that the 'grandmother effect' either eliminates, or at least moderates, the generally valid rule that longer inter-birth intervals are associated with lower infant and child mortality rates, and vice versa. When trying to prove the 'grandmother effect', demographic studies tend to focus on infant (and child) mortality rates and often neglect the inter-birth intervals. However, we could imagine a form of the 'grandmother effect' where children who receive their grandmothers' care have the same mortality rate as those who do not receive it, but daughters or daughters-in-law have shorter inter-birth intervals than women for whom grandmothers' care of their infants is not available. It seems that existing studies in historical demography have not yet explored this possibility.

Comparisons between large populations (referred to here as 'regional') thus do not lead to any definite conclusions. Let us, therefore, focus on individual local populations. Analyses of the late- 18th-to-early-19th-century west Bohemian Estate of Šťáhlavy show that although the local population included a relatively large number of women of post-reproductive age,[35] significant influence of either paternal or maternal grandmothers cannot be observed in the farming classes nor among the cottars. Nevertheless, as noted above, a positive grandmother effect has been found among the poorest class of the landless tenants. The grandmother effect thus does not seem to be present equally throughout the population. Instead, it is quite clearly linked to a particular social class, a certain segment of society.[36]

At the level of individual households, we find that co-resident domestic groups may have included various other women, genetically both related and unrelated, who could stand in for one another, i.e., their roles within the families were complementary from the infant's point of view (they acted as alloparents). For instance, Markéta Pražáková Seligová[37] reports that in selected localities of the north Bohemian Estate of Horní Police in 1771, there were 259 households with nuclear families, of which only 88 did not include any other adult female. Other unrelated women lived in 20 households, biological grandmothers in 44 households and step-grandmothers in 7 households. A total of 90 households included another married couple of post-reproductive age or a widow with children, and 13 households also included a sister, an aunt, or a sister-in-law. At the same time, 'the small sample of households where cohabitation of the couple and the mother of one of the spouses was of a longer duration lends itself to a conclusion that grandmothers may have contributed to the survival of grandchildren but in a minority of cases.' Nor does this small sample show 'that the effect of maternal grandmothers and that of paternal grandmothers should play a distinctly different role in the survival of their grandchildren'.[38]

Thus the 'grandmother effect' can be demonstrated for some local populations dispersed within large Models of Relations areas (i.e., large regional populations)

35 A. VELKOVÁ, *Přítomnost babiček v předindustriálních rodinách*, pp. 213–234.

36 A. VELKOVÁ, *Transgenerational Effect on Reproduction Based on Parish Registers from the 17th to 19th Century Bohemia*; A. VELKOVÁ, *The Effect of Grandmothers on Their Grandchildren's Survival (West Bohemia, 1708–1834)*.

37 MARKÉTA PRAŽÁKOVÁ SELIGOVÁ, *Rozbor domácností na Hornopolicku v roce 1771 z hlediska přítomnosti babiček* [Analysis of Households in the Horní Police Estate in 1771 with Regard to Presence of Grandmothers], Historická demografie 42/2018, no. 2, pp. 177–210.

38 M. PRAŽÁKOVÁ SELIGOVÁ, *Rozbor domácností na Hornopolicku v roce 1771*, pp. 181, 210.

in the 18th and 19th c. and moreover, at least in some local populations where the effect is significant, it appears to be related to specific social classes or segments of the population. Therefore, what does it mean in terms of evolutionary biology and evolutionary anthropology?

Models of Relations, Patterns of Culture, Lines of Development, and 'Progress' in the Area of 'Technological Rationality'?

We can distinguish between (a) 'relational models' (or 'models of relations') on the one hand, and (b) 'patterns of culture' on the other hand. Models of relations can take (a.a) the form of either 'ideal types',[39] or they can be (a.b) 'empirically' derived as they are, for instance, in Voland and Beise's study.[40] By 'patterns of culture' we shall mean particular patterns of (b.a) behaviour or (b.b) of actions undertaken by their actors either implicitly or intentionally, which can be spread by cultural transfer (within families or between individual families, generations or cultures). To what extent relational models are merely noetic tools or to what extent they have their ontic counterparts in the form of real correlations between the studied entities (physiological qualities, demographic behaviour, family structures, etc.) can then be viewed as theoretical and empirical issues which deserve closer attention. In addition, we may also ask whether some 'empirical models of relations' overlap with 'patterns of culture' enacted by particular actors.

Let us ask whether (1.) female menopause, which appeared either in prehistory or perhaps only in antiquity, was an evolutionary consequence of the fact that the presence of women of post-reproductive age became commonplace in population. We can further ask whether this evolutional event–relatively ancient from the perspective of historiographers–can be unambiguously linked by a developmental line with historical, Early Modern patterns of demographic behaviour, as can be observed in at least some local populations (particularly in the form of shorter inter-birth intervals in conjunction with lower infant mortality). This line of development could be viewed (from the point of view of nominalism) on a purely (1a) explanatory interpretative level, and at the same time, it could also be seen, at least under certain circumstances, on the level of (1b) ontic evolutional connection of the scrutinized phenomena. Another question then is whether, or to what extent (2.), the relational model of the grandmother effect, which

39 M. WEBER, *Die „Objektivität' sozialwissenschaftlicher und sozialpolitischer Erkenntnis*, pp. 22 to 87.

40 Voland and Beise's study. See E. VOLAND, J. BEISE, *Bilanzen des Alters*.

researchers posit or (also) observe, was/is also a 'cultural pattern' upon which actors intentionally or unwittingly act. Demographers naturally speak of 'modern' demographic behaviour (i.e., the behaviour which limits the rate of marital fertility) and tend to describe it as planned, i.e., intentionally regulated parenthood. However, a degree of intentionality might also be (if not must be) assumed for the so-called 'old' demographic regime, where fertility within a family was not controlled. After all, many studies in (historical) demography use terms such as 'strategy of reproductive behaviour', 'family strategy', etc.

As regards the first question (1.) (i.e., whether a developmental line can be drawn between the emergence of menopause and certain demographic patterns), it is undeniable that since its evolutionary emergence (or since its evolutional ancient predisposition was evoked in individual branches of humankind by various environmental and sociocultural influences after the spread of man from Africa), menopause has been genetically inherited in a developmental line which has ontic coherence. However, it is questionable how closely the increasing presence of older women who helped care for their grandchildren (although in terms of human evolution, we cannot yet speak of women in their post-reproductive age) is related to the onset of menopause in evolutionary terms. There is also a question of how closely the grandmothers' care of their grandchildren is related to shorter inter-birth intervals of their daughters (or daughters-in-law) and lower grandchild mortality. Comparisons with other species and among cultures suggest that such correlations are highly probable,[41] t which does not mean, however, that they are evolutionarily stable and clearly fixed. Comparisons between various socio-cultural environments show that such correlations are not universally present, at least not in several past centuries.

Variability among different human environments with regard to the interconnection between these phenomena is a manifestation of culture. To quote a classic: Jacques Monod[42] says that the development of human symbolic language, a unique event in the biosphere, has opened the way for the second evolution that creates a new realm: a realm of culture, of ideas, of knowledge. Nevertheless, according to a number of theories,[43] culture, in its turn, co-evolves with

41 K. HAWKES, J. F. O'CONNELL, N. G. BLURTON JONES, H. ALVAREZ, E. L. CHARNOV, *Grandmothering, menopause, and the evolution of human life histories*, pp. 1336–1339; K. HAWKES, *Grandmothers and the Evolution of Human Lonevity*, pp. 380–400.

42 JACQUES MONOD, *Chance and Necessity: An Essay on the Natural Philosophy of Modern Biology*, New York 1972, chap. 7, pp. 118–137, esp. pp. 129–133.

43 MARCELLO BARBIERI, *The Organic Codes. An introduction to semantic biology*, Cambridge 2003, pp. 217–242; PETR TUREČEK, JAN HAVLÍČEK, *Kultura jako předmět a produkt*

genes[44] and may even have an impact on the level of epigenetic memory.[45] In other words, particular behaviours, or possibly their intersubjective configurations, can be inherited either purely genetically, or (on a short-term or a long-term basis) epigenetically, culturally, or possibly within a system of dual heredity of co-evolving genes and culture. The spread of 'cultural contents' (variations of culture, cultural complexes, or cultural patterns) in time and space can be explained in various ways. Some tend to appeal more to the (biological) theory of evolution while other approaches are rooted in the history of culture (and emphasis on the spontaneity of cultural change). Some evolutionary explanations tend to rely on the replication of cultural contents in their spread (the selectionist model) while others focus on their transformation (the attractionist model).[46]

However, it is also possible to imagine cultural contents (i.e., a certain, relatively stable configuration of behaviour, or acultural pattern) which appear apparently independently of more general lines of development in different places and at different times (or are recovered from 'cultural memory'). They are then culturally inherited over a period of time. Their emergence (or present activation) can be a response to a relatively wide range of factors (environmental or cultural pressures). It may also be supposed that as a response to one and the same situation, more possible (mutually alternative) cultural contents may exist.

evoluce [Culture as the Object and Product of Evolution], in: O původu kultury. Biologické, antropologické a historické koncepce kulturní evoluce [On the Origin of Culture: Biological, Anthropological and Historical Concepts of Evolution of Culture], (ed.) LENKA OVČÁČKOVÁ, Praha 2017, pp. 183–229.

44 PETER J. RICHERSON, ROBERT BOYD, *Not by Genes Alone, How Culture Transformed Human Evolution*, Chicago 2005, pp. 191–237.

45 Some evolutionary biologists have been promoting the 'phenotype first' principle, which assumes that in evolution, phenotypical changes-including behavioural changes and including culturally conditioned changes in human behaviour-precede changes of the genotype while the new phenotypical traits (phenotypical accommodations) need not necessarily be genetically fixed. In some cases, their fixation may be merely epigenetic (JANA ŠVORCOVÁ, ANTON MARKOŠ, *Epigenetic processes and evolution of life*, Boca Raton 2019, pp. 79–84; referring to MARY JANE WEST-EBERHARD, *Developmental plasticity and evolution*, New York 2003). In other words, this hypothesis claims that while the human species develops (mainly) in accordance with Darwin's model of evolution, (human) culture develops in accordance with Lamarck's model of evolution. The 'mainly' in brackets refers to the theory of co-evolution of genes and culture (i.e. to the dual-inheritance theory on the level of genes and on the level of culture, and according to some interpretations, also on the level of the environment; P. TUREČEK, J. HAVLÍČEK, *Kultura jako předmět a produkt evoluce*, pp. 190–197).

46 P. TUREČEK, J. HAVLÍČEK, *Kultura jako předmět a produkt evoluce*, pp. 197–206.

In this context, it may be interesting to consider an alternative to the 'grandmother effect' which Sarah B. Hrdy treats as 'cooperative breeding'.[47]

It can also be assumed that one and the same cultural content may be evoked by several relatively diverse situations. If such cultural contents (or patterns of culture) include demographic behaviours, this could make them relatively more stable and persistent (than other cultural contents). They could assume the nature of Braudel's longue dureé, which in turn may limit the number of possible cultural responses to that particular situation (or a given complex of pressures). An example of this could be the correlation between infant and child mortality, inter-birth intervals, and a particular sociocultural, or possibly natural, environment.

Following the studies in evolutionary anthropology (e.g., Kristen Hawkes), it could be argued that grandmothers taking care of their grandchildren were most likely primary in terms of evolution, which led to lower infant and child mortality and shorter inter-birth intervals of their daughters, or daughters-in-law. Menopause appeared as an evolutionary consequence of this phenomenon. Therefore it seems that an originally highly variable behaviour pattern which was probably only relatively loosely fixed in culture has over time produced a genetically firmly fixed consequence. Hypothetically, we could suppose that grandmothers' care (including its demographic impact) was initially passed on only culturally or its physiological consequences may have been inherited only epigenetically. Only later, did it come to be a genetically fixed evolutionary adaptation.

47 Even this claim could be tested using (historical) demography. It should certainly be possible to investigate the relation between the infant mortality rate and inter-birth intervals and the number of persons (adult women, or possibly men) per household, both in local populations and larger regions. The main problem is that the relationship of persons genetically unrelated to the children in question would be much more hypothetically construed than it is in the case of grandmothers. Cooperative breeding is interesting especially within such household coresident groups, which are not constituted on kinship relations, but on symbolic (cultural) relations. If an analogous effect to the "grandmothers 'effect" were demonstrated for these symbolically constituted groups, the question would arise as to how to evaluate this in terms of the "grandmothers' hypothesis". We could either say that this is proof of the adaptability of culture. During development, cultural institutions would begin to replace the original role of biological kinship and take over its function. Or it would be reason to doubt the legitimacy of the "hypothesis itself". See SARAH B. HRDY, *Development Plus Social Selection in the Emergence of 'Emotionally Modern' Humans*, in: Childhood. Origins, Evolution, and Implications, (edd.) Courtney L. Meehan, Alyssa N. Crittenden, Albuquerque 2016, pp. 17–44; SARAH B. HRDY, *Variable postpartum responsiveness among humans and other primates with 'cooperative breeding': A comparative and evolutionary perspective*, Hormones and Behavior 77/2016, pp. 272–283; R. SEAR, D. COALL, *How Much Does Family Matter?*, pp. 81–112.

It remains yet to be seen where there was (or is) – in terms of evolution, history and system – the division between adaptation, which is (epi)genetically fixed and stable, and adaptive behaviour (a phenomenon), which has (or potentially may have) an impact on the fitness and can be viewed as a relatively stable phenotypical manifestation of an organism (a species, in this case the human), but its fixation is (merely) cultural and therefore relatively very unstable. Seen yet from another point of view, what originated as an evolutionary adaptation may be covered with layers of other factors in the course of time, which may have the same or similar effect.

It is likely that during the period, for which we want to test the 'grandmother hypothesis' using the available demographic data (i.e., mainly of the 18th and 19th c.), the infant and child mortality rate was also affected by other factors which were perhaps even more significant than the grandmother effect. On the other hand, the same effect which we ascribe to maternal grandmothers' care, i.e., increased fitness of grandchildren, may have resulted from other mutually alternative cultural complexes. This makes the question of the extent to which we can link the developmental line of a specific configuration of demographic and cultural phenomena, observed in some local populations over the past two or three centuries, to an ancient evolutionary event even more pressing. The more it turns out to be a (purely) cultural transmission, the more the developmental lines posited by us will have a merely interpretative or explanatory character, and the less certain we will be that the phenomena which we observe are indeed ontically related in the sense of cultural evolution.

Ad (2.)

Supposing that the grandmother effect could be viewed as a 'pattern of culture', in our search for answers to the above-mentioned questions [ad (2.):], we may find Weber's conception of progress (Fortschritt) as 'advancing technical rationality of the means' quite useful.[48] Weber uses the term 'technical' in relation to

48 MAX WEBER, *Schriften zur Wissenschaftslehre*, (ed.) Michael Sukale, Stuttgart 1991, p. 218. – Max Weber investigates whether it is possible to work with a value-neutral (wertfrei) concept of progress (Fortschritt) within the framework of social 'empirical sciences'. He distinguishes three different meanings of the term, namely 'im Sinne 1. bloße diferenzierenden 'Fortschreiten', ferner 2. der forschreitenden technischen Rationalität der Mittel, endlich 3. der Wertsteigerung'. ('Progress can be used in the sense 1. of a merely differentiating 'progress ahead', further 2. of advancing technical rationality of the means, and finally, 3. of an increase in values'.) M. WEBER, *Schriften zur Wissenschaftslehre*, pp. 218n.

human behaviour and actions in the broadest sense of the word. He states that 'if, in a particular case, it holds that measure x is, according to our assumption, the only way in which a result y can be achieved … and if now, which can also be empirically ascertained, people consciously use such consideration to direct their actions oriented on result y, then their behaviour is 'technically correctly' oriented. If human behaviour (of any kind) is at any particular point 'more correct' than its earlier orientation, we can see 'technical progress' at play'.[49]

Hypothetically, we could ask whether a configuration of family relations which enables grandmothers to assist in the care of their new-born grandchildren was the 'means' ('measure') x applied (or in some cases [consciously] chosen) in 'order' to 'successfully' achieve a 'goal' y, which in this case would have been the increased likelihood of survival of new-born children. If this pattern of cultural behaviour (this 'strategy of reproduction') seems to be 'technically more correct' than earlier patterns, we could speak – with reservations specified below – about 'progress' in the sense of increased 'technical rationality of the means' in Weberian sense of the word.[50]

With respect to the studied subject, it should be emphasised that the cultural pattern involving the 'grandmother effect' may not have been the only possible means (x) available to achieve the objective (y). In this sense, the model would differ from Weber's concept of technical progress. Nonetheless, even if there were a 'choice' between multiple mutually competitive patterns of behaviour, all of which could lead to the achievement of the *y*-objective, if these patterns were more efficient than the patterns available for 'choice' , we could speak of 'technical progress', albeit in somewhat weaker sense than Weber suggested. For this reason alone, Weber's concept of 'progress' as 'increasing technical rationality of the means' is valid primarily as an ideally typical scheme of possible (evolutional) connections. Confrontation with it reveals that we cannot tell whether the cultural pattern constituting the 'grandmother effect' spreads by unreflectedcultural transmission through social learning or by a deliberate intuitive 'choice',

49 M. WEBER, *Schriften zur Wissenschaftslehre*, pp. 218–219. – „Ist aber im Einzelfall der Satz richtig: die Maßregel x ist das (wir wollen annehmen: einzige) Mittel für die Erreichung des Erfolges y [...] und wird nun dieser Satz – was ebenfalls empirisch feststellbar ist – von Menschen bewußt für die Orientierung ihres auf der Erfolg y gerichteten Handelns verwertet, dann ist ihr Handelns 'technisch richtig' orientiert. Wird menschliches Verhaltens (welcher Art immer) in irgendeinen Einzelpunkt in diesem Sinn technisch ‚richtiger' als bisher orientiert, so liegt ein ‚technischer Fortschritt'…' M. WEBER, *Schriften zur Wissenschaftslehre*, pp. 219n.

50 From a terminological point of view, it should be noted that the concept of 'progress' is meant as a shift, a change in a particular direction, a change within a particular line of process; the term 'progress' should not arouse any positive or negative connotations.

that we (probably) cannot (verifiably) trace the line of evolutionary behaviour in the sense of the cultural pattern constituting the 'grandmother effect', and that we can at best (most likely) find some discretely and dispersed 'foci' where the grandmother effect occasionally appeared in the period accessible to historical-demographic research.

The 'Choice' of Cultural Patterns and their Adaptive or Maladaptive Character

When we consider the 'choice' of a cultural pattern (such as more care provided to infants by involving [maternal] grandmothers) the notion of 'choice' also includes acting without thought or reflection. If the 'choice' needs to be assessed in terms of possible 'increase in technical rationality of the means', it should be considered in the context of other cultural patterns which may have the same 'effect' as the care given by [maternal] grandmothers. An example of this could be the 'measures' ('means') connected with the involvement of midwives, or the population policy coined by the enlightened Viennese Court.[51] These probably involved more than a reflected 'choice' of cultural complexes (or patterns of culture). The question of how much they actually influenced the decrease in infant and child mortality is the subject of further studies (especially comparison of 'the grandmother effect' with the 'midwife effect'). Another measure which may fit the definition of 'increasing technical rationality of means' is employment of (conscious, intentional, and goal-oriented) restrictions on marital fertility, which became prominent in the Czech Lands around 1900.[52] Limitations on marital fertility undoubtedly reduced infant and child mortality, significantly more than the grandmother effect in the traditional demographic regime. On the other hand, fertility limitation, especially once it drops below a certain level, is a prime example of maladaptive culture as it reduces biological fitness.[53]

In general, (maternal) grandmothers' care of their grandchildren is an example of cultural patterns of adaptive behaviour which increase the fitness of grandchildren. A similarly adaptive cultural pattern of behaviour is the role of the alloparents assigned mostly to childless aunts who are genetically as close to their nieces and nephews as grandmothers. If the grandmother effect applied only to

51 DANIELA TINKOVÁ, *Tělo, věda, stát. Zrození porodnice v osvícenské Evropě* [Body, Science, State. The Birth of the Birth Clinic in Enlightened Europe], Praha 2010, pp. 27–51, 94–153.

52 L. KÁRNÍKOVÁ, *Vývoj obyvatelstva v českých zemích 1754–1914*, pp. 332–334.

53 P. J. RICHERSON, R. BOYD, *Not by Genes Alone, How Culture Transformed Human Evolution*, pp. 148–191.

maternal grandmothers, then both of these adaptive (cultural) patterns, i.e., the one involving maternal grandmothers and the one involving alloparents, would only have an impact northwest of the Hajnal Line, if only co-resident domestic groups ('family households') were taken into account. Southeast of the Hajnal Line, this adaptive advantage would either not be used (a), or, if the grandmother effect were universal, it would be used only marginally (b). Finally, if the negative influence of paternal grandmothers were more widespread (though it is unlikely, or at least not to the extent observed in Krummhörn) (c), the south-eastern family type with rigidly patrilinear family formation would be maladaptive as a whole, because it would represent a cultural complex (cultural pattern) which reduces the fitness of grandchildren compared to the Northeast. , in comparison with the northeast,

Yet, it should be noted that the southeast of Europe adopted the patrilinear family structure from the classical Antiquity.[54] How, perhaps, can we explain why the civilization of Ancient Greece and Rome 'chose' a cultural complex (cultural pattern) which was less adaptive–if not outright maladaptive–than a matrilineal family structure? Is it possible that this limited adaptive or maladaptive strategy was compensated for by the choice of other, more adaptive cultural patterns (for instance, contacts within kinship networks that transcend the household boundaries, of which we know but little)? Or did they 'choose' some other means? These questions apply to the north-western type of family structure as well, but not to the same extent as the south-eastern type.

The Problem of Deductively Constructed Qualities

When testing the grandmother hypothesis, we are interested in human actions and behaviours configured into particular 'cultural patterns', and their evolutionary 'effect'. We use the term behaviour (das Verhalten, pratique) both in its relatively narrow sense (i.e. as a designation of quantifiable demographic behaviour) and in its broader sense, where the concept of 'human behaviour' (menschliches Sichverhalten) includes 'every spiritual thought action' (jeder geistige Denkakt), every psychological habit (jeder psychische Habitus).[55] Unlike most research into empirical psychology, ethology, or ethnography, we cannot observe the quality of interest (that is, the intensity and nature of a particular caregiving relationship) immediately, but we can only construct it deductively on the

54 A. GESTRICH, J.-U. KRAUSE, M. MITTERAUER, *Geschichte der Familie*, pp. 21–159.
55 M. WEBER, *Schriften zur Wissenschaftslehre*, p. 226.

basis of historical demography or cultural history. We can deduce it either from demographic phenomena or from the configurations of family and kinship positions within a household, a village or a parish, or, for example, from the wording of contemporary norms.[56]

The level of infant and child mortality , which is the focus of our interest when testing the 'grandmother hypothesis', is often seen as an indicator of the nature of the relationship between mothers (and parents in general) and their children. High infant and child mortality rates as well as the fact that children used to leave the home of their parents relatively early in their lives are often regarded as indicating that emotional relationship between mothers and their children was not particularly close in traditional societies. Nevertheless, this view has been challenged, for example, by Edward Shorter[57] and Irene Hardach-Pinke.[58] Hardach-Pinke points out that intercultural comparisons show that in societies with similar levels of infant and child mortality, attitudes to children can be quite different.[59] She draws attention to the example of Prussia in the first half of the 19th century, where infant mortality was increasing although this was a time when the Biedermeier culture (at least according to some views) 'had discovered the childhood' and the domestic idyll was in vogue. Infant mortality, in particular, rose from around 170 per 1000 in 1816–1820 to 200 per 1000 in 1851–1869,[60] although these rates were on a par with the average values within the wider German context of the time (see above). Shorter believes that it was at this time that maternal feelings as we know them today were constituted.[61] He says that maternal kindness to children (historische Kristalisierung der mütterlichen Zuneigung) historically developed first among the middle class of the mid-eighteenth century England and then spread across Europe in the 19th century.[62]

If, therefore, we use demographic data, configurations of family positions, and normative texts to deductively construe certain qualities, in our case the nature

56 In a similar way, Jack Goody (2000) often deduces the nature of family relations from the sources which tend to describe the circumstances that are 'external' to the family. See JACK GOODY, *The European Family: an historico-anthropological essay*, Oxford 2000.

57 E. SHORTER, *Die große Umwälzung in den Mutter-Kind-Beziehungen vom 18. bis 20. Jahrhundert*, pp. 505–506.

58 I. HARDACH-PINKE, *Zwischen Angst und Liebe*, pp. 542–537.

59 I. HARDACH-PINKE, *Zwischen Angst und Liebe*, p. 534.

60 I. HARDACH-PINKE, *Zwischen Angst und Liebe*, p. 535.

61 E. SHORTER, *Die große Umwälzung in den Mutter-Kind-Beziehungen vom 18. bis 20. Jahrhundert*, p. 503.

62 E. SHORTER, *Die große Umwälzung in den Mutter-Kind-Beziehungen vom 18. bis 20. Jahrhundert*, p. 521.

of grandmothers' care of their grandchildren, we ought to bear in mind that we may be projecting our own experience onto the past. Our life experience, however, could be significantly different from that of people in the 17th, 18th, and perhaps even the 19th c. But the situation may be even more complex. We have asked whether reliance on the 'grandmother effect' may have been a cultural pattern subliminally (if not consciously) chosen by its actors and whether its adoption might have represented 'progress' in the sense of increasing 'technical rationality' in the Weberian sense. Nonetheless, studies such as Shorter's should lead to the utmost caution when it comes to assuming that the actors always did whatever they could to secure the survival of their offspring. Shorter[63] mentions doctors from the area of Lyon, France, who reported that during the harsh winter of 1867–1868, local spinners stopped breastfeeding their infants and looked forward to their expected death. While we may believe that such reports were somewhat exaggerated and unduly generalised, we should nevertheless bear in mind that purely from the point of view of evolutionary biology, human behaviour can often be markedly maladaptive with respect to human social and cultural dimensions. In other words, humans (unlike [all] other species) can behave in ways which are significantly contrary to the increase in their biological fitness.[64] Behaviour (or action) which is 'technically rational' and which may, although always only within a specific cultural context, be an element of 'progress' (in the Weberian sense) may– or may not–be 'evolutionarily adaptive'. The question then becomes whether our assumption of evolutionary purposefulness (let alone of intentionality) of demographic behaviour is not disproportionately greater than similar assumptions in the ethology of other species. It should urge caution when we try to link evolutionary biology and evolutionary anthropology with research based on historical demography.

Questions Instead of Conclusion

We have seen that in the European population of the 17th–19th c. (at least), there were factors which may have had a greater impact on infant and child mortality than grandmothers sharing the care of their grandchildren. In this period the 'grandmother effect' was geographically dispersed and, at least in some cases, linked to particular social classes. If we were to assume that the fitness-increasing

63 E. SHORTER, *Die große Umwälzung in den Mutter-Kind-Beziehungen vom 18. bis 20. Jahrhundert*, p. 520.

64 P. J. RICHERSON, R. BOYD, *Not by Genes Alone, How Culture Transformed Human Evolution*, pp. 148–191.

grandmother effect is more apparent in the case of maternal grandmothers (which, however, cannot be generally verified), we would have to explain why cultural development, at least to the southeast of the Hajnal Line, 'chose' the less adaptive practice of patrilinear family household structuring. If research in historical demography can only demonstrate the grandmother effect in the 17th to 19th c. in certain places and/or social classes, can we dare to assume that it was originally universal in the human population? And even if we assume that the grandmother effect was the cause of menopause as an evolutionary adaptation, is it not possible that it has been present in the human population since prehistoric or ancient times only as one of the complementary alternative and more or less adaptive forms of care for infants and children?

It remains to be seen what all this means in terms of evolutionary biology and evolutionary anthropology, as well as in terms of co-evolution of genes and culture. Is the 'grandmother phenomenon', including the 'grandmother effect', originally perhaps inherited only culturally, and human menopause, which is evolutionarily related to it, an evolutionary adaptation which occurred at some point in human evolution and was subsequently genetically inherited? Or is a certain predisposition to menopause (and the associated possibility of the grandmother effect) more generally spread (i.e. in other species as well)? Does it manifest itself more (or fully) only under certain conditions, at different times and places in life development? If the latter were the case, we could all the more imagine that supplementing maternal care of infants by grandmothers' care may have been one of many interchangeable factors which could have had the same 'effect' (as the one that we call the 'grandmother effect').