Marital fertility and birth control in rural Netherlands and Taiwan, 19th and early 20th centuries*

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Introduction

A few years ago, Arthur Wolf compared the oral and literary evidence that the pretransitional Chinese had practiced deliberate birth control to an elephant in the living room: "There would be evidence of its presence everywhere". He stated that all suggestions of wide spread birth control were utterly misguided: "Who, then, cleaned up after the elephant? No one. There was no elephant".[1] With these sentences he concluded an article in which he dismissed the claim of "revisionist" demographers that historical levels of Chinese marital fertility were low because Chinese couples had consciously limited their family size. The "revisionists", however, are not convinced by Wolf's arguments and the debate on pretransitional fertility continues unabated.[2] This controversy is not restricted to the arcane field of sexuality in the Chinese past. The subject is attracting interest from economic and "world" historians, who take a keen interest in the diverging developments of China and western Europe in the past three centuries. See, for instance, the latest issues of *the Journal of Asian Studies*. Indeed, these are exciting times to analyze and compare historical fertility patterns in China and western Europe.

The "new" historical demography of China seeks to undermine the "Malthusian" paradigm on Chinese population history. In the wake of Malthus, it is a widely held view that Chinese population growth was checked by recurrent crises, such as wars and epidemics. Because the Chinese married early and universally, the birth rates are supposed to have been high. However, recent research shows that marital fertility was actually very low, at least compared to Europe. In addition, (female) infanticide was a commonly used method to adjust family size to current circumstances. Some authors have described this as the "functional equivalent of family planning".[3] How did Chinese couples achieve a low marital fertility and was this deliberate or more or less accidental? The debate on this issue is based on rather disparate sources. The "revisionists" draw on John Lossing Buck's Farm Survey (1929-1931), on Qing imperial genealogies (1700-1830) and on the registers of the bannermen of Daoyi in Liaoning province (1774-1873). According to Lee, Wang, Campbell and others, Chinese marital fertility rates were low due to late starting, early stopping and the spacing of birth intervals. In their view,

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[1] Wolf, "Is There Evidence of Birth Control", 151-152.

[2] Campbell, Wang and Lee, "Pretransitional Fertility in China"; Lee, Campbell and Wang, "Positive Checks or Chinese Checks".

[3] Lavely and Bin Wong, "Revising the Malthusian Narrative".

reduction of fertility occurred in all social groups as a strategic adaptation to adverse economic circumstances. Also, fertility of couples with a humble position within the extended household was relatively low. Clearly, decisions at the household level overruled the aspirations of individual couples.[4] According to Lee and Wang, the tradition of submission to household collective needs prepared the ground for the successful state control of fertility in the People's Republic.[5]

Critics, in particular Arthur Wolf, challenge this view on several grounds. Wolf states that the Buck survey seriously underestimated Chinese marital fertility, whereas the banner registers underreported births to an alarming degree.[6] Also, he contends that the Qing dynasty and the bannermen are in no way representative of the Chinese population at large.[7] More important, he refutes the claim that Chinese couples deliberately reduced the number of offspring. Although Wolf admits that Chinese marital fertility levels were quite low and that the Chinese were indeed rational planners with respect to reproduction, he says that the low fertility was a consequence of low maternal health and miscarriages (due to malnutrition) as well as to spousal separations when husbands were seeking work. Also, Chinese marriages were typically secured at a very early age. In many cases, women married before the age at menarche, leading to the false impression of "late starting". Since duration of marriage is negatively associated with coital frequency, the "early stopping" can also be seen as a consequence of early marriage. Finally, when prospective brides were adopted at an early age and were raised alongside their future husband, their "natural" aversion to one another resulted in very low fertility within these "minor" marriages.[8] In short, although Chinese couples traditionally aimed at maximizing their (male) offspring, their low actual fertility was caused by adverse conditions. Wolf backs up his claims with interviews of elderly mainland women held in the 1980s and with the Taiwanese household registers (1905-1945). His opponents, in their turn, doubt that Wolf's data have any bearing on the 18th and 19th century mainland population, they question his statistical methods and, in particular, they challenge Wolf's conviction that poverty and malnutrition directly impaired procreation.[9]

Meanwhile, in Europe, a revived interest in pretransitional fertility is visible as well. European "revisionists" challenge the conventional view that interference with childbearing within marriage was "outside the calculus of conscious choice". In this conventional view, deliberate fertility control in western Europe began with the (innovative) adoption of contraceptive methods that were used once a desired family size was reached. The application of new techniques heralded the onset of the fertility decline that generally took place in the final decades of the 19th century. Instead, authors like Anderton and Bean, David and Mroz, Szreter, Friedlander, Okun and Segal and Van

[4] Lee and Campbell, *Fate and Fortune*, 92-101.
[5] Lee and Wang, "Malthusian Models and Chinese Realities"; Lee and Wang, *One Quarter of Humanity*, 130.
[6] Wolf, "Fertility in Prerevolutionary China".
[7] Wolf, "Is There Evidence of Birth Control".
[8] Wolf and Huang, *Marriage and Adoption in China*; Wolf, *Sexual attraction and childhood association*.
[9] Campbell, Wang and Lee, "Pretransitional Fertility in China".

Bavel challenge the equation of fertility control with parity specific birth control.[10] They claim that deliberate birth spacing, regardless of parity, was an important feature of traditional fertility behavior and prepared the (mental) ground for the later introduction of birth control techniques. Thus, the European fertility decline was not the dramatic break with past practices as has often been portrayed. However, convincing empirical studies of birth spacing are still very scarce. Generally, it is considered to have been of minimal importance.[11] At best, spacing is seen as a temporary stage in the fertility transition.[12]

These debates within historical demography may have an important bearing on how differences between East and West are perceived. If the "revisionist" claims on both sides of the continent are rejected it appears that the "Malthusians" have stood their ground. This implies that Europeans were rather unique in controlling their family size through entry into marriage. This may have given them a crucial advantage in the form of a capacity to accumulate economic resources. The Chinese, on the other hand, were constantly suffering the consequences of their early and universal marriage pattern. These consequences, of course, were poverty and high mortality. However, when revisionist claims can be confirmed, this would mean that Chinese and Europeans shared, to some extent at least, a rational attitude towards procreation. Thus, there would be no intrinsic behavioral difference that could explain why the paths of economic development diverged so widely from the 18th century onwards. This perspective is already taken by Pomeranz who states that the west-European took the lead through Britain's control of (cotton-producing) colonies and the location of their coalmines.[13]

The stakes of the fertility debate are high. However, it is probably much too early to draw firm conclusions. More empirical studies, in particular for China, are desperately needed and the comparisons with western European case studies have to be more finely tuned. Also, potential biases need to be removed before comparing. A lot of discussion has been devoted to total marital fertility rates (TMFR). An upward bias of the TMFR may result from the inclusion of the experience of 15-19 year old women.[14] Also, pregnant brides cause an upward bias because – often marrying because they are pregnant – they are clearly not *at risk* of pregnancy. This problem is particularly acute in western Europe where often the majority of the brides in the younger age groups were pregnant. Age-specific marital fertility rates are attractive to portray the difference in levels between East and West.[15] Also, the concave shape of the curves are interpreted as "natural fertility", that is without parity-specific limitation. However, this comparison may be misleading because of strong differences in marriage duration in western Europe and China. The Chinese rates tend to be dominated by the fertility of women all marrying around age 20. In Europe, the aggregation of women marrying at various ages reinforces the concave shape of the curve.[16] Thus, it would be more precise to compare only women

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[10] Anderton and Bean, "Birth spacing and fertility limitation"; David and Mroz, "Evidence of Fertility Regulation"; Szreter, *Fertility, class and gender*; Friedlander, Okun and Segal, "The Demographic Transition"; Van Bavel, "Deliberate birth spacing".

[11] Knodel, *Demographic Behavior*, 329.

[12] Alter, "Theories of Fertility Decline", 15.

[13] Pomeranz, *The Great Divergence*.

[14] Campbell, Wang and Lee, "Pretransitional Fertility in China", 739.

[15] Lee, and Wang, *One Quarter of Humanity*, 87.

[16] Van Bavel, *Van natuurlijke naar gecontroleerde vruchtbaarheid*, 98.

married in the same age group. Finally, the debate is somewhat hampered by a lack of agreement of what constitutes a significant difference. For instance, Arthur Wolf noted that mothers with only sons stopped child bearing earlier than mothers with only daughters. They also had longer last birth intervals and lower parity progression ratios. However, he asserted that this did not indicate reduction of births: “They had just relaxed a little”.[17]

Even more important is the question how to detect *deliberate* birth control. The intervals between successive births intervals and the timing of the last child are determined by a host of biological, social and cultural factors. How to disentangle all these effects and how to determine to what extent deliberate efforts were involved? Essentially, we have to take account of four sets of factors.

(1) The natural determinants of fertility. The age of mother is a very important factor, since fecundity is negatively associated with age. Thus, intervals tend to be longer and the chance of stopping increases when the mother is older. Also, birth intervals react strongly to infant mortality. The early death of the previous infant puts an abrupt end to breastfeeding. Breastfeeding causes postpartum amenorrhea during which the woman is not fecund. Therefore, the decease of an infant leads to a quick return of fecundity and thus to a short subsequent interval.[18] Obviously, fecundability is directly related to coïtal frequency. The latter tends to declined as a function of the duration of marriage. Finally, we have to consider individual differences in fecundability; some women have shorter intervals and more births simply because they are more fecund.

(2) Socio-economic determinants. Many observed differences between social groups in intervals, age at last birth etcetera may result from factors that influence fertility but have nothing to do with deliberate control. As we mentioned above, the debate on pretransitional Chinese fertility is largely a debate on the effects of poverty versus rational planning. First, we have to consider the effects of chronic malnutrition. Although this appears not to affect fecundability as such, it may have increased the risk of miscarriage and thus lengthened average birth intervals.[19] The same goes for chronic, untreated diseases. Second, factors causing the husband and wife to be separated for long stretches will increase the birth intervals. For instance, the absence of seamen and seasonal laborers from home probably reduced the number of children. Third, we need to take into account social differences in breastfeeding practices. In China, breastfeeding seems to have been practiced widely.[20] In western Europe, however, its incidence varied widely, both regionally and across social groups. In the 19th century Netherlands, the upper classes seem to have been ahead of the middle and working classes in adopting new insights about hygiene and breastfeeding. These

[17] Wolf, “Is There Evidence of Birth Control”, 147.
[18] Preston, “Introduction”; Wood, *Dynamics of Human Reproduction*.
[19] Wolf and Huang, *Marriage and Adoption in China*, 167; Wolf, “Is There Evidence of Birth Control”, 137-139; Campbell, Wang and Lee, “Pretransitional Fertility in China”, 745.
[20] Lee and Wang, *One Quarter of Humanity*, 91; Hsiung, “To Nurse the Young”.

insights were slowly disseminated from around the middle of the 19th century.[21] The reports also suggest that around 1850, in particular in industrial towns and large cities, women from the lower class often did not breastfeed their children. They either worked or they hired themselves as wet nurses. Their own children were boarded out and were fed on a (often lethal) mixture of water, cow milk and sugar.[22] Wet-nurses probably had longer birth intervals themselves.

(3) Cultural factors. Before the transition, cultural factors that influenced fertility included customs regulating sexuality during the first period after confinement and customs with respect to breastfeeding. For instance, Confucianism prescribed a three-month reclusion of the mother and child.[23] Cultural differences between the ethnic Hakka and Hokkien were not relevant in terms of marital fertility.[24] In the Netherlands, interesting differences existed between religious groups in the Netherlands. An individual-level enquiry in The Hague in 1908 showed that Catholics practiced less breastfeeding than Protestants (and both groups less than Jews).[25] Possibly, the difference stemmed from the second half of the 19th century when the catholic clergy campaigned against breastfeeding on the ground that exposing the breasts was something shameful.[26]Also, religious groups differed strongly in their receptivity towards new, scientific insights in hygiene and childcare. Catholics and orthodox protestant groups tended to reject modern, secular views from outside their group. In Taiwan, the *form of marriage* is particularly important for the subsequent fertility. Arranged marriage and the transfer of a girl to a subservient position in an unknown family probably caused a lot of distress and an initial period of antipathy towards her husband. A certain degree of premarital familiarity may have attenuated this. At least, Pasternak has found higher fertility among endogamous couples, regardless of the form of marriage.[27] On the other hand, in minor marriages in which future spouses grew up together as brothers and sisters, marital fertility was very low.

(4) Finally, there are *deliberate* efforts to lengthen the birth intervals or to stop having children altogether. Before contraceptive techniques became available these efforts included abstinence from intercourse, coïtus interruptus or the extension of breastfeeding.[28] In order to detect such efforts, it is crucial that we hypothesize about situations in which couples were motivated to limit childbearing. Women's work could be an important motive. When married women made an important contribution to the family income, it was sensible not to burden her for long period with young children. Indeed, women working in textile had relatively low fertility, particularly

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[21] Van Poppel and Mandemakers,"Sociaal-economische verschillen in zuigelingen- en kindersterfte".
[22] Verdoorn, *Het gezondheidswezen te Amsterdam*.
[23] Servais and Arrault, "Family from East and West", 58; Furth, "Concepts of Pregnancy", 22**.**
[24] Shepherd et. al. in this volume; Wolf and Chuang, "Fertility and Women's Labour".
[25] Saltet, *Sterfte*.
[26] Meurkens, *Sociale veranderingen in het oude Kempenland*.
[27] Pasternak, *Guests in the Dragon*, 98.
[28] Szreter, Nye and Van Poppel, "Fertility and contraception".

when their jobs were not compatible with nursing. Although these families were interested in a large number of (income earning) children, it was also beneficial to space births.[29] On Taiwan, no such association between fertility and women's work was found.[30] Apart from household economic motives, couples may have deliberately moderated the pace of childbearing to protect the health of both mother and child. The child enjoys a longer period of close maternal attention, including a longer period of breastfeeding, and will be better established in the world before his mother turns her attention to a new infant. Second, the mother has more time to rest and recover her strengths when birth intervals are longer.[31] In principle, these advantages were visible to parents and deliberately delaying a next birth would match well with and strengthen the basic human reproductive strategy. Spacing may partly reflect and overlap with efforts of stopping altogether. When couples felt the desired family size was reached they started trying to avoid a next birth. Detection of parity-specific stopping is quite feasible, provided we control for natural factors such as the age of the mother and the duration of the marriage. Similarly, we can try to see if spacing was in any way parity-specific as well. Another way of detecting deliberate control of reproduction is to see whether deceased children were *replaced*. Finally, conscious control of reproduction is revealed through the preferences of the parents for the sex composition of their family. For instance, a preference for a minimum number of sons may have led to longer intervals and earlier stopping when that minimum was reached.

Clearly, there is a need to approach European and Chinese marital fertility with exactly the same definitions. Also, we will have to use methods that separate deliberate manipulation of fertility from all other factors affecting it through coital frequency or breastfeeding. In this paper, we will make an effort in this direction. We will directly compare micro level datasets on fertility from Taiwan (1905-1945) and the Netherlands (1830-1940). Obviously, colonial Taiwan cannot represent the experience of mainland China in all respects. Its economic development and living standards were well in advance of the mainland, which was translated in relative high fertility and decreasing mortality levels. However, Japanese occupation hardly affected the family values of the Taiwanese.[32] This means that the internal hierarchy of households, the preference for sons and the attitudes of parents towards the deployment of their offspring remained highly traditional.

In the next section we will describe the datasets and the field sites that are used. Then, we compare the marital fertility rates in these areas by looking at age-specific rates corrected for prenuptial pregnancies. Instead of concentrating on total marital fertility rates, we have chosen to compare the number of births as determined by age at marriage,

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[29] Alter, *Family and the Female Life Course*; Szreter, *Fertility, class and gender*; Van Bavel, “Deliberate birth spacing”.
[30] Wolf and Chuang, “Fertility and Women’s Labour”.
[31] Palloni and Millman, “Effects of inter-birth intervals”; Miller et al., “Birth spacing and child mortality”; Lindstrom and Berhanu, “The Effects of Breastfeeding”.
[32] Barclay, *Colonial Development and Population in Taiwan*.

age at last confinement, sterility and birth intervals. We focus in this paper on the building of multivariate models that take account of as much relevant variables as possible and that will indicate the extent and meaning of deliberate control of fertility. In the fourth section, we construct a model of spacing behavior. The sources do not enable us to define exactly the same variables in both countries, so we will have a separate model for each country. In the fifth section, this will be followed by a model on stopping. Finally, we will sum up our findings in the last section.

Field sites and databases

The Dutch family reconstructions used in this paper pertain to two areas in the central and western parts of the Netherlands. The first dataset is drawn from the Historical Sample of the Netherlands, a large database that will contain more than 70.000 life courses. The database is built from a random sample (0,5%) in the Dutch birth certificates of 1812-1922, linking and entering all information in both the civil registers (birth, marriage and death certificates) and the continuous population registers which started in 1850.[33] We use the first, more or less completed, part of this database that covers the province of Utrecht. We limit the analysis to married sample persons. Their birthplaces were evenly spread over the urban and rural parts of the province. More important, their complete life courses were reconstructed by following them in all their successive places of residence. From 1850 onwards, Dutch population registers recorded all life events (birth, death, marriage and migration) of individuals within their households, and noted additional information on occupation and religion. We have restricted the analysis to first marriages of rural couples (N=490). The second dataset is built from a marriage cohort in one North-Holland village (1830-1879). All first-marrying couples in Akersloot (N=281), an agricultural community about thirty kilometres to the north-west of Amsterdam, were traced in their migration trajectories. However, most of them remained in or near Akersloot. This was an ordinary North-Holland village, except for the fact that its continuous population registers started already in 1830. For the analysis, we have combined the Utrecht and North-Holland data in a rural pretransitional cohort (mothers born before 1870, N= 534) and a rural transitional cohort (mothers born between 1870 and 1900, N=237).

During the 17th and early 18th centuries, North-Holland and Utrecht had benefited greatly from the commercial successes of the Dutch Republic. However, the second half of the 18th century was characterized by economic decline. The Napoleonic Wars sealed the fate of the Netherlands as a leading seafaring nation. In the first half of the 19th century, the coastal province of North-Holland was only slowly recovering from this crisis. Population size of cities like Amsterdam stagnated until 1850. In the second half of the 19th century, the provinces of North- and South-Holland regained their former dominance, due to a redirection of the trade streams towards Germany. Amsterdam became a world centre of financial services. Also, the area to the north of Amsterdam industrialized rapidly. The small, inland province of Utrecht had suffered less from the collapse of the sea trade. Its population grew strongly, in particular in the eastern part of

[33] Mandemakers, “Historical Sample of the Netherlands”.

the province. From around 1850 onwards, the number of factories increased with chemical, textile and cigar making industries predominating. The province, especially its major cities Utrecht and Amersfoort, profited strongly from is central location at the nexus of Dutch railway lines. This attracted railroad offices and workshops, metallurgical industries and a host of commercial service companies.[34]

The Netherlands as a whole was relatively late in industrializing. The industrial "take-off" did not occur until the 1890's. In this respect, North-Holland and Utrecht were no exceptions. Apart from the service sector, their economies were built on agriculture, in particular on dairy farming which grew continuously in importance. This sector was characterized by farms that were small in size and workforce but highly oriented towards producing quality products for export. Around the cities, horticulture expanded whereas in the coastal parts of North-Holland bulb farming was of importance as well. By and large, farmers in North-Holland and the western part of Utrecht were rather prosperous. Due to the commercialised and specialized character of the economy in these areas, most people depended on wages. The labour market was clearly divided in a skilled and an unskilled segment. Up until the final decades of the 19th century, there were large numbers of unskilled day-labourers whose income was highly insecure and who often turned to charity to supplement their incomes. In fact, around 1850 23% of the North-Holland population was on poor relief. In Utrecht, this figure was 15% and in the country as a whole 14% .[35]

The demographic transition in The Netherlands has followed a somewhat different course from the rest of Europe. Although mortality declined early, marital fertility declined later and slower, which caused a strong population growth until well after the Second World War.[36] Explanations of this pattern tend to combine the late industrialization of the country with the strong impact of religious organizations on Dutch mentality and procreative behaviour. Marital fertility in the Netherlands declined slowly from the 1890s onwards. In North-Holland, marital fertility started to decline from 1885 onwards, earlier and stronger than in Utrecht.[37] In the cities, the decline started roughly at the same time as in the countryside, but it was steeper so that by the 1930's urban levels of marital fertility were about 30-40% lower than rural ones.[38]

In Taiwan, we analyze the first marriages from two rural field sites, Chu-Shan (N=1146) and Ta-chia (N=340). Chu-Shan township is situated at the Southeast tip of Nantou County. It is an extension of the North Ridge of A-Li Mountain; thus, its southern part is higher, and its northern part lower in altitude. The total area occupies 247.433 sq. km., of which 83% is a mountainous area. It measures 18.5 km. from east to west, and 23 km. from south to north; giving it the shape of a long boot.

Chu-Shan is one of the earliest areas to be cultivated in all of Taiwan, and also the earliest developed area in the whole of the Nantou region. The process started at the time of Cheng Ch'eng-Kung in the Ming Dynasty (around 1664 A.D.) when Lin Chi led over

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[34] Knippenberg, "Het hart van Nederland".
[35] Van Leeuwen, "Kerk, staat en burger", 449.
[36] Van Poppel, "Late Fertility Decline"; Boonstra and Van der Woude, "Demographic transition in the Netherlands".
[37] Hofstee, *Korte demografische geschiedenis*, 132.
[38] Van Poppel, *Stad en platteland*, 37.

two hundred to Dou-Liu Gate, and went further east till Lin Chi Po (today's Chu-Shan) to clear the land for cultivation. To commemorate Lin's achievement of cultivation and of pacifying the aborigines, previously, Chu-Shan was called Lin Chi Po. It was only in the ninth year of 1920, when the whole of Taiwan was divided into 5 states, 3 cities, 47 counties, and 2 ministries that Chu-Shan *Chun* (level equal to city or county) was set up. Because it was under Taichung *Chou* (Chou means prefecture), it has been called Chu-Shan ever since. It was the main gateway to east Taiwan from the back mountains for the Hans to enter aboriginal land.

Even though Lin Chi Po had been developed as early as the time of Cheng in the Ming Dynasty, it was only in the early years of Ch'ien-lung during the Ch'ing Dynasty that the Hans were actively participating in the cultivation of the land. Therefore, some of the main irrigation systems were built in this period. It is after those early years in the post-agricultural stage when farming was first done in flooded fields.[39] As a result of the Japanese government's implementation of a colonization policy which was both dynamic and scientifically managed, in the short span of 50 years, Taiwan economy during Japanese occupation underwent a huge progress which was unmatched by that under the rule of the Ch'ing Dynasty.[40] hief agricultural products of Chu-Shan were rice , tea, sugar canes, sweet potatoes and bananas. Situated at the warmer forest regions, trees of the camphor and bamboo forests flourished. During Japanese occupation, the fact that economic products like rice, cane sugar and camphor had already been somewhat developed and were consumed by overseas markets made it easy for further and rapid development of those products. In addition, the rise of economic products like tobacco and bananas led to the increasing importance of bamboo forestry in the mountain areas. The whole island of Taiwan did not only consume these products, they were also for sale in the international market. Through the enlargement of this kind of market network, Chu-Shan evolved from a state of semi-isolation to one of integration with a bigger social system.

As for population, during the early Japanese colonial period, a figure of 25,975 inhabitants was recorded in the first census conducted by the Japanese government. This almost doubled during the Japanese colonial period from 1906-1941, with the largest increase coming from those whose ancestry was from Zhangzhou of Fujian.[41] There may be two causes for this population increase: on the one hand, the natural cause of the birth rate exceeding the death rate; on the other hand, the influx of migrants. Nevertheless, according to Chen, owing to the extremely strict mobilization laws imposed by the Japanese colonial government during the occupation period, relocation only had a minute influence on the population of Taiwan.[42] Ninety six percent of the population increase was a result of the natural cause. According to a field survey done by Chuang, Lin Chi Po after the cultivation of Cheng's general Lin Chi, witnessed the gradual appearance and development of both villages and temples to produce ritual field of various sizes which interlocked to form a very intricate regional organization, under the increasing influence of the Hans.[43]

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[39] XX Chuang, 1977:55).
[40] Ibid., 70.
[41] Ibid., 19.
[42] XX Chen 1955, 4.
[43] Chuang 1977.

The second field site of this study is Ta-Chia, which is located in the middle of Taiwan's West Coast, about 5 kilometers from the seashore and at an altitude of 500 meters. Ta-Chia was under the administrative supervision of Ta-Chia Township. Because the Ta-An River cuts through the town and the Ta-Chia River lies to the south, Ta-Chia had an abundant water supply and fertile land. It was settled first by aborigines of the Pin-Pu group, called the Taokas tribe. The name Ta-Chia originated from the early Pin-Pu settlers. As a result Ta-Chia developed very early in Taiwan's settlement history. The Han migrants moved into this area around 1700, and beginning in 1706 roads were constructed and a rural township was established in this area. Ta-Chia was famous for its woven sleeping mats, and in 1765 the Ta-Chia mat became a tribute to the imperial court of the Ch'ing dynasty. It was in 1897 that the weavers in Ta-Chia developed the Ta-Chia Panama hat, which was a very famous article and sold in the international market.

After the Japanese occupation of Taiwan, Ta-Chia's administrative status was not very stable, because the Japanese authorities began to re-organize local administrative boundaries. It was only in 1922, after the completion of the North-South railway, that Ta-Chia was re-vitalized. During this period of time, Ta-Chia's surrounding areas were cultivated with sugarcane fields, and the Japanese colonial government built a railway branch line to connect Ta-Chia and Ta-An harbor. The location of Ta-Chia Township then became a convenient place to distribute goods and services to the surroundings areas.

Marital fertility

Correcting for biases

Although age-specific marital fertility rates (ASMFR) are the most accurate calculations of marital fertility, direct comparison of these rates can be misleading in several respects. Firstly, prenuptial conceptions lead to overestimation of the ASMFR and differences between Taiwan and The Netherlands in the incidence of bridal pregnancies disturb the comparison. Secondly, (female) infanticide causes underestimation of the ASMFR. Again, when this occurs more often in one country, the comparison is flawed. Thirdly, because the *form* of Taiwanese marriage (minor, major or uxorilocal) is directly related to fertility, we need to know the incidence of the relevant forms in Chu-Shan and Ta-Chia as well as the extent of their impact on fertility before comparison with the Dutch figures. Finally, strong differences in marriage duration will distort the comparison of the ASMFRs. We will first discuss these problems before presenting the final comparison.

Prenuptial pregnancies occurred more often in the Netherlands than in Taiwan. In Chu-Shan, 13,6% of all first born children was conceived before the wedding. In Ta-chia the corresponding figure was 11,5%. In the early Dutch marriage cohort (mothers born before 1870), the premarital pregnancy was 33%. In this cohort, pregnant brides married almost two years earlier than non-pregnant brides. This means that, in many cases, the marriage took place because the wife was already pregnant. The concentration of such "forced marriages" in particular age groups will bias the calculation of the ASMFR because the period "at risk" of conception after the wedding data is much shorter than in age groups with a lower incidence of pregnant brides. Thus, the denominator is smaller and the ASMFR will be higher. Interestingly, we find the same problem among minor marriages in Taiwan. No less than 40% of the first-born children of minor-marrying couples in Chu-Shan and Ta-chia were conceived before the official date of marriage. According to Wolf, parents tended to conceal the marriage between foster-siblings until they accepted the match, a clear sign of which was a pregnancy. Only then was their marriage registered.[44] We have solved this problem following a procedure developed by Wilson.[45] We calculate the mean intervals between marriage and first births in the case of pregnant and non-pregnant brides. Then, we add the difference between these intervals (generally about a year) to the period at risk of the pregnant brides.

Female infanticide was probably a common phenomenon in mainland China. According to Lee and Campbell, about 20-25% of all newborn girls in Liaoning fell victim to this practice.[46] However, little is known on regional variations in infanticide. At least, in early 20th century Taiwan it appears to have been rare. On the basis of sex ratios in the aggregated vital statistics, Barclay calculates that in the "worst" years, 1906-1911, only 2% of newborn girls were not reported and therefore probably killed.[47] Obviously, these aggregate Taiwanese data may still hide local differences. However, Pasternak reaches the same conclusion for the field sites of Lungtu and Chungshe.[48] When we compare the sex ratios of Chu-Shan and Ta-Chia with those of the early Dutch cohort, we can conclude that female infanticide does not invalidate our comparison (see Figure 1).

[Figure 1 about here]

In Chu-Shan and Ta-Chia, major marriage was the most popular form. No less than 80% of the couples in the Chu-Shan dataset had married in this fashion, whereas both minor and uxorilocal marriages each took up 10 percent. The corresponding figures in Ta-Chia were 65% major marriages, 9.4% minor marriages and 25.6% uxorilocal marriages. The aggregate figures in the two Taiwanese field sites are thus highly dominated by the experiences of major marrying couples. But how strong were the differences between forms of marriages in Chu-Shan and Ta-Chia with respect to fertility? In Figure 2 we present the ASMFRs per type of marriage, after the correction for bridal pregnancies

[44] Wolf, "The Women of Hai-Shan, 103.
[45] Wilson, "Natural fertility in pre-industrial England"; Van Bavel, *Van natuurlijke naar gecontroleerde vruchtbaarheid.*
[46] Lee and Campbell, *Fate and Fortune*, 65-70; Lavely and Bin Wong, "Revising the Malthusian Narrative".
[47] Barclay, *Colonial Development and Population in Taiwan*.
[48] Pasternak, *Guests in the Dragon*, 112.

[Figure 2 about here]

We can see that, as in Hai-Shan and in Lungtu, minor marriages were characterized by relatively low fertility.[49] Uxorilocal marriages on the other hand, had somewhat higher fertility rates than those in major and minor marriages. This has been found in other Taiwanese areas as well. According to Pasternak, couples that married in this fashion often had the opportunity to get to know one another before marriage. Also, there was no transfer of the bride to a strange household. These factors may have diminished the emotional stress involved with (arranged) marriage and may explain why young uxorilocal brides had relatively high fertility levels. Furthermore, when the prime purpose of the uxorilocal marriage was to provide the household with labor, this could be a stimulus to (continued) high fertility that is visible in the high rates after age 40.[50]

The timing of first marriage of women differed widely between Taiwan and The Netherlands. In Chu-Shan the average age at first marriage was 19 years with a standard deviation of only 2.6 (N=1146). In fact, 67.6% of all Chu-Shan brides married in the age group 15-19. In Ta-Chia the age at marriage was the same (19.4), but the standard deviation somewhat larger (3.6, N=340). In the northwestern part of the Netherlands (rural women born before 1870) the average age at first marriage was 26 years (N=534). However, the entry into marriage was not tied to a specific age group, since the standard deviation was five years. Only 46.3% of the brides married in the age group 25-29. When comparing figures of age-specific marital fertility rates of these two populations, we will have to keep in mind that potential differences in either the level or shape of the curves can be caused by differences in marriage duration. To demonstrate the effect of marriage duration, we show in Figure 3 the “normal” aggregated ASMFRs for the Netherlands (early rural sample, corrected for bridal pregnancy) as well as the ASMFRs of women who married in the “Taiwanese” age groups 15-19 and in the – more or less – standard group 25-29.

[Figure 3 about here]

Although few women married in the age group 15-19, their fertility pattern clearly stands out from the rates of the 25-29 group and the rates of the whole cohort. Fertility in the young-marrying group declined already from age 20-24 onwards!

Dutch, Taiwanese and “natural” fertility

[49] Wolf and Huang, *Marriage and Adoption in China*; Pasternak, *Guests in the Dragon*.
[50] Pasternak, *Guests in the Dragon*, 106.

In many historical demographic studies, the extent of birth control in a given population is deducted from the divergence of the shape of the ASMFR curve from a standard curve created by Coale and Trussell.[51] When the curve takes a marked convex shape this is held to be evidence of parity-specific birth control. Coale and Trussell have build their standard on the basis of ten historical fertility schedules. These schedules refer to populations who never practiced birth control. Recently, Coale and Trussell's standard has been corrected by Xie.[52] who weighted the size of the populations involved. We will use Xie's figures to compare with the Dutch and Taiwanese data (Figure 4). All rates are corrected for premarital pregnancies. The Taiwanese figure combines data from major, minor and uxorilocal marriages in the two field sites. In figure 4, we will also look at a transitional Dutch birth cohort of mothers born between 1870 and 1900. Finally, we will split the Taiwanese group into a cohort of women born before 1906 and a cohort born after 1906, to see whether there was any change during the period under consideration.

[Figure 4 about here]

The rural Dutch pretransitional fertility rates were not far removed from Xie's maximum levels (Figure 4). The youngest cohort, however, had decidedly lower levels after age 20/24. More important, the shape of the curve was much more convex which probably reflects stopping efforts related to an ideal family size. The Taiwanese levels are lower than the pretransitional Dutch, but just as concave. So, both the Dutch (before the 1870-1900 birth cohorts) and the Taiwanese were "natural fertility" populations. In Taiwan, changes during this period are ambiguous. Women born after 1906, thus marrying roughly from 1920 onwards, had higher fertility in the youngest age groups but lower in the older age groups. Obviously, they could not be followed after age 39.

Finally, how do the Taiwanese rates look like in comparison to the Dutch when the ages at marriage are matched? In Figure 5 we compare the fertility rates of groups of Chu-Shan and Ta-Chia women married in the major fashion at respectively 15-19 and 20-24 year with comparable Dutch groups. Even after controlling for prenuptial pregnancies, very young Dutch women seem somewhat more fertile than their Taiwanese counterparts. Possibly, this could be ascribed to a later age at menarche among Taiwanese girls. In addition, we should consider the emotional problems associated with arranged marriage versus the free choice common in the Netherlands. More important, the differences between the two countries are more moderate than in Figure 4 and certainly much less extreme than many east-west comparisons will have us believe. We can conclude that many of the differences in fertility levels reported can be ascribed to differences in marriage duration and in levels of bridal pregnancy.

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[51] Coale and Trussell, "Model fertility schedules".

[52] Xie, "What is natural fertility", see also Van Bavel, *Van natuurlijke naar gecontroleerde vruchtbaarheid*.

[Figure 5 about here]

Total marital fertility rates: theory and practice

Total marital fertility rates (TMFR) play an important role in the discussion on the "true" levels of Chinese fertility. They are simply the cumulative age-specific marital fertility rates and they give a final number of births provided a woman married at age 20 (or even 15) and was still married at age 50. Thus, they provide the maximum family size that is theoretically attainable given the fertility schedule for a particular population. Women from our rural Dutch cohort (born before 1870) would have had no less than 10.2 childbirths if they had spent all their reproductive years (15-49) in the married state. Chu-Shan and Ta-Chia women fall somewhat behind this with respectively 8.28 and 7.63 childbirths. To be sure, this is much higher than the (disputed) mainland figure of 5.65 calculated from the Chinese Farm Survey (1929-1931).[53] The TMFRs of 8.28 of major marriage in Chu-Shan is lower than the 8,56 found in Lungtu, but higher than the 7.52 reported for major marriages in Hai-Shan and the 7.82 found in Chungshe.[54] Women marrying in the major fashion in Ta-Chia had an average TMFR of 7.47.

In our opinion, comparing TMFRs is too abstract. Does this theoretical maximum has any actual significance? Surely, the average married woman differed strongly from a woman who fully conforms to a group fertility schedule. Also, we still we do not know *how* Taiwanese women reached a lower TMFR than the Dutch women. The demographer McDonald has suggested a decomposition of average fertility of completed marriages by taking into account starting, stopping, spacing and sterility. His formula of the average number of children born to completed marriages[55] enables us to make a more realistic assessment of differences between the Netherlands and Taiwan, as well as the reasons for these differences. McDonald's formula reads T= s(1+(l-m-f)/i) *T* stand for the total number of children born, *s* is the percentage of marriages with at least one child, *m* is the female mean age at first marriage, *f* is the average interval between marriage and first birth, *i* is the average birth interval and, finally, *l* is the mean age of the mother at last confinement.[56] In table 1 we calculate the outcomes for our two countries.

[Table 1 about here]

Because the observation period is maximally restricted to the period 1906-1945 and because out migrations lead to censored observations, the total number of "completed" marriages in Chu-Shan and Ta-Chia is rather limited. Also, infertile couples tended to divorce rapidly, which resulted in a very low percentage of sterile couples among

[53] Wolf, "Fertility in Prerevolutionary China".
[54] Pasternak, *Guests in the Dragon*, 89.
[55] We have defined this as all marriages still intact when the woman was 44 years old.
[56] See Van Bavel, *Van natuurlijke naar gecontroleerde vruchtbaarheid*, 47; for a modified version, see Knodel, *Demographic Behavior*, 334.

completed marriages. However, the table shows convincingly that when Taiwanese couples remained married until the wife's menopause, they would have had 1.38 *more* children than Dutch couples before the fertility transition. Also, Dutch completed marriages appear to have realized less than half of their theoretical maximum of 10.2 children. The Taiwanese on the other hand realized about 80% of the TMFR (8.13).

The table shows that the difference between the Dutch and the Taiwanese in age at last confinement was unimportant. However, the Taiwanese interval between marriage and the first birth as well as the successive intervals were conspicuously longer than the Dutch intervals. Furthermore, as we already know, there was an enormous difference in age at marriage. Just how important were these features in determining final family size? We can find that out easily by substituting a Dutch parameter in the Taiwanese formula and vice versa. Doing this with the percentage of couples with at least one child (*s*), we can calculate that, had we found a similar percentage of sterile couples (11%) in the Taiwanese cohort, the total number of children born would still only have been 6.1 children, or 0.28 less than the 6.38 calculated above. The Dutch, on the other hand, would win 0.23 children when they would have the low "Chu-Shan and Ta-Chia" sterility ratio. We have repeated this procedure for all the parameters in the formula. The results are graphically displayed in Figure 6.

[Figure 6 about here]

Figure 6 unequivocally shows that what really mattered in determining family sizes were age at marriage and birth intervals. Differences in starting, stopping and sterility were, in the end, insignificant.

Were the Taiwanese birth intervals longer because the lactation period was more extended? Indirect evidence on the duration of lactation can be gleaned from looking at the effect of infant mortality on the subsequent birth interval. Both in The Netherlands and Taiwan, birth intervals were shorter when the infant died within its first year. However, the Taiwanese intervals were even 8,3 months longer than the Dutch after the birth of a surviving boy and 5,6 months longer after the birth of a surviving girl. Thus, it seems likely that not only were Taiwanese infants breastfed much longer, this was particularly so for boys. We also notice that the incidence of infant mortality was much higher in the Netherlands. Thus, the impact of mortality on lowering the aggregate mean intervals is stronger in the Netherlands than in Taiwan.

[Table 2 about here]

Birth intervals are strongly influenced by coital frequency and breastfeeding, which may or may not be manipulated consciously to space births.[57] It is not possible to draw

[57] Wood, *Dynamics of Human Reproduction.*

conclusions about the presence or absence of controlled birth spacing from a simple comparison of mean or median lengths of birth intervals between groups or time periods.[58] As we have explained in the introduction, only a multivariate approach can help us unravel this knot.

Analyzing birth intervals

Building the multivariate models

We employ multivariate Cox regression in order to model the length of the interbirth intervals.[59] As we are interested in the *speed* of parity progression here, not in the probability of such progression, we include closed birth intervals only.[60] By definition, then, only married couples with at least two legitimate children born are included in the samples. One additional condition is that, in order to exclude sterile and extremely sub-fecund couples, only intervals closed by a birth conceived within five years after the previous one are included.[61] Finally, we model all progressions together, and include the previous fertility history in the list of covariates. As we indicated in the Introduction, we distinguish four groups of factors that influence marital fertility: natural determinants, socio-economic factors, cultural factors and, finally, family composition. This categorization reflects an increasing deliberateness in fertility control.

The natural determinants of fertility are defined in both the Taiwanese and Dutch model as follows. First, mother's ages at the beginning of the birth intervals are included in the form of the commonly used five-year age categories. Second, marriage duration is included in the regressions as the exact number of year the marriage has lasted at the beginning of the birth interval. Third, we need to control for differences between individual couples with respect to fecundability and postpartum amenorrhoea. Following Van Bavel, we do this by including crude legitimate parity in the regression.[62] Crude legitimate parity is defined as the number of children already born within the current marriage at the beginning of the interval. It represents fecundity differences because couples with on average short birth intervals in the past and, hence, relatively many births at a given age and marriage duration, can be expected to have shorter birth intervals in the future as well. Differences between couples reflect differential fecundability and breastfeeding habits. Fourth, infant mortality is included in the regression equations as a time-varying dummy variable: from the moment the previously born infant dies, it is set to one. The death of the previous infant abruptly stops breastfeeding and restores fecundability. In principle, adopting-out an infant could have the same effect. In Chu-San 7.5% of girls and 1.9% of boys were adopted out already before the first birthday (in Ta-

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[58] Knodel, *Demographic Behavior*; David and Mroz, "Evidence of Fertility Regulation".
[59] Allison, *Event History Analysis*.
[60] See also Yamaguchi and Ferguson, "The stopping and spacing of childbirths".
[61] Larsen and Menken, "Measuring sterility"**;**Van Bavel, *Van natuurlijke naar gecontroleerde vruchtbaarheid*.
[62] Van Bavel, *Van natuurlijke naar gecontroleerde vruchtbaarheid;* Van Bavel, "Does an effect of marriage duration"; Van Bavel, "Deliberate birth spacing"**.**

Chia these figures are respectively 6.1% and 1.0%). Therefore we combine premature death and adopting-out of the previous child in the Taiwanese model. Fifth, even in the absence of fertility control, final interbirth intervals tend to be much longer than non-final intervals.[63] Therefore, and in order to make sure that we don't mix up attempts to stop with true spacing behaviour, a dummy variable differentiates final from non-final intervals.

Although the household registers in both countries are very rich in details on life course events, they contain little information on the socio-economic position of the households. At best, some information is provided on the occupation of the husband. Thus, we lack direct information on the income position, land use and tenure status, and property. Furthermore, we do not know if and how often the spouses were separated because the husband was working elsewhere. Finally, there is hardly any information on women's labour. In the model for the Netherlands we use six occupational categories. (1) elite occupations (employers in industry, professionals, high civil servants and higher military); (2) farmers (3) white collar middle class (lower level professionals, lower civil servants, foremen and supervisors of various kinds); (4) self-employed *(*shopkeepers, small entrepreneurs, merchants and self-employed artisans); (5) skilled workers (craftsmen, skilled labourers in small business and industry) and servants with a labour contract; (6) casual and unskilled labourers and peddlers. This occupational classification is often used in Dutch historical demography.[64] These occupational groups differ in many ways. The more (security of) income, the less motivated the couples were to space their births. Even if a woman was working after marriage, as was common in farming, she could be replaced by a servant when the children were young. The favourable economic situation of (dairy) farming in the Dutch North-west made this a feasible option. On the other hand, because casual and unskilled workers earned so little their wives were forced to work even when she had a young child. We expect the longest birth intervals in this social group. Apart from motivation to space births, coital frequency may have been low because the men were often away from home seeking work elsewhere. Finally, the women in the lower classes may have worked as wet nurses. In the Taiwan model information on the husband's occupation is often lacking. Instead, we have decided to focus on the household by combining the information on occupation of the head of the household with his wealth (the latter with land tax data). The "high" status was defined as land tax of 50 dollars or more or having an occupation as teacher, physician, commercial professionals. Also, we placed heads in this category when they were a leader of a village and worked as a professional. The "middle" group was defined as having a land tax between 1 and 50 dollars or the head of the household was an employee of the government or a social organization, a chandler, or a skilled worker of industry. Finally, the "lower" group paid no land tax or worked as coolie, as a transportation worker, as a peddler or as an unskilled worker.

In the Netherlands, religion is a prime cultural factor influencing fertility. Although the historiography on this subject is devoted mainly to the (post)transition period, the remarkable differences between the various religious groupings may have had

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[63] Anderton and Bean, "Birth spacing and fertility limitation"; Knodel, *Demographic Behavior;* Van Bavel, "Deliberate birth spacing".

[64] Giele and Van Oenen, "De sociale struktuur"; Giele and Van Oenen, "Theorie en praktijk".

an impact *before* the transition as well.[65] Of prime importance here, is the openness of a particular group to (secular) information from outside and the possibility of individual believers to approach the issue of fertility in an experimental and rational manner. The official church opinion in sexual matters was probably less important than internal social control mechanisms and the level of identification of followers with their church. We expect Catholics to have the shortest birth intervals. A combination of factors works in that direction: pastoral advice against breastfeeding, high internal social control, a fatalistic attitude towards life and little receptiveness of new, scientific knowledge.[66] Possibly, there was also less room for communication on sexual matters in catholic marriages.[67] On the other hand, couples from liberal protestant denominations were probably more willing to consider and experiment with birth spacing.[68] In our multivariate analysis, we will combine the liberal denominations in one group.[69] We expect the most birth spacing efforts in this group. Shorter intervals are expected among the orthodox Protestants. In general, they shared a fatalistic attitude and a strong social control with the Catholics. In the category "Orthodox Protestants" we have combined members of the various Calvinist secessionist churches.[70] We assign a couple to this category when at least one of the partners was orthodox. Intermediate positions will be held by couples of mixed protestant-catholic religion. In our view, a mixed marriage is a sign of moderate religiousness. We also expect the Jews to be in an intermediate position. They were highly inclined to breastfeeding but had pronatalist leanings. We have also formed a group in which at least one of the partners was a member of the (liberal) Catholic secessionist church as well as a group in which at least one or both of the partners was nondenominational. Finally, we include a group with parents whose religion was unknown.

Education is also considered a very important factor in the spreading of new insights on childcare, new "bourgeois" values favouring a limited family size and, finally, knowledge on contraceptive techniques. However, in neither country do the household registers record the educational experience of individuals. For the Netherlands, we can make use of the capacity of bride and bridegroom to sign their marriage certificate. Literacy is a minimal indication of education and, thus, of responsiveness to innovative knowledge.

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[65] Boonstra and Van der Woude, "Demographic transition in the Netherlands"; Engelen and Hillebrand, "Fertility and Nuptiality".
[66] Wolleswinkel-van den Bosch, *The epidemiological transition in The Netherlands.*.
[67] Van Poppel, "Late Fertility Decline".
[68] See also McQuillan, *Culture, Religion and Demographic Behaviou*r.
[69] This "liberal protestant" group consists of the majority denomination of the Dutch Reformed, as well as the Mennonites, the Lutherans and the Remonstrants
[70] [XX refer to Shepherd et al, p XX] Also, Dutch Reformed persons born in communities where their church was dominated by fundamentalists were counted as orthodox. The Dutch Reformed Church is actually a mixture of liberal and fundamentalist streams. It is not possible to distinguish these groups on the basis of the population registers. However, the religious orientation of the church ministers is known for the year 1920. In 33 Utrecht municipalities, all ministers belonged to the orthodox "confessionelen" and "Gereformeerde Bonders" (Historical Ecological Database). Since communities chose their own ministers, it can be assumed that they were already orthodox in the nineteenth century. In the province of North-Holland, the Dutch Reformed Church was dominated by the liberals. See Knippenberg, *De Religieuze Kaart van Nederland*.

The "classical" Chinese marriage custom was major marriage, which was arranged by the parents and entailed the immediate transfer of the bride to the home of her husband's family. Under certain economic and demographic conditions, other, less prestigious, forms of marriage came into existence: minor marriage, uxorilocal marriage and delayed transfer marriage. As we have discussed above, the form of marriage could have important ramifications for fertility. In Chu-Shan, we have found major, minor and uxorilocal marriages with TMFRs of respectively 8.28, 7.67 and 8.73. In Ta-Chia, these figures were respectively 7.62, 5.36 and 9.19. Thus, we can expect minor marriages to have longer birth intervals than major marriages and uxorilocal to have shorter intervals. The majority of the marriages were arranged, which meant that, often, the spouses had not even seen one another before the wedding day. This factor alone may be responsible for low initial fertility. Exceptions to this pattern are found in uxorilocal marriages that had higher levels of prenuptial pregnancies than major marriages (e.g. 16.7% vs 9.9% in Chu-Shan) and in endogamous marriages in which the spouses were more or less familiar with one another.[71] We include endogamy in both the Dutch and the Taiwanese models. In the Netherlands, it is defined as sharing the same birthplace. In the Taiwan registers information on birthplaces is lacking, so endogamy is defined as "both living in the Chu-Shan/Ta-Chia area at least five years before the marriage". In arranged marriages, a large age difference between husband and wife may have obstructed the process of familiarization. In Europe, a large difference in age has been associated with "instrumental" marriages and low standards of marital sexuality.[72] On the other hand, "romantic" marriage in which partners had the same age may have been more able to discuss methods of birth control. We add the add difference between the spouses to our models.

Deliberate control of fertility can first of all be demonstrated by the parity-dependence of birth intervals. We analyse parity-dependence by including *net parity* in the model. Net parity is calculated as the number of children alive at the start of the interval. If birth spacing would be aimed at a final family size, and if any replacement effects would be at work, we would expect a negative effect of this variable on the interval. It is of crucial importance to distinguish net parity from crude parity: the former is the number of children still alive at the beginning of the current interval, while the latter includes all children already born, alive as well as deceased. Therefore, net parity equals crude parity minus the number of deceased children. If net parity has a statistically significant effect on age-specific fertility, even after controlling for crude parity (or, equivalently, the number of deceased children), this would strongly suggest that the speed of parity progression was being controlled with a desired offspring in mind.[73] Because we are interested in the effect of the burden of young, surviving children on fertility decisions, we also include any stepchildren and premarital children in this variable.

In Taiwan, family size was not only determined by births and deaths. Regularly, children – in particular girls – were adopted out. They were either given away to their future parents-in-law (*sim-pua*) or sold as servants *(ca-bo-kan*). Conversely, children

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[71] Pasternak, *Guests in the Dragon*.
[72] Mitterauer and Sieder, *The European Family*, 126; Van Poppel et al., "Love, necessity and opportunity".
[73] Van Bavel, "Does an effect of marriage duration"; Van Bavel, "Detecting Stopping and Spacing Behaviour".

were adopted in as well. Sons were sometimes adopted to ensure the continuance of the patriline. However, the supply of boys was limited. More often, daughters were adopted in. The reasons for this were varied. They seemed to have been adopted frequently for "therapeutic" reasons. The presence of a baby was believed to stimulate fertility and "to lead in" the arrival of a boy.[74]Also, girls were adopted as sim-pua, a future bride for one of the sons. Another motive was that these girls replaced children that had died. Finally, some families simply may valued the presence of girls as workers.[75] Obviously, we have to take account of adopted children in assessing the impact of the family composition of fertility behaviour. Did parents (temporarily) restrict their fertility when their family had become too large, either by adoption or not?

A second indication of deliberate spacing would be any dependence of the interval on the sex composition of the children alive. First of all, we look at the effect of the gender of the last-born child. Recent studies of Asian populations have reported shorter subsequent birth intervals after the birth of a girl compared with the birth of boy.[76] This may be caused by earlier weaning of girls but parents wishing a son may also be motivated to have a next child as soon as possible. Secondly, we include a covariate indicating the proportion of girls counted among the children alive at the start of the interval. In addition, we include a dummy indicating whether there are as yet any boys. This dummy is meant to capture any preference for having at least one boy. Finally, following David and Mroz, we assess whether the effect of infant mortality was sex-selective.[77] This is done by including a dummy indicating the sex of the previous child as well as a product term for the interaction between the death of that child during infancy and its sex. David and Mroz report that in rural France during the final decades of the *Ancien Regime* the probability of a conception soon after the death of an infant was significantly higher when the deceased child was a girl than when it was a boy.[78] Furthermore, in line with the household economic motivation to space births, the proportion of the young, dependent children in the household may have influenced parity progression. Any influence of the proportion of small children on the hazard rate may be read as a sign of fertility control. The proportion of dependent children alive was calculated at the start of each interbirth interval from the dates of birth and death of the previously born. As a working hypothesis, any child under age 9 was considered to be dependent, i.e. a net consumer of household resources instead of a net contributor. Finally, the position of the Taiwanese father within the extended household may be relevant. It has been asserted that men in favorable positions (in particular, the head of the households and his firstborn son) were encouraged to produce more sons whereas men in inferior positions were discouraged to do so. We include the position of the father in the model in the form of dummies: head of the household, first son, non-first son and other.

Results

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[74] Wolf and Huang, *Marriage and Adoption in China*, 242-250.
[75] Pasternak, *Guests in the Dragon*.
[76] Pasternak, *Guests in the Dragon*, 152.
[77] David and Mroz, "Evidence of Fertility Regulation", 173-206.
[78] David and Mroz, "Evidence of Fertility Regulation",195-196.

In tables 3 and 4 we present our models of birth spacing in the Netherlands and Taiwan. The regression parameters are presented in an exponentiated form, which allows for more convenient interpretation. The parameters can be interpreted as hazard ratios. When r=1, there is no effect. In addition, the table gives the probability of the corresponding chi-squared statistic, testing the null-hypothesis that the regression coefficient is zero (which is equal to a hazard ratio r=1). In both models, the natural determinants had very strong effects on birth intervals. A crucial variable was the duration of marriage. Clearly, the longer the marriage had lasted, the less frequent sexual intercourse between the spouses took place with the result of longer time spans between conceptions. Another major factor was the death of the last-born child. When the previous child died the next child was born much earlier than when it survived: in the Chu-San/Ta-Chia model the intervals were 50% shorter (1/0.5=2.00) The effect was stronger in Taiwan than in the Netherlands (35.5% shorter), which suggests that breastfeeding was more extended in Taiwan. Final intervals in the Netherlands, as well as in Taiwan, were longer than other intervals, which indicates that fecundability of the mothers of penultimate children was already decreasing dramatically. On the other hand, high crude legitimate parity can be seen as an indicator of high fecundability, since there is a clear negative association: the more confinements a woman had already had, the shorter the time span until the next effective conception.

In the Netherlands, the social and cultural parameters yield a number of interesting and, sometimes, unexpected findings. Long birth intervals were not associated with experimentation and openness to innovative ideas from the outside world. On the contrary, they appear to have been associated with proletarian living conditions. We find strong associations with unskilled and casual work, with illiteracy and with local endogamy. As for the latter, it has been shown that Dutch couples with little cultural and economic capital tended towards endogamy.[79] Also, the birth cohort 1800-1829 that lived through the worst period in the recent history of Dutch living standards had long birth intervals. The links between poverty and long intervals could in principle have been forged by low coital frequency, malnourishment and miscarriages. However, it is also possible that the poorest people were adjusting the pacing of their childbearing to accommodate for the depressed circumstances. Recent research from the Scania region in Sweden suggests that labourers anticipated strong increases in food prices by delaying the arrival of an additional child.[80] Short intervals, on the other hand, are associated with farming and with Catholicism. Farmers were probably motivated to have many children and they could afford to have a servant replace the mother during the childbearing years. What about the Catholics? Apparently, the standpoints of the clergy concerning sexuality and breastfeeding had a strong impact on daily life. This was possible due to the contemporary process of catholic emancipation that increased the identification of Catholics with their church. In this period, mechanisms of social control were developed and strengthened which increased conformity to norms on the ideal family. Interestingly, the small minority of the liberal Catholics (*oud bisschoppelijke cleresij*) tended towards short intervals as well.

[Tables 3 and 4 about here]

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[79] Kok and Mandemakers, "Vrije keuze uit een beperkt aanbod".
[80] Bengtsson and Dribe, Deliberate Control in a Natural Fertility Population.

In Chu-Shan and Ta-Chia, there is less evidence for a relationship between poverty and long birth intervals. Surprisingly, social class differentials in birth intervals are not statistically significant. We do find that the birth intervals were longer in the oldest cohort (mothers born before 1906). Although living standards were lower in this period, the effect may have also been caused by underreporting of children in this period or by the depressing effect of warfare on coital frequency.[81]Another interesting result is the fact that in Ta-Chia intervals were shorter than in Chu-Shan. Future analysis will have to disclose whether this can be attributed to differences between the two localities in living standards or in female employment.

As predicted, couples with a large age difference between the spouses tended to have longer intervals. Minor marriages had much longer intervals than major marriages, even after controlling for all other factors, such as the age of the mother and the duration of marriage. This outcome confirms Arthur Wolf's hypotheses on the fertility-depressing effects of childhood association. However, uxorilocal marriages had longer intervals as well.[82] Perhaps the husband was resenting his subjugated role in his parents-in-law's household and therefore not very keen on maximizing his offspring.[83]

Finally, we come to the factor that interests us most. To what extent did the fertility of pretransitional couples respond to the exigencies of their households? That is, did they deliberately delay the next birth when this was considered expedient? In the Dutch pretransitional cohort, the only significant household variable was the proportion of young, dependent children. Indeed, the larger this proportion was, the longer the next birth was delayed. There is no indication that this behaviour was related to a target family size (no significant effect of net parity). Neither have we found any evidence of a preference for boys or girls. In Chu-Shan and Ta-Chia, we find no evidence of spacing in relation to the family composition. On the contrary, the more children were surviving (net parity) the shorter the intervals became. This may be accounted for by the dominance of fertility-maximizing families among the high parities. The variable indicating the effect of the presence of at least one son indicates that intervals were shorter when there were still no boys.[84] Finally, we have found no indication that the fertility of couples with a 'low" position in the extended household was reduced, at least not by longer intervals. On the contrary, when the husband was not a son of the head of the household (but an uncle, cousin or nephew), the birth intervals were shorter.

In the Dutch transitional cohort (mothers born between 1870 and 1902), only the natural determinants explain the length of birth intervals. Apparently, social and cultural differences in breastfeeding or coital frequency had diminished. Only the skilled workers

[81] Barclay, *Colonial Development and Population in Taiwan*, 242.

[82] This seems to contradict our findings in figure 2 where we observed their relatively high age-specific marital fertility. A typical feature of uxorilocal marriages is the age gap between the spouses – the husbands are on average 5,5 years older. However, we already controlled for the age difference. The age at marriage is about the same as the couples marrying in the major fashion. The only difference seems to be the relatively late age at last childbirth that we can observe in completed marriages (39,2 in uxorilocal marriages, N=24 and 38,3 in major marriages, N=102).

[83] Pasternak, *Guests in the Dragon*, 106.

[84] Lee and Wang, *One Quarter of Humanity*, 98.

tend to have longer intervals than the reference group. Finally, birth intervals were no longer related to the family composition.

Stopping behaviour

As we have seen in table 1, both the Taiwanese and Dutch mothers tended to have their last child around age 38. At first sight, this age does not suggest widespread deliberate stopping with child bearing. Still, the aggregate figure may hide subgroups of women who did manage to stop at a relatively early age. Did these groups exist and can we reconstruct the motives for stopping? Again, we will use a multivariate technique. In the model, we include all couples with at least one child who have been followed for at least five years after the last one was born. The crucial question is: what determined the fact that a couple stopped having further children? Binary (or dichotomous) logistic regression is a suitable technique, specifically developed to analyse dependent variables with only two outcomes (thus, stopping or continuing). The probability (p) of the dependent variable being stopping or continuing is calculated in terms of *odds*, that is the probability of stopping divided by the probability of continuing (p/(1-p)). The regression coefficients of the independent variables are the natural logarithms of the odds. By exponentiating them, we obtain *odds ratios*. These indicate the increase in the odds of the dependent variable of stopping resulting from an increase of one unit in the independent variable.[85]

Practically all variables used in the model in tables 5 and 6 are the same as already described for the spacing analysis. Obviously, the factor “final interval” is removed, since it is actually the dependent variable. Because logistic regression does not include time dependent variables, the definition of child mortality is modified. Now, we define it as the death of the previous child with a year after its birth.

We have seen in Figure 4 that the pretransitional Dutch cohort resembled the prototypical “natural fertility” population. Our model confirms that the end of childbearing was solely determined by biological factors. Age of the mother, marriage duration and fecundity (indicated by crude parity) are the crucial factors that predict whether stopping will occur. The death of a child did not lead to a deliberate “replacement”. Interestingly, net parity was even negatively related to stopping. Thus, the more (surviving) children a couple had, the more likely that they would have another child. Since all natural determinants are controlled, this suggests a positive interest in maximizing the number of children. Finally, we cannot detect any social or cultural “forerunners” apart from the Jews.[86]

[table 5 and 6 about here]

In the Dutch transitional cohort (second panel of Table 5), the natural causes of stopping had lost none of their significance. However, stopping was also associated with social class, in the sense that officials and white-collar workers stopped earlier. In the

[85] Menard, Applied Logistic Regression Analysis.
[86] Livi-Bacci, “Social-group forerunners”.

countryside, they appear to have been forerunners of birth control. Catholics and orthodox protestants were less inclined to stop with reproduction than the liberal protestants. Clearly, the vehement opposition of their churches against contraception was having an effect. In this model, we cannot find an effect of a desired family size on stopping. However, stopping occurred more often in the birth cohort 1890-1902 compared with 1870-1889. Indeed, when we run a separate model for the youngest cohort, we do find a significant, positive effect of net parity on the odds of stopping. We may conclude that, in the north-western countryside, parity-specific birth control only began with the cohorts of women born after 1890.

In Chu-Shan and Ta-Chia, we find the same paramount effects from the natural covariates of age, marriage duration and fecundity. The presence of sons does not increase the odds of stopping, as has been reported for mainland Liaoning.[87]An additional finding is that couples married uxorilocally tended to continue somewhat longer with childbearing than minor and major marriages. This contradicts our first impression based on their longer intervals that they were less interested in maximizing their family size. Couples in Ta-Chia stopped earlier than couples in Chu-Shan. A compensation for their relatively short birth intervals? Because Ta-Chia had better connections than Chu-Shan to the more "urbanized" parts of Taiwan, it could have displayed "modern" behaviour. Stopping occurred somewhat more often in the youngest cohort but overall we could not find any trace of deliberate birth control. On the contrary, as in the pretransitional Dutch cohort, the larger the number of children present in the family (net parity), the lower were the chances of stopping.

Discussion

Our comparative exploration of marital fertility in Rural Netherlands and Taiwan has yielded a number of interesting results. Using the same definitions and corrections for potential biases we have shown that early twentieth century Taiwanese marital fertility rates were only slightly lower than Dutch fertility rates in the pretransitional period. Thus, the gap between western Europe and China with respect to fertility may be much smaller than is assumed in the current controversy on the divergence of East and West. In fact, by taking into account starting, spacing and stopping we have shown that completed marriages in Taiwan actually had more children than the Dutch. However, due to their long birth intervals, Taiwanese families remained relatively small. How can we explain the remarkable difference in intervals? We can think of three possible reasons. Firstly, the cause may have to be sought in differences in living standards. Malnutrition may have increased the incidence of miscarriages leading to longer intervals. There is some evidence for this relationship in the Dutch case. Birth intervals were longest when the father was a casual or unskilled worker, when the parents had married endogamously and when the mother was illiterate. Also, long intervals occurred during the bleak period of the 1840s and 1850s. In Taiwan, however, we find no effect of social class on intervals, nor of intra-household differences in hierarchical position. Thus, it is unlikely that Dutch-Taiwanese differentials were caused by differences in living standards. Secondly, the long Taiwanese intervals may have been caused by the conscious adjusting of births to

[87] Lee and Campbell, *Fate and Fortune*.

the current or even the desired family composition. This is the viewpoint taken by "revisionists" in the current debate. However, we have found no conclusive evidence of conscious spacing. On the one hand, the intervals were relatively longer when already one or more boys were present.. On the other hand, there was no effect of the burden of young, dependent children on the intervals. Net parity, that is the number of children present, actually tended to shorten the birth intervals. Interestingly, the oldest Dutch cohort showed more signs of conscious spacing than the Taiwanese. The positive effect of the proportion of dependent children on the birth intervals shows that Dutch couples were motivated to space their births during the worst period of the family cycle. Finally, the differences may be attributed to breastfeeding behaviour. Taiwanese intervals after the birth of a surviving child were much longer than the Dutch. It seems likely that Taiwanese infants were breastfed much longer and more general than in the (western parts of) the Netherlands.

Parity-specific stopping is often considered to be the most direct criterion for birth control. Not surprisingly, Dutch couples did not display any parity-specific control until the birth cohort 1890-1902. The end of childbearing could be explained almost entirely by "biological factors". The same was true for the Chu-Shan and Ta-Chia cohorts.

The models have proven useful in detecting deliberate fertility control while controlling for natural, social and cultural determinants of fertility. In future research they can be elaborated further. For instance, the composition of the extended Taiwanese household could have more effects than those we have detected with our simplified variables. Also, it will be very interesting to apply these models to urban contexts as well. Possibly, forerunners of stopping are to be found in Taiwanese and Dutch cities. The models have also shown the relative impact of social and cultural factors on fertility in both countries. In the Netherlands, the cultural factors surrounding breastfeeding were important in the explanation of differential fertility. Also, links are suggested between poverty on the one hand, and miscarriages, low coital frequency and deliberate spacing on the other. In Taiwan, the form of marriage mattered greatly with respect to birth intervals, probably through coital frequency.

Finally, we return to the "problem" of birth control in late imperial China. The current discussion on the demographic differences between western Europe and China centers on the levels of age-specific marital fertility. In our view, these differences, at least judging from rural Taiwan and the Netherlands, were not dramatic. By and large, lower marital fertility in Taiwan can be ascribed to longer birth-intervals due to longer breastfeeding and less infant mortality. All in all, Arthur Wolf was correct when he wrote that no elephant had walked in the living room. At least, we haven't found one in early 20th century Taiwan.

FIGURES to

Marital fertility and birth control in rural Netherlands and Taiwan, 19th and early 20th centuries

JAN KOK, WEN-SHAN YANG, YING-HUI HSIEH

Figure 1. Sex ratios by parity, Chu-Shan/Ta-Chia and early rural Netherlands sample

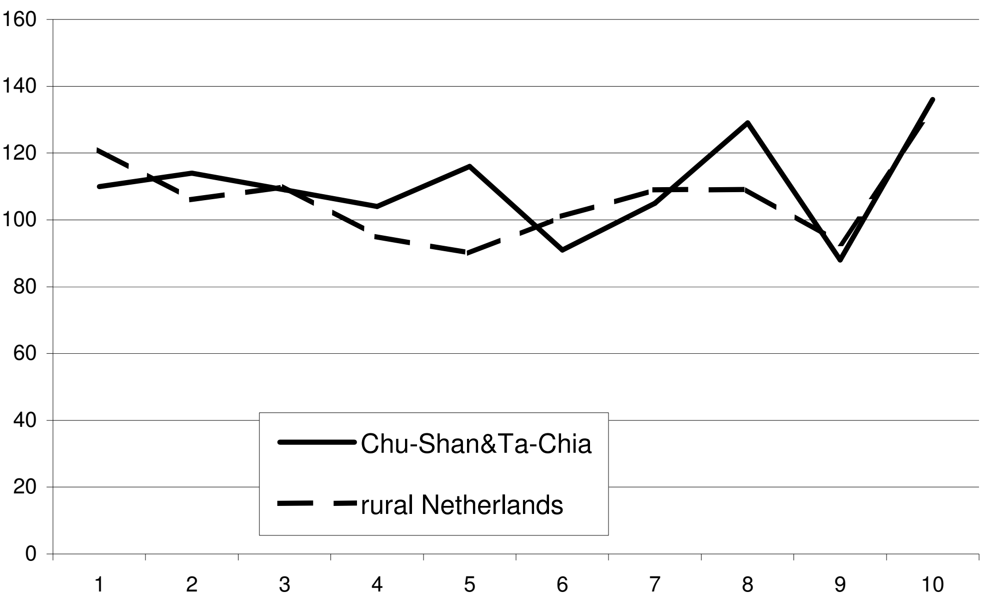


Figure 2. Age-specific marital fertility rates in Chu-San and Ta-Chia, by form of marriage

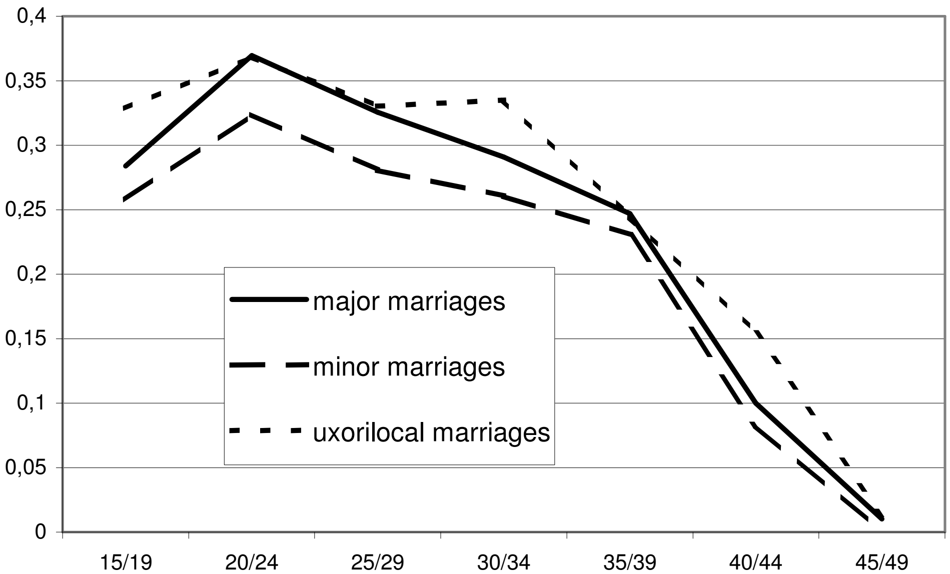


Figure 3. Age-specific marital fertility rates controlling for age at marriage. Rural Netherlands

Figure 4. Age-specific marital fertility rates, Taiwan (women born before and after 1906) and The Netherlands (women born 1800-1870 and 1870-1900)

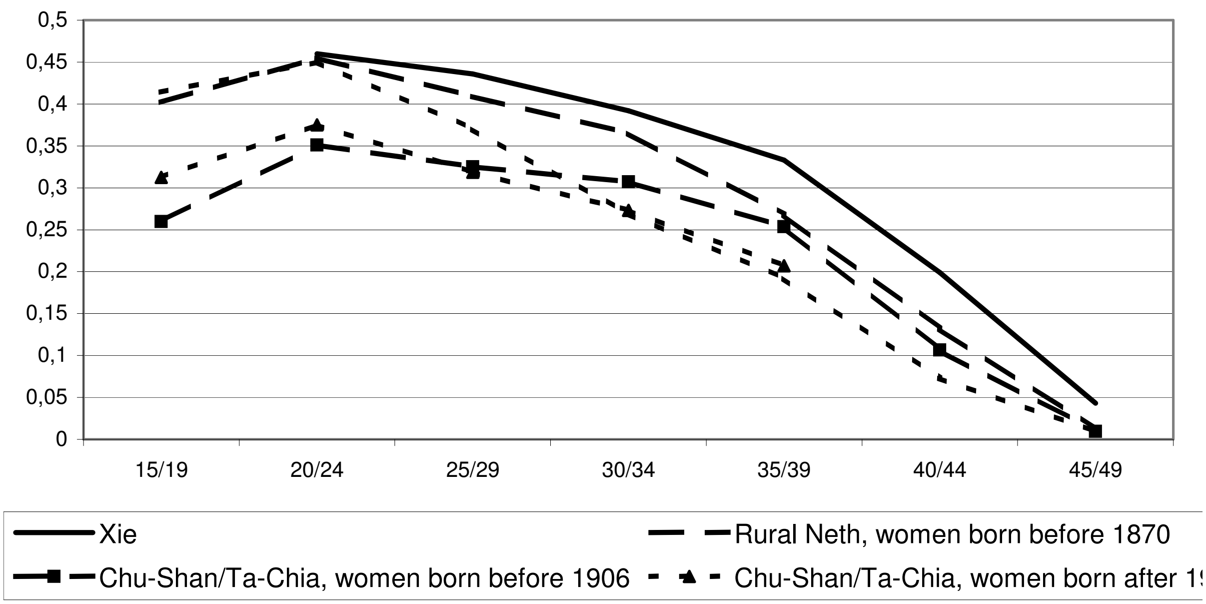


Figure 5. Age-specific marital fertility rates, Chu-Shan/Ta-Chia (major marriages) and rural Netherlands (women born before 1870) controlling for age at marriage

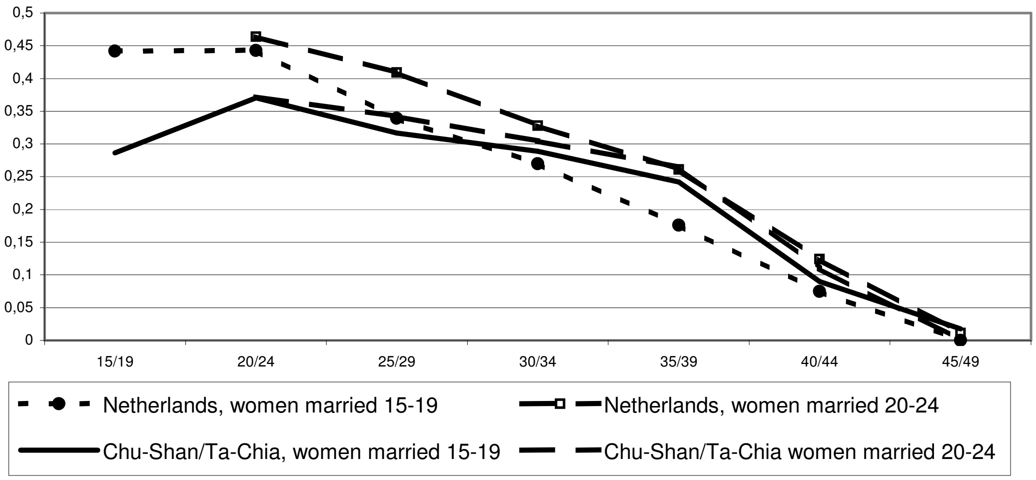


Figure 6. Changes in total family size of completed families in rural Netherlands and Chu-San/Ta-Chia when McDonalds parameters are exchanged

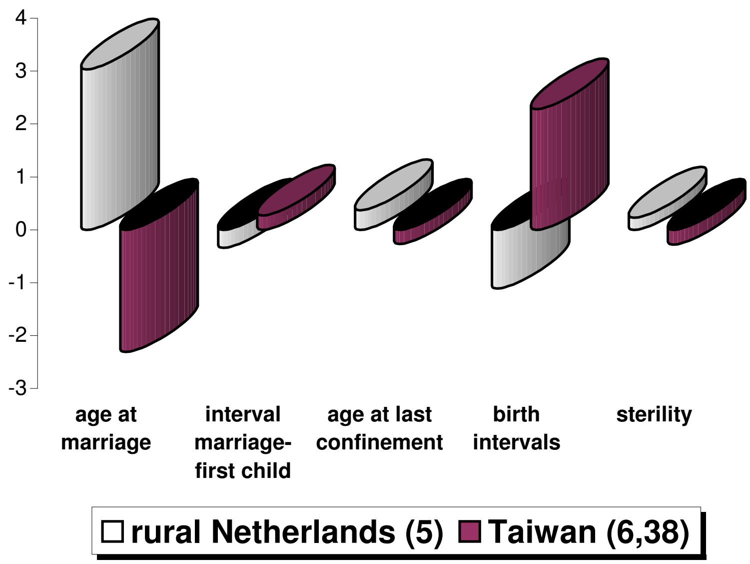
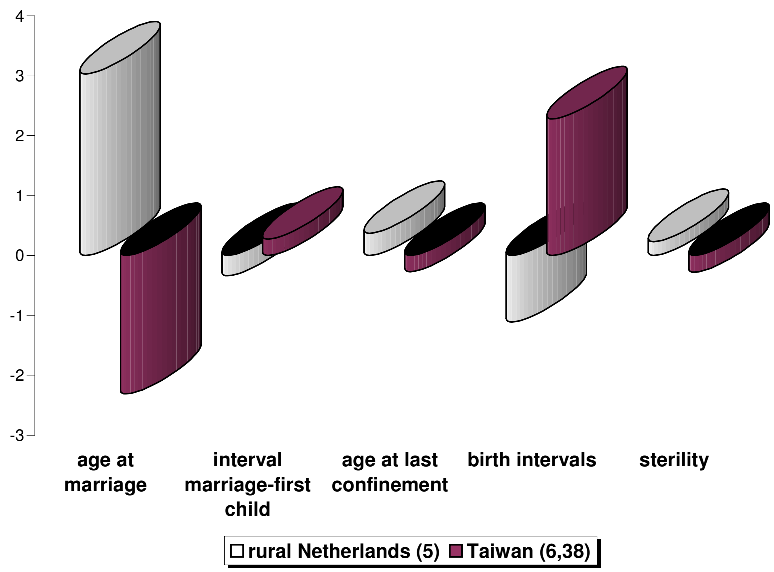


Figure 6. Changes in total family size of completed families in rural Netherlands and Chu-San/Ta-Chia when McDonalds parameters are exchanged



TABLES to

Marital fertility and birth control in rural Netherlands and Taiwan, 19th and early 20th centuries

JAN KOK, WEN-SHAN YANG, YING-HUI HSIEH

Table 1. McDonalds calculation of total number of children born to completed marriages

	Netherlands (rural women born before 1870)	Chu-Shan and Ta-Chia (major marriages)
%fertile (s)	89%	93%
age at first marriage (m)	26.5	19.4
average interval between marriage and first birth in years (f)	1.33	2.14
Average birth interval in years (i)	2.08	2.85
age at last confinement (l)	37.45	38.29
N	372	102
Total number of children born	5	6.38

Table 2. Comparison of subsequent birth intervals by survival status and sex of of the child, Taiwan and rural Netherlands.

	Taiwan (Chu-San)		Rural Netherlands (mothers born before 1870)	
	Male	Female	Male	Female
Birth interval when infant survived	32,8 (1554)	30,8 (1538)	24,5 (884)	25,2 (839)
Birth interval when infant died	22,5 (185)	23,2 (106)	21,1 (181)	21,9 (160)

Outcomes of T-tests for the effect of infant mortality in Dutch and Taiwan tables all Pr >t <0.0001.

Table 3. Cox regression on the duration of closed birth intervals, western-central Netherlands (hazard ratios).

	Mothers born 1800-1870	Mothers born 1870-1900
Mother's age		
<25 years (ref.)		
25-29	0.870*	0.849
30-34	0.912	0.898
35-39	0.848	1.118
40 and older	1.286	0.992
Marriage duration in years	0.917****	0.916***
Final interbirth interval	0.586****	0.501****
Crude legitimate parity	1.119****	1.136*
Death of infant before birth of the next child (time dependent covariate)	1.550****	1.559**
Family composition		
Net parity	1.000	0.975
Proportion of dependent children (less than 9 years old)	0.537***	0.578
Last child female	0.962	1.007
Last child female and deceased before birth of the next child	0.889	1.065
Proportion of girls among children alive at beginning of interval	1.030	1.022
Already one or more boys surviving at beginning of interval	1.036	1.105
Occupation of father		
Unskilled and casual worker (ref.)		
Elite	0.882	0.829
Farmer	1.209***	1.103
Official or white collar worker	1.119	1.191
Shopkeeper or artisan	1.065	0.977
Skilled worker	1.117	0.747***
Religion of parents		
Both liberal protestant (ref.)		
Both catholic	1.286****	1.166
At least one of the parents is orthodox protestant	1.079	1.032
Mixed catholic-protestant	1.171	0.755
Both Jewish	0.250	0.406
Both unknown	0.975	3.669
Liberal catholic (at least one of the parents)	2.497***	
Nondenominational (at least one of the parents)	2.029*	0.953
Parents same age (difference less than 4 years) (ref.)		
Wife older than husband (4 year or more)	1.057	1.028
Husband older than wife (4 years or more)	1.011	0.982
Parents exogamous (different birth place) (ref.)		
Parents endogamous (same birth place)	0.831***	0.913
Endogamy unknown	0.568*	0.716
Father illiterate	1.006	0.833
Father's literacy unknown	0.927	
Mother illiterate	0.803***	1.066
Mother's literacy unknown	1.989	
Mother born between 1800 and 1829 (ref.)		
Mother born between 1830 and 1849	1.176***	
Mother born between 1850 and 1869	1.209***	

Mother born between 1870 and 1889 (ref.)		
Mother born between 1890 and 1909		0.873
Utrecht sample (ref.)		
Akersloot sample	0.911	0.486
Number of intervals	2068	755
Likelihood ratio Chi^2	319.30	131.00

Level of significance: * 0.1; ** 0.05; *** 0.01; **** 0,001

Table 4. Cox regression on the duration of closed birth intervals, Chu-Shan and Ta-Chia, Taiwan (hazard ratios).

Mother's age	
<25 years (ref.)	
25-29	0.954
30-34	0.988
35-39	0.981
40 and older	1.221
Marriage duration in years	0.917****
Final interbirth interval	0.428****
Possibly final interval (migration after last birth)	0.874***
Crude legitimate parity	1.191****
Death or adopting-out of infant before birth of the next child (time dependent covariate)	2.011****
Family composition	
Net parity	1.081***
Proportion of dependent children (less than 9 years old)	0.876
Last child female	1.101
Last child female and deceased/adopted out before birth of the next child	1.030
Proportion of girls among children alive at beginning of interval	0.923
Already one or more boys surviving at beginning of interval	0.900**
Socio-economic status head of the household	
Low (ref.)	
High	1.014
Middle	1.008
Relation father to head of household	
Head of household himself (ref.)	
First son	1.052
Non-first son	1.108
Other	1.115**
Parents exogamous (different birth place) (ref.)	
Parents endogamous (same birth place)	1.013
Parents same age (difference less than 4 years) (ref.)	
Wife older than husband (4 year or more)	1.407
Husband older than wife (4 years or more)	0.919**
Type of marriage	
Major (ref.)	
Minor	0.704****
Uxorilocal	0.790****
Mother born after 1906 (ref.)	
Mother born before 1906 (ref.)	0.848****
Chu-Shan (ref.)	
Ta-Chia	1.266****
Number of intervals	4213
Likelihood ratio Chi^2	940.64

Level of significance: * 0.1; ** 0.05; *** 0.01; **** 0,001

Table 5. Logistic regression on stopping with childbearing, western-central Netherlands (odds ratios).

	Mothers born 1800-1870	Mothers born 1870-1900
Mother's age		
<25 years (ref.)		
25-29	1.212	1.611
30-34	1.632	2.183*
35-39	2.687***	3.648***
40 and older	13.416****	31.660****
Marriage duration in years	1.350****	1.590****
Crude legitimate parity	0.696****	0.530****
Death of previous infant within a year	1.005	0.338
Family composition		
Net parity	0.844***	0.817
Proportion of dependent children (less than 9 years old)	0.652	0.690
Last child female	1.293	0.848
Last child female and deceased within a year	0.626	1.626
Proportion of girls among children alive	0.820	0.940
Already one or more boys surviving	0.837	0.644
Occupation of father		
Unskilled and casual worker (ref.)		
Elite	0.987	1.612
Farmer	1.281	1.099
Official or white collar worker	0.518	2.911***
Shopkeeper or artisan	1.321	1.423
Skilled worker	1.031	1.437
Religion of parents		
Both liberal protestant (ref.)		
Both catholic	1.038	0.317****
At least one of the parents is orthodox protestant	0.795	0.650*
Mixed catholic-protestant	1.521	0.117***
Both Jewish	15.251*	2.319
Both unknown	1.119	2.363
Liberal catholic (at least one of the parents)	1.962	
Nondenominational (at least one of the parents)	2.671	1.499
Parents same age (difference less than 4 years) (ref.)		
Wife older than husband (4 year or more)	1.046	1.211
Husband older than wife (4 years or more)	0.823	1.137
Parents exogamous (different birth place) (ref.)		
Parents endogamous (same birth place)	0.903	1.021
Endogamy unknown	0.941	1.742
Father illiterate	1.056	0.196
Father's literacy unknown	0.094	
Mother illiterate	0.792	0.424
Mother's literacy unknown	10.951*	
Mother born between 1800 and 1829 (ref.)	1.178	
Mother born between 1830 and 1849	1.350	
Mother born between 1850 and 1869		
Mother born between 1870 and 1889 (ref.)		
Mother born between 1890 and 1909		1.862***
Utrecht sample (ref.)		
Akersloot sample	1.174	6.678

Number of births	2496	1007
Nagelkerkes r^2	0.35	0.43
Likelihood ratio Chi^2	567.52	333.58

Level of significance: * 0.1; ** 0.05; *** 0.01; **** 0,001

Table 6. Logistic regression on stopping with childbearing, Chu-Shan and Ta-Chia, Taiwan (odds ratios).

Mother's age	
<25 years (ref.)	
25-29	0.59
30-34	1.58
35-39	3.69***
40 and older	38.09****
Marriage duration in years	1.25****
Crude legitimate parity	0.76****
Death or adoption out of previous infant within a year	0.86
Family composition	
Net parity	0.84**
Proportion of dependent children (less than 9 years old)	0.89
Last child female	1.18
Last child female and deceased or adopted out before birth of the next child	0.78
Proportion of girls among children alive	0.74
Already one or more boys surviving	0.93
Socio-economic status head of the household	
Low (ref.)	
High	0.88
Middle	1.11
Relation father to head of household	
Head of household himself (ref.)	
First son	0.87
Non-first son	0.79
Other	1.04
Parents exogamous (different birth place) (ref.)	
Parents endogamous (same birth place)	1.09
Parents same age (difference less than 4 years) (ref.)	
Wife older than husband (4 year or more)	0.71
Husband older than wife (4 years or more)	0.87
Type of marriage	
Major (ref.)	
Minor	1.11
Uxorilocal	0.57**
Mother born after 1906 (ref.)	
Mother born before 1906	0.68**
Chu-Shan (ref.)	
Ta-Chia	2.15****
Number of children	4369
McFadden's r^2	0.19
Likelihood ratio Chi^2	259.16

Level of significance: * 0.1; ** 0.05; *** 0.01; **** 0,001