DH-05 The Neolithic turn: agriculture, property and patriarchy

Introduction: The Architecture of the Neolithic Transition

The transition from mobile foraging to sedentary agriculture—commonly termed the Neolithic turn—represents the most profound restructuring of human social organization in the species' history. Originating in the Holocene (beginning circa 11,700 years ago), this shift catalyzed the emergence of property rights, hereditary inequality, early state formation, and the systematic institutionalization of patriarchal gender relations. To rigorously understand how and why these dynamics transformed, analysis must eschew monolithic narratives and instead disaggregate the evidence into three distinct but interacting layers.

First is the layer of **physiology (measurable)**, which encompasses the empirical, bioarchaeological, and genetic records. This includes osteological data reflecting mechanical bone loading, ancient DNA (aDNA) pedigrees, strontium isotope analyses tracing spatial mobility, and genomic bottlenecks mapping effective population sizes. Second is the layer of **behaviour (statistical)**, representing the overlapping distributions of human action responding to changing macroeconomic and environmental incentives. This involves the intergenerational transmission of wealth, the division of labour driven by technological adoption, and demographic responses. Crucially, these are statistical averages; a shift in a population mean does not prescribe the behaviour of any specific individual. Overlapping distributions dictate that while the average agrarian male may have controlled more resources than the average female, vast numbers of individual women wielded more power, wealth, or physical strength than vast numbers of individual men. Finally, the third layer is **culture (variable)**, which consists of the institutional, legal, and religious frameworks constructed to codify, justify, or mitigate these behavioural realities. This includes formal law codes, religious iconography, and marriage exchange systems.

By synthesising peer-reviewed primary literature, ancient DNA analyses, and cross-cultural economic databases, this report investigates the origins of patriarchal structures. It systematically evaluates the impact of agricultural technologies, the consequences of property accumulation, the violence of Bronze Age expansions, and the ideological codification of gender inequality.

The Origins of Inequality: Surplus, Storage, and State Formation

Understanding the origins of patriarchy requires examining the broader origins of social stratification. Classic anthropological and sociological theories have long debated the exact causal mechanism that terminated the relative egalitarianism of Pleistocene foragers. Friedrich Engels, in *The Origin of the Family, Private Property and the State* (1884), established the classic materialist paradigm: agriculture generated a caloric surplus, which led to the concept of

private property, which in turn required patrilineal inheritance, resulting in the "world historic defeat of the female sex."

However, modern ethnographic and archaeological data reveal that agriculture is not the sole prerequisite for inequality. Alain Testart (1982) disrupted the binary view that all hunter-gatherers were egalitarian and all agriculturalists were stratified[1]. Testart demonstrated that sedentary, food-storing hunter-gatherers—such as the indigenous populations of the North American Pacific Northwest, or the intensive fishing communities of southeastern Siberia—developed massive social inequalities, rigid hierarchical structures, and institutionalized slavery purely through the intensive harvesting and storage of wild resources like salmon and acorns[1]. Thus, the precipitating variable for wealth inequality is not cultivation itself, but the *technology of storage* and the reliance on delayed-return economies[2].

This materialist framework was further expanded by Marvin Harris, who argued that population pressures in early sedentary communities led to intensified resource competition and warfare. In Harris's model, the premium placed on male physical strength in hand-to-hand combat generated a "male supremacy complex," leading to female infanticide as a crude mechanism of population control. While Harris's focus on warfare is partially corroborated by Bronze Age bioarchaeology, recent aDNA shows an *increase* in female effective population size during these periods, challenging his specific claims regarding pervasive female infanticide.

James C. Scott (2017) provides a synthesis of state formation in *Against the Grain: A Deep History of the Earliest States*. Scott observes a profound historical reality: all early archaic states (e.g., in Mesopotamia, Egypt, and China) were based exclusively on cereal grains (wheat, barley, millet, rice)[4]. History records no states built on cassava, taro, sago, or sweet potatoes[5]. The reason is fundamentally administrative. Cereal grains ripen simultaneously, grow above ground, and are highly visible, divisible, and storable[6]. This makes them uniquely "legible" to a tax collector[6].

Scott posits that the earliest agrarian states functioned as protection rackets[6]. To maintain the elite and the military apparatus, the state required a concentrated, localized population engaged in arduous, legible grain agriculture. The state viewed its subjects as a domesticated flock, tightly regulating movement and reproduction to maximize the tax base and military manpower[7]. For women, this meant immense systemic pressure to maximize fertility.

Sedentary agrarian communities suffered unprecedentedly high rates of mortality due to the zoonotic diseases inherent in living closely with domesticated animals and human waste[7]. The systemic subordination of women, therefore, was partly a demographic imperative dictated by the state's insatiable need to outbreed epidemiological collapse.

Classic Theorist	**Core Text / Era**	**Primary Catalyst for Patriarchy/Inequality**	**Modern Consensus / Critique**
Friedrich Engels	*Origin of the Family*	Agricultural surplus leading to private	Overly deterministic;

	(1884)	property.	ignores non-agricultural storing foragers.
Marvin Harris	*Cannibals and Kings* (1977)	Population pressure $\rightarrow$ warfare $\rightarrow$ male supremacy.	Warfare was critical, but aDNA contradicts universal female infanticide.
Alain Testart	*The Hunter-Gatherers* (1982)	Food storage and delayed-return economies.	Highly supported by ethnographic analysis of complex foragers.
Gerda Lerner	*The Creation of Patriarchy* (1986)	Commodification of female reproductive capacity.	Supported by early legal codes defining women as property.
James C. Scott	*Against the Grain* (2017)	Cereal grain "legibility" enabling state taxation.	Highly robust synthesis of crop ecology and early state coercion.

Physiological Realities: Labour, Locality, and the Body

To move beyond sociological abstraction, the physiological layer of the Neolithic turn provides a measurable record of lived experience. For decades, bioarchaeological investigations interpreted prehistoric workloads by comparing women's bones directly to men's bones[9]. Because male bones generally undergo more dramatic shape changes in response to physical exertion due to hormonal differences, this male-centric baseline systematically underestimated the physical demands borne by prehistoric women[9].

Macintosh, Pinhasi, and Stock (2017, *Science Advances*) fundamentally disrupted this narrative by comparing the bone cross-sectional geometry of Central European Neolithic women directly to living, modern females[9]. The researchers utilized CT scanners to analyze 89 tibiae (shinbones) and 78 humeri (upper arm bones) from female skeletons spanning the early Neolithic (circa 5300 BCE) to the Medieval period (850 CE)[10]. The control group consisted of modern female athletes, including elite rowers who train 18 to 20 hours per week, as well as sedentary university students[11].

The results were staggering. The prehistoric agricultural women exhibited leg bone strength similar to modern rowers, but their upper arm bones were 11% to 16% stronger than the elite rowers, and nearly 30% stronger than the sedentary students[9]. This extreme upper-limb loading, which peaked during the Bronze Age, points to hours of intense, repetitive manual labour[12]. The most likely mechanism was the bimanual grinding of cereal grains using saddle querns, a task that, in remnant traditional societies, occupies women for up to five hours a day[9]. The physiological record thus proves that early agricultural economies did not domesticate women into passive domesticity; rather, they were heavily dependent on gruelling, asymmetrical female physical labour. Importantly, because these figures represent population averages, the standard deviations indicate that some individual Neolithic women possessed musculoskeletal adaptations far exceeding even the most elite modern athletes, while others may have engaged in less physically demanding craft specializations[12].

In the realm of genetics, ancient DNA (aDNA) has provided unprecedented insight into the spatial and marital realities of early farmers. Rivollat et al. (2023, *Nature*) reconstructed a massive pedigree from the 6,700-year-old Neolithic site of Gurgy 'Les Noisats' in France[14]. The researchers successfully extracted genome-wide data for 94 individuals out of 110 sampled, mapping shared identity-by-descent (IBD) blocks to reliably estimate biological relatedness up to the fifth degree[14]. The result was two extensive family trees, including a primary pedigree of 64 individuals spanning seven generations[14].

By integrating this genomic data with strontium isotope ratios ($^{87}Sr/^{86}Sr$), the researchers demonstrated a strict system of patrilineality and patrilocality. The adult males were genetically related to one another and bore isotopic signatures indicating they lived their entire lives locally[14]. In stark contrast, the adult females were genetically diverse, were largely unrelated to one another, and bore isotopic signatures indicating they had migrated from outside regions[14]. This provides definitive, physiological evidence that patrilocal exogamy—a system where women leave their natal support networks and kinship groups to join their husband's lineage—was heavily entrenched early in the European Neolithic. The isolation of women from their biological kin is a recognized precursor to reduced female bargaining power within the household.

The Behavioural Layer: Wealth Transmission and the Plough Hypothesis

The behavioural layer examines how populations statistically reoriented their actions in response to the material conditions of agriculture. A landmark study by Borgerhoff Mulder, Bowles, et al. (2009, *Science*) quantified intergenerational wealth transmission across 21 historical and contemporary small-scale societies[17]. The researchers calculated the intergenerational transmission coefficient (β), where $0 \leq \beta < 1$, measuring how strongly a child's wealth correlates with their parents' wealth. The equation $w_i = \beta w_{ip} + (1 - \beta)\bar{w} + \lambda$ captures this, where w_{ip} is parental wealth and λ

represents exogenous shocks[18].
The study found a stark divide based on subsistence strategy. In hunter-gatherer and horticultural societies, where wealth is primarily somatic (health, body size) or relational (coalitional support), the β coefficient averaged a modest 0.13 to 0.18[19]. In these systems, advantages are heavily subject to regression to the mean; a successful hunter cannot automatically transfer his physical prowess to his son[18]. In contrast, agricultural and pastoral economies, characterized by material, defensible wealth (land and livestock), exhibited an average β of 0.61[19]. In these systems, a child born into the top wealth decile is on average 11 times more likely to remain in the top decile than a child born into the bottom decile[17]. Agriculture created highly inheritable material wealth, drastically steepening the Gini coefficients of human societies and statistically locking individuals into rigid class hierarchies.

The Plough Hypothesis

One of the most heavily debated theories regarding the origins of patriarchal gender norms is the "Plough Hypothesis," originally advanced by Danish economist Ester Boserup (1970) and empirically tested by Alesina, Giuliano, and Nunn (2013, *Quarterly Journal of Economics*)[20]. The hypothesis asserts that the specific type of agriculture traditionally practiced shaped the historical division of labour and the subsequent cultural evolution of gender norms. In shifting cultivation using hoes or digging sticks, agriculture is highly labour-intensive, and women participate equally or dominantly[23]. Conversely, intensive agriculture utilizing the plough requires significant upper-body strength and bursts of power to control draft animals[23]. It is also largely incompatible with simultaneous childcare, given the dangers posed by heavy machinery and large animals[23]. Furthermore, the plough eliminates the need for weeding—a task historically dominated by women and children[23]. Consequently, plough adoption pushed men into the fields as primary producers and relegated women to the domestic sphere.
Alesina et al. merged pre-industrial ethnographic data on traditional plough use from 1,267 ethnic groups with contemporary economic datasets[21]. To account for endogeneity—the possibility that inherently patriarchal societies simply chose to adopt the plough—they utilized an Instrumental Variable (IV) approach, exploiting the historical geo-climatic suitability of the environment for growing crops that differentially benefited from the plough (e.g., wheat, barley, rye) versus those that did not (e.g., sorghum, millet)[21]. Both Ordinary Least Squares (OLS) and IV estimates revealed a robust, statistically significant negative relationship between ancestral plough use and contemporary female labour force participation, female firm ownership, and the proportion of women in politics[20]. To test for cultural persistence, they analyzed the children of immigrants in the United States and Europe, finding that individuals carrying a cultural heritage of plough agriculture still hold less egalitarian beliefs regarding gender roles today, regardless of their current geographic location[20].
Subsequent research has validated, replicated, and nuanced these findings:

- **Methodological Replication:** A 2024 study utilizing Causal Machine Learning (CML) methods successfully replicated Alesina et al.'s findings. By flexibly modeling non-linearities and interactions not considered in the original OLS regressions, the CML

approach found that the negative effect of historic plough adoption on female labor force participation is actually *larger* than initially estimated[27].

- **Fertility Effects:** Alesina, Giuliano, and Nunn (2011, *American Economic Review*) demonstrated that a one standard deviation increase in historic plough use correlates with a decline in modern fertility by 0.52 children (equal to 17% of the sample mean)[23]. Because the plough made women and children less economically useful in the fields, it generated a preference for fewer children compared to hoe-based societies[23].
- **Sex Ratios:** Alesina, Giuliano, and Nunn (2018, *PLoS ONE*) linked historic plough use to highly skewed male-to-female sex ratios today[24]. Because plough agriculture devalued female economic contributions, it generated a cultural preference for boys. Across 146 countries, the male-to-female ratio was 104.5 for plough-based countries versus 101.9 for non-plough countries among older children. This ancestral bias manifests today in sex-selective abortion, infanticide, and unequal nutritional allocation[22].
- **Soil Texture Dynamics:** Carranza (2014, *American Economic Journal: Applied Economics*) provided an environmental mechanism for this dynamic in India (N=577 districts). She demonstrated that loamy soils require deep tillage, reducing the demand for female agricultural labour, whereas clayey soils do not. The fraction of loamy soil in a district directly and positively correlates with a demographic deficit of girls (a skewed sex ratio), proving that local ecological endowments dictate female economic value and survival[30].

Controversies and Critics of the Plough Hypothesis

While the correlation between agrarian history and patriarchal norms is widely accepted, the exclusivity of the plough is contested. The leading critics are Hansen, Jensen, and Skovsgaard (2015, *Journal of Economic Growth*)[25]. They argue that early agriculture generated patriarchal norms and diminished female mobility long before the invention of the plough[25].

Hansen et al. posit that the transition to sedentary farming itself allowed for reduced birth spacing, drastically increasing female fertility burdens. Farming women did not have to carry infants long distances as foraging women did, leading to more frequent pregnancies and confining women to the domestic sphere[25]. Using cross-country regressions, they demonstrate a robust negative relationship between the *number of years a society was predominantly agrarian* (the timing of the Neolithic transition) and contemporary female labour force participation, arguing that the deep root of patriarchy is agriculture itself, not merely the implement used to till the soil[25]. The consensus suggests an overlapping dynamic: early agriculture initiated the domestic confinement of women due to fertility demands, and the subsequent adoption of the plough economically formalized and exacerbated this division of labour.

Pastoralism, Warfare, and the Bronze Age 'Sexual Revolution'

As agricultural and pastoral populations grew, competition for scarce, defensible land intensified, leading to a catastrophic demographic event known as the Holocene

Y-chromosome bottleneck.

Karmin et al. (2015, *Genome Research*) sequenced 456 high-coverage Y-chromosomes globally, revealing that between 8,000 and 4,000 years ago, male genetic diversity suffered a sudden, violent collapse[35]. The male effective population size (N_e) plummeted, while the female effective population size (inferred from mitochondrial DNA) continued to climb steadily[37]. At the nadir of this bottleneck, the ratio reached approximately 17 reproducing females for every 1 reproducing male[37].

This genetic signature does not mean that 16 out of 17 men were physically exterminated globally. Rather, it reflects a radical restructuring of social organization characterized by extreme variance in male reproductive success. Two primary models attempt to explain this:

1. **Warring Clans (Cultural Hitchhiking):** Zeng, Aw, and Feldman (2018, *Nature Communications*) proposed that as humans organized into patrilineal segmentary systems, male lineages became tightly bound to clans competing for resources[37]. When a dominant clan won a conflict, it wiped out the rival clan's males but absorbed their females. The surviving Y-chromosomes "hitchhiked" on the culturally transmitted identity of the victorious group, leading to the rapid extinction of diverse male lines[38].
2. **Peaceful Lineage Splitting:** Guyon et al. offer a less violent mathematical model, demonstrating that the ordinary, harsh operation of patrilineal social advantage can produce the bottleneck. In systems where high-status male lineages grow faster, accrue more resources, and suffer fewer extinctions than low-status lineages, the long-term statistical result is a massive reduction in male genetic diversity, even without apocalyptic clan warfare[38].

The evolutionary logic behind this variance was established by Laura Betzig (1986) in *Despotism and Differential Reproduction*[40]. Betzig utilized ethnographic data to demonstrate that absolute political power routinely translates into Darwinian fitness. Despots historically maintained massive harems, strictly defending their reproductive access to convert power into the ultimate currency of natural selection[41]. Modern genetics confirms this: approximately 8% of modern men in regions of Asia (roughly 16 million individuals) carry the Y-chromosome haplotype of a single male ancestor living roughly 1,000 years ago, widely attributed to Genghis Khan or his immediate lineage[40]. Similar "star clusters" exist globally, such as the lineage of the Uí Néill dynasty in Ireland[40].

However, bioarchaeology confirms that the transition to these hierarchical societies was staggeringly violent. The Neolithic and Early Bronze Age experienced endemic inter-group conflict. Famous mass graves include:

- **Talheim (Germany):** 34 individuals (men, women, and children) hastily buried in a mass grave. Trauma analysis reveals they were struck from behind by stone axes, indicative of a massacre of a fleeing population[43].
- **Asparn/Schletz (Austria):** A minimum of 67 individuals violently killed and left unburied to be scavenged by carnivores. Crucially, demographic profiling revealed a statistically significant absence of young women among the dead, strongly implying they were abducted by the attackers[44].

- **Herxheim (Germany):** A minimum of 500 individuals showing peri-mortem bone breakage, cut marks, and marrow extraction. This is heavily debated as either mass ritual violence or cannibalism[45].
- **Schöneck-Kilianstädten (Germany):** 26 individuals killed with blunt force and arrows. The attackers systematically broke the victims' lower legs to prevent escape, and again, young females were statistically absent[43].

Mass Grave Site	Minimum Number of Individuals (MNI)	Key Bioarchaeological Indicators	Interpretation
Talheim	34	Lethal blows to the back of the skull.	Massacre of a fleeing community.
Asparn/Schletz	67	Carnivore gnawing; absence of young adult females.	Annihilation event with targeted female abduction.
Herxheim	500+	Peri-mortem fragmentation, marrow extraction.	Mass ritual violence or systemic cannibalism.
Schöneck-Kilianstädten	26	Systematic breaking of lower limbs; absence of females.	Torture/prevention of flight; targeted female abduction.

The long-term cultural consequences of such male-biased violence and imbalanced sex ratios are profound. Grosjean and Khattar (2019, *Review of Economic Studies*) utilized the natural experiment of Australia's convict era—where the male-to-female ratio wildly skewed due to penal transportation—to prove that historically high male-biased sex ratios generate persistently conservative gender norms[49]. High male sex ratios historically incentivized women to marry early and drop out of the workforce[49]. Even after the sex ratio returned to natural levels, these behaviours entrenched into vertically transmitted cultural norms, resulting in modern areas with historically high male populations exhibiting significantly lower female labour force participation and heightened support for traditional gender roles today[49].

Marriage Markets: Bride Price, Dowry, and the Control of Sexuality

As land became scarce and wealth highly transmissible, the nature of marriage exchange

underwent an economic revolution. In foraging and hoe-agricultural societies, marriage was frequently accompanied by **bride price** (bridewealth), a transfer of goods from the groom's family to the bride's family[52]. Because female labour was highly valued in these economies, the groom essentially compensated her family for the loss of her labour and reproductive output[52].
The anthropologist Jack Goody (1976, *Production and Reproduction*) mapped a global correlation between the rise of intensive plough agriculture, diverging devolution (inheritance passing to both sexes), and the emergence of **dowry**[53]. Dowry is a transfer of wealth from the bride's parents to the newly formed household or directly to the groom[52].
Botticini and Siow (2003, *American Economic Review*) provided the leading economic model for this transition[52]. In virilocal, stratified agricultural societies, sons remain on the family estate to supply agricultural labour and protect the asset. A daughter leaves the natal home. To resolve the "free-rider" problem—ensuring daughters receive their fair inheritance without compromising the physical integrity of the family estate or diluting the sons' incentives to work the land—parents provide the daughter her inheritance early, as a liquid dowry at the time of marriage[54].
Furthermore, dowry functions as a market-clearing price. In highly stratified monogamous societies, high-quality, wealthy grooms are scarce[54]. Because female reproductive windows are narrower than males', women face biological pressure to match early[54]. Dowry allowed wealthy families to bid on the best possible sons-in-law, simultaneously preserving their daughters' class status and ensuring their grandchildren were well-resourced[53].
Critics of Goody's overarching model, such as Sylvia Yanagisako and Stanley Tambiah, point out that dowry functions differently across cultures. Tambiah noted that in North India, dowry often bypasses the bride entirely and is absorbed into the groom's joint family, acting less as female inheritance and more as an extortionate groom-price[53]. Nonetheless, the transition to property-concentrating dowry systems required absolute certainty of paternity. Because vast material wealth was being transferred across generations, patriarchs demanded total control over female sexuality to guarantee that their inheritable wealth was passing exclusively to their biological offspring[56]. Female virginity at marriage and strict marital fidelity became paramount, enforced through harsh legal codes, physical seclusion, and intense social stigma.

Ideology: Law, Religion, and the Dethroning of the Goddess

The behavioural and physiological institutionalization of patriarchy required robust cultural and ideological justification. In the mid-20th century, archaeologists like Marija Gimbutas popularized the theory that the Neolithic was a peaceful, egalitarian, matriarchal utopia dedicated to the worship of a universal Great Mother Goddess, which was subsequently overthrown by violent, patriarchal Indo-European invaders[57].
Modern archaeology has largely dismantled this romanticized narrative. The ongoing excavations at Çatalhöyük in Turkey (circa 7100 BCE), led by Ian Hodder, have demonstrated that while the society was relatively egalitarian in its early phases—with little bioarchaeological differentiation in diet, trauma, or burial placement between men and women—there is zero

evidence of a matriarchy[59]. The famous voluptuous "goddess" figurines are no longer interpreted by the excavation team strictly as deities of female fertility. Scholars like Lynn Meskell and Carolyn Nakamura argue that these figurines, which often depict fat, older individuals, likely represent status, longevity, and abundance rather than an overarching female deity[60]. As Çatalhöyük evolved over centuries, society became increasingly stratified, transitioning from communal sharing economies to independent, household-based agricultural production[62].

Meskell sharply critiques the modern "Goddess movement" and ecofeminism, pointing out a profound philosophical flaw. By insisting that women are inherently aligned with "nature, emotion, and the body" against male "culture, reason, and the mind," these movements unwittingly reinforce the exact Cartesian dualisms and biological essentialisms that historical patriarchies utilized to justify the subjugation of women[57].

Instead of a spiritual utopia, early urban centers utilized religion and codified law to cement state authority and male dominance. Gerda Lerner, in *The Creation of Patriarchy* (1986), posited that the commodification of female sexual and reproductive capacity preceded the formalization of class society, becoming institutionalized in archaic law codes[56].

A paramount example is the Middle Assyrian Laws (circa 1076 BCE). Law 40 strictly regulated the sartorial presentation of women, specifically the use of the veil[63]. Veiling was legally mandated for "respectable" women (wives, widows, and daughters of free men)[63]. It was strictly prohibited for prostitutes and female slaves, who faced severe physical punishment (beatings and mutilation) if caught wearing one[63]. The veil was not initially an instrument of religious modesty, but a visible, cultural property marker. It demarcated which women were under the economic and physical protection (and ownership) of a specific patriarch, and which women were sexually available to the public[56]. By making adultery a crime strictly against the husband's property rights, archaic law codes institutionalized the concept that women's bodies were part of the transmissible wealth system mapped out by agrarian economics[65].

Conclusion

The Neolithic turn did not invent male dominance overnight. Rather, it constructed an ecological, demographic, and technological environment where the accumulation of defensible property (land and livestock), the demand for intensive physical labour (the plough), and the coercive requirements of the state heavily incentivised patrilineality, patrilocality, and the rigid control of female reproduction. The overlapping statistical behaviours of populations adjusting to these agrarian incentives eventually calcified into the legal, religious, and cultural frameworks of patriarchy.

Summary of Robust Findings

1. Early Neolithic agriculture demanded gruelling female manual labour (e.g., grain grinding), evidenced by prehistoric female arm bones up to 30% stronger than modern averages.
2. Patrilocality and female exogamy were institutionalised early in Europe, proven by multi-generational aDNA pedigrees and strontium isotopic tracking.
3. The transition from foraging to agriculture/pastoralism radically increased

intergenerational wealth transmission ($\beta \approx 0.61$), generating rigid class hierarchies.
4. Intensive plough agriculture reduced the economic value of female agricultural labour, leading to persistent cultural norms that lower modern female labour force participation and skew sex ratios.
5. Archaic state formation was utterly reliant on legible, storable cereal grains, allowing elites to extract surplus and treat populations as domesticated, taxable assets.
6. A massive Y-chromosome bottleneck occurred in the Holocene (17 reproducing females per 1 male), driven by patrilineal competition, warring clans, and extreme male reproductive variance.
7. Dowry emerged in stratified, agrarian societies as a pre-mortem inheritance mechanism to clear monogamous marriage markets and protect family estates without diluting male incentives.
8. Early Middle Eastern law codes legally demarcated women based on sexual ownership (e.g., through veiling laws), treating female reproductive capacity as a male property right.
9. Bioarchaeology proves the Neolithic and Bronze Age were marked by severe, lethal mass violence (e.g., Talheim, Schletz), often involving the targeted abduction of young women.
10. The archaeological consensus (e.g., at Çatalhöyük) rejects the existence of a peaceful, primordial matriarchy or universal Mother Goddess, viewing such concepts as modern, biologically essentialist projections.

Contested or Open Questions

- **The Primary Catalyst of Gender Inequality:** Did the technology of the plough cause the definitive shift in patriarchal gender norms (Alesina et al., 2013), or was it the longer duration of agricultural sedentism, fertility demands, and property accumulation itself (Hansen et al., 2015)?
- **The Nature of the Y-Chromosome Bottleneck:** Was the drastic reduction in male genetic lineages driven strictly by apocalyptic clan warfare (Zeng et al., 2018), or can it be sufficiently explained by the peaceful splitting of lineages based on socio-economic advantages over deep time (Guyon et al.)?
- **Interpreting Early Figurines:** Are the voluptuous figurines of Çatalhöyük representative of revered human elders and social status, or do they hold specific religious, fertility-based meanings that have been over-corrected by modern archaeological critique?
- **Sex Ratios and Future Norms:** Can the deep-rooted cultural sedimentation of male-biased sex ratios (as identified by Grosjean & Khattar) self-correct through modern economic policy, or will these conservative norms persist indefinitely?

Important Sources to Read in Full

1. Alesina, A., Giuliano, P., & Nunn, N. (2013). "On the Origins of Gender Roles: Women and the Plough." *The Quarterly Journal of Economics*.
2. Borgerhoff Mulder, M., Bowles, S., et al. (2009). "Intergenerational Wealth Transmission and the Dynamics of Inequality in Small-Scale Societies." *Science*.

3. Botticini, M., & Siow, A. (2003). "Why Dowries?" *American Economic Review*.
4. Grosjean, P., & Khattar, R. (2019). "It's Raining Men! Hallelujah? The Long-Run Consequences of Male-Biased Sex Ratios." *Review of Economic Studies*.
5. Karmin, M., et al. (2015). "A recent bottleneck of Y chromosome diversity coincides with a global change in culture." *Genome Research*.
6. Lerner, G. (1986). *The Creation of Patriarchy*. Oxford University Press.
7. Macintosh, A. A., Pinhasi, R., & Stock, J. T. (2017). "Prehistoric women's manual labor exceeded that of athletes through the first 5500 years of farming in Central Europe." *Science Advances*.
8. Rivollat, M., et al. (2023). "Extensive pedigrees reveal the social organization of a Neolithic community." *Nature*.
9. Scott, J. C. (2017). *Against the Grain: A Deep History of the Earliest States*. Yale University Press.
10. Zeng, T. C., Aw, A. J., & Feldman, M. W. (2018). "Cultural hitchhiking and competition between patrilineal kin groups explain the post-Neolithic Y-chromosome bottleneck." *Nature Communications*.

Implications for Living Together

The historical and bioarchaeological evidence makes clear that patriarchy and severe gender inequality are not innate, immutable laws of human biology, but rather emergent, statistical properties resulting from specific economic, technological, and demographic incentives (e.g., defensible property, the plough, state taxation). Acknowledging this avoids the naturalistic fallacy: just because a hierarchical structure emerged "naturally" as an adaptation to agrarian conditions does not mean it is morally good, biologically necessary, or optimal for human flourishing today.

For modern couples, families, and organizations, this implies that gender roles are highly elastic and exquisitely responsive to material conditions. If historical environments that isolated women from economic production (like the plough) or heavily skewed sex ratios fostered inequality, then modern structures that deliberately share domestic burdens, promote female economic independence, and dilute the concentration of inheritable wealth can actively reverse those ancient trajectories. Societies construct cultural norms based on the tools and resources they rely upon; deliberately designing institutions that value equal participation can effectively rewrite the socio-cultural script that humanity inherited from the Neolithic.

Works cited

1. (PDF) Innovations, food storage and the origins of agriculture, https://www.researchgate.net/publication/273313099_Innovations_food_storage_and_the_origins_of_agriculture
2. Alain Testart - Wikipedia, https://en.wikipedia.org/wiki/Alain_Testart
3. Inequality at the Dawn of the Bronze Age: The Case of Başur Höyük, https://knowledge.lancashire.ac.uk/id/eprint/54966/1/54966%20Wengrow%20et%20al.%20VOR.pdf
4. Against the grain james c scott sparknotes,

https://cdn.prod.website-files.com/66f43ab41995d6ee71c55727/67153d75a9e4b0454b3a38f8_waxazekedinibeforomexafaw.pdf
5. *Against the Grain: A Deep History of the Earliest States* - Marginal, https://marginalrevolution.com/marginalrevolution/2017/06/grain-deep-history-earliest-states.html
6. Is Government a Protection Racket? How Wheat and Taxes Built the, https://lareviewofbooks.org/article/is-government-a-protection-racket-how-wheat-and-taxes-built-the-ancient-states/
7. Against the Grain: Civilisation as a Slave State, by James C. Scott, https://thehumandivine.org/2022/04/10/against-the-grain-civilisation-as-a-slave-state-by-james-c-scott/
8. Book notes: Against the Grain, by James C. Scott | devonzuegel.com, https://devonzuegel.com/book-notes-against-the-grain-by-james-c-scott
9. Prehistoric women had stronger arms than today's elite rowing crews, https://www.sciencedaily.com/releases/2017/11/171129143359.htm
10. Study: Prehistoric Women Were Stronger Than Today's Female, https://www.sci.news/othersciences/anthropology/prehistoric-women-stronger-todays-female-athletes-05482.html
11. Strong-armed women helped power Europe's ancient farming, https://www.sciencenews.org/article/strong-armed-women-helped-power-europes-ancient-farming-revolution
12. Prehistoric women's manual labor exceeded that of athletes through, https://pmc.ncbi.nlm.nih.gov/articles/PMC5710185/
13. Prehistoric women's manual labor was tougher than elite rowing, https://www.facebook.com/groups/684483754906272/posts/24063522073242444/
14. (PDF) Extensive pedigrees reveal the social organization of a, https://www.researchgate.net/publication/372654292_Extensive_pedigrees_reveal_the_social_organization_of_a_Neolithic_community
15. Neolithic French community's family tree reveals “founding father”, https://connectsci.au/news/news-parent/4064/Neolithic-French-community-s-family-tree-reveals
16. Social and genetic diversity in first farmers of central Europe, https://reich.hms.harvard.edu/sites/reich.hms.harvard.edu/files/inline-files/41562-024-02034-z.pdf
17. Intergenerational Wealth Transmission and the Dynamics of, https://digitalcommons.chapman.edu/cgi/viewcontent.cgi?article=1029&context=psychology_articles
18. Intergenerational Wealth Transmission and the Dynamics of, https://www.eva.mpg.de/documents/AAAS/Borgerhoff-Mulder_Intergenerational_Science_2009_2189437.pdf
19. Summary statistics: Intergenerational transmission of wealth (b), by, https://www.researchgate.net/figure/Summary-statistics-Intergenerational-transmission-of-wealth-b-by-economic-system-and_tbl1_38077769
20. On the Origins of Gender Roles: Women and the Plough,

https://ideas.repec.org/a/oup/qjecon/v128y2013i2p469-530.html
21. WOMEN AND THE PLOUGH Alberto F. Alesina Paola Giuliano, https://www.nber.org/system/files/working_papers/w17098/w17098.pdf
22. A History of Plough-Based Farming Leads to Fewer Girls, https://anderson-review.ucla.edu/sex-ratios/
23. Fertility and the Plough, https://d-nb.info/1011006219/34
24. Traditional agricultural practices and the sex ratio today - Nathan Nunn, https://nathannunn.sites.olt.ubc.ca/files/2022/07/nathannunn_Traditional-agricultural.pdf
25. Gender and Industrialization: Developments and Trends in the, https://ftp.iza.org/dp14160.pdf
26. The Role of Historical Resource Scarcity in Modern Gender Inequality, https://www.lsu.edu/business/economics/files/workingpapers/pap15_06.pdf
27. The effect of plough agriculture on gender roles - PURE.EUR.NL., https://pure.eur.nl/ws/portalfiles/portal/157711816/The_effect_of_plough_agriculture_on_gender_roles_A_machine_learning_approach.pdf
28. Traditional agricultural practices and the sex ratio today | PLOS One, https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0190510
29. Ancestral ecological endowments and contemporary sex ratios, https://www.ideasforindia.in/topics/social-identity/ancestral-ecological-endowments-and-contemporary-sex-ratios
30. Soil Endowments, Female Labor Force Participation, and the, https://www.researchgate.net/publication/267104489_Soil_Endowments_Female_Labor_Force_Participation_and_the_Demographic_Deficit_of_Women_in_India
31. Agricultural Mechanization and Gendered Labor Activities across, https://cgspace.cgiar.org/server/api/core/bitstreams/29383101-b0a4-408b-b188-70596e609419/content
32. Gender: An Historical Perspective - IZA@LISER Network, https://docs.iza.org/dp10931.pdf
33. Historical Determinants Of Gender Inequality - impri, https://www.impriindia.com/insights/determinants-gender-inequality/
34. Historical availability of arable land affects contemporaneous female, https://pmc.ncbi.nlm.nih.gov/articles/PMC12321104/
35. A recent bottleneck of Y chromosome diversity coincides ... - PubMed, https://pubmed.ncbi.nlm.nih.gov/25770088/
36. Y-chromosome bottleneck at the Younger Dryas Boundary, https://www.scientificpsychic.com/etc/carolina-bays/Y-chromosome-bottleneck.html
37. How was the study that concluded that 8000 years a ratio of 1:17, https://www.reddit.com/r/genetics/comments/1wmwyxb/how_was_the_study_that_concluded_that_8000_years/
38. The Y-Chromosome Bottleneck and the Bronze Age Mind, https://snakecult.net/posts/y-chromosome-bottleneck-bronze-age-mind/
39. (PDF) What the DNA Remembers Noah's Flood, the Y-Chromosome, https://www.researchgate.net/publication/403524810_What_the_DNA_Remember

s_Noah's_Flood_the_Y-Chromosome_Bottleneck_and_What_Modern_Genetics_Cannot_Explain_Away
40. Is History the Same as Evolution? No. Is it Independent of ... - PMC, https://pmc.ncbi.nlm.nih.gov/articles/PMC10523472/
41. The Contribution of Genetics to the History of Differential Reproduction, https://pmc.ncbi.nlm.nih.gov/articles/PMC10303451/
42. The 'Means of Reproduction' and the Ultimate Purpose of Political, https://thecontemporaryheretic.com/2021/09/19/the-means-of-reproduction-and-the-ultimate-purpose-of-political-power/
43. 3 - Settled Lives, Unsettled Times: Neolithic Violence in Europe, https://www.cambridge.org/core/books/cambridge-world-history-of-violence/settled-lives-unsettled-times-neolithic-violence-in-europe/E2EFF019FF74C684ADC9B9FB6A4F6A86
44. Neolithic Massacres: Local Skirmishes or General Warfare in Europe?, https://www.researchgate.net/publication/236166865_Neolithic_Massacres_Local_Skirmishes_or_General_Warfare_in_Europe
45. Neolithic Violence in Europe | PDF | Skull | Anthropology - Scribd, https://www.scribd.com/document/637593081/Sticks-Stones-And-Broken-Bones-Neolithic-Violence-in-a-European-Perspective
46. Patterns of Collective Violence in the Early Neolithic of Central Europe, https://www.researchgate.net/publication/326527579_Patterns_of_Collective_Violence_in_the_Early_Neolithic_of_Central_Europe
47. Herxheim (archaeological site) - Wikipedia, https://en.wikipedia.org/wiki/Herxheim_(archaeological_site)
48. The massacre mass grave of Schöneck-Kilianstädten reveals new, https://www.pnas.org/doi/10.1073/pnas.1504365112
49. It's Raining Men! Hallelujah? The Long-Run Consequences of Male, https://www.researchgate.net/publication/345134912_It's_Raining_Men_Hallelujah_The_Long-Run_Consequences_of_Male-Biased_Sex_Ratios
50. The Long Run Gender Origins of Entrepreneurship, https://www.monash.edu/__data/assets/pdf_file/0006/3726528/2024-11.pdf
51. CESifo Working Paper No. 12523 - ifo Institut, https://www.ifo.de/DocDL/cesifo1_wp12523.pdf
52. (PDF) Dowry and Bride-Price - ResearchGate, https://www.researchgate.net/publication/305348271_Dowry_and_Bride-Price
53. Dowry - Wikipedia, https://en.wikipedia.org/wiki/Dowry
54. Population Dynamics and Marriage Payments - Sudeshna Maitra, https://www.sudeshnamaitra.com/Maitra-Irdowry-Feb2018.pdf
55. On the Heterogeneity of Dowry Motives, https://www.nber.org/system/files/working_papers/w12630/w12630.pdf
56. The Creation of Patriarchy by Gerda Lerner - pdfcoffee.com, https://pdfcoffee.com/the-creation-of-patriarchy-by-gerda-lerner-pdf-free.html
57. Archaeological Dialogues - ResearchGate, https://www.researchgate.net/profile/Lynn-Meskell/publication/290186170_Oh_my_goddess_Archaeology_sexuality_and_ecofeminism/links/671d4a5f2b65f6174dc

ce4d9/Oh-my-goddess-Archaeology-sexuality-and-ecofeminism.pdf
58. Archaeologists and Goddess Feminists at Çatalhöyük - ResearchGate, https://www.researchgate.net/publication/236714924_Archaeologists_and_Goddess_Feminists_at_Catalhoyuk_An_Experiment_in_Multivocality
59. Matriarchy, Gimbutas and figurines. Entanglements with the Goddess, https://www.cambridge.org/core/journals/archaeological-dialogues/article/matriarchy-gimbutas-and-figurines-entanglements-with-the-goddess/07D1A3C4647CC496F4410F70E54075D5
60. A Woman of Çatalhöyük (Chapter 2) - Women in the Ancient, https://www.cambridge.org/core/books/women-in-the-ancient-mediterranean-world/woman-of-catalhoyuk/1AE7EAE3DB8A63207658C2E9F56E0A5A
61. Women and Men at Çatalhöyük | Request PDF - ResearchGate, https://www.researchgate.net/publication/8953774_Women_and_Men_at_Catalhoyuk
62. Archaeologists from Stanford find an 8000-year-old 'goddess, https://news.stanford.edu/stories/2016/09/archaeologists-find-8000-year-old-goddess-figurine-central-turkey
63. “Unveiling the Versions: The Tactics of Tamar in Genesis 38:15”, https://jhsonline.org/index.php/jhs/article/download/5966/5019/12998
64. Slavery, Sexual Ethics, and the Social Logic of Veiling in Islamic Law, https://www.researchgate.net/publication/351455567_Status_Distinctions_and_Sartorial_Difference_Slavery_Sexual_Ethics_and_the_Social_Logic_of_Veiling_in_Islamic_Law
65. Gerda Lerner, The Creation of Patriarchy, https://gepacf.wordpress.com/wp-content/uploads/2015/03/women-and-history_-v-1-gerda-lerner-the-creation-of-patriarchy-oxford-university-press-1987.pdf