SO-07 Mixed vs single-sex decision bodies and collective risk

Introduction: The Architecture of Collective Decision-Making

The structural composition of a decision-making body represents one of the most critical variables in the management of collective risk. From corporate boards determining the financial risk appetite of multinational conglomerates to legislatures drafting climate policies, central banks managing macroeconomic stability, and juries deciding on capital punishment, the demographic makeup of these groups fundamentally alters their outcomes. A central dimension of this architecture is the sex composition of the decision-making body—specifically, the contrast between mixed-sex and single-sex groups in their handling of collective risk and long-term problem-solving.

Evaluating the impact of sex composition on collective risk requires navigating a complex interplay of biology, psychology, and sociology. The empirical investigation of this topic demands rigorous causal identification, as observational data is frequently contaminated by endogeneity and omitted variable bias. Institutions that appoint women to high-level positions may already possess unobserved characteristics—such as egalitarian cultures or lower baseline risk profiles—that confound the analysis of the women's actual impact[1]. To cut through this statistical noise, the most reliable insights emerge from randomized controlled trials, natural experiments leveraging legislative quotas, and deep comparative analyses of social species.

Furthermore, any scientific inquiry into sex differences must rigorously distinguish between statistical averages and individual predictability. While population-level differences in risk tolerance exist between men and women, the overlapping nature of these distributions means that individual behaviour cannot be reliably deduced solely from biological sex.

To systematically unpack how men and women operate in collective decision-making environments, this report separates the underlying mechanisms into three interacting layers: measurable physiology, statistical behaviour, and variable culture. It then synthesizes the strongest causal evidence across environmental policy, public health, corporate governance, central banking, and the judicial system, paying careful attention to effect sizes, sample sizes, and the replication status of foundational claims.

The Three Layers of Analysis: Physiology, Behaviour, and Culture

Understanding mixed-sex decision-making requires isolating the biological drivers of risk from the social environments in which they are expressed.

Layer 1: Physiology (Measurable)

The physiological layer encompasses measurable biological variables, most notably endocrinology, which directly modulates neural responses to risk and social status. In the

context of decision-making, testosterone is frequently cited as the primary biological driver of male-typical risk profiles. Folk wisdom routinely attributes antisocial, aggressive, and excessively risky behaviour to high testosterone levels.

However, rigorous empirical work has overturned this simplistic narrative. Eisenegger et al. (2010, *Nature*) conducted a double-blind, placebo-controlled study administering a single sublingual dose of testosterone to 120 women playing the Ultimatum Game, a standard economic bargaining paradigm[3]. The study found that exogenous testosterone actually caused a substantial increase in *fair* bargaining behaviour, thereby reducing bargaining conflicts and increasing the efficiency of the social interaction[3]. The physiological mechanism driving this is the "social status hypothesis": testosterone promotes status-seeking behaviour, and in a context where fairness yields social prestige, the hormone drives prosociality rather than antisocial aggression[3].

Crucially, Eisenegger et al. (2010) also measured the psychological effect of belief. Subjects who *believed* they had received testosterone—regardless of whether they actually received the hormone or the placebo—behaved much more unfairly than those who believed they had received the placebo[4]. This highlights a vital principle: physiological realities are easily overwritten or confounded by cultural expectations and psychological framing.

Conversely, in different contexts, endogenous testosterone spikes do correlate with physical risk-taking. Ronay and von Hippel (2010) demonstrated this in an experiment with young male skateboarders[6]. The presence of an attractive female observer elevated the men's testosterone levels, which subsequently mediated a significant increase in physical risk-taking, measured by attempts at highly difficult, dangerous tricks[6]. Thus, at the physiological level, the presence of the opposite sex can alter hormonal profiles and immediately shift risk appetites, though the direction of this shift is heavily dependent on the environmental context of status acquisition.

Layer 2: Behaviour (Statistical, Overlapping Distributions)

The behavioural layer deals with observable actions, choices, and preferences. In economics and psychology, gender differences in risk preferences are robustly documented, though they represent statistical averages with heavily overlapping distributions.

Croson and Gneezy (2009, *Journal of Economic Literature*) reviewed the literature on gender differences in economic experiments and concluded that, on average, women are more risk-averse than men[9]. This finding is supported by a foundational meta-analysis by Byrnes, Miller, and Schafer (1999, *Psychological Bulletin*), which aggregated 150 studies and found that men take significantly more risks than women across a variety of domains[11].

However, the effect sizes (measured as Cohen's *d*) vary substantially by domain. For physical skills and intellectual risk-taking, the male bias is moderate to large, whereas in domains like smoking or sexual risk-taking, the gap is small or non-existent[12]. It is a critical analytical requirement to distinguish between population averages and individual traits. Because the distributions of risk preferences for men and women overlap substantially, knowing an individual's sex provides limited predictive power regarding their specific risk tolerance. Consequently, transitioning from single-sex (all-male) to mixed-sex decision bodies changes the *mean* risk profile of the group, but individual selection effects—such as the specific traits required to reach the upper echelons of corporate or political leadership—can easily override

the population-level average.

Layer 3: Culture (Variable)

The cultural layer encompasses the variable norms, socialization practices, and institutional structures that govern human interactions. Culture acts as a gating mechanism, dictating whether physiological and behavioural differences are permitted to influence collective outcomes.

For instance, the impact of female representation on environmental policy is not universal but is highly contingent on national culture. Mavisakalyan and Tarverdi (2019) demonstrated that the positive influence of female parliamentarians on environmental sustainability is bounded by cultural factors[14]. Using the Hofstede cultural dimensions across a panel of 18 countries over 20 years, they found that in societies characterized by high "power distance" (acceptance of hierarchical inequality), high "masculinity" (preference for achievement and heroism over cooperation), and high "uncertainty avoidance," the impact of female leaders is severely constrained[14]. These dimensions, often characterized by male dominance and stereotyping, restrict the effectiveness of women in decision-making roles[14].

Evolutionary Precedents: Decision-Making in Other Species

To understand the baseline dynamics of mixed-sex decision-making, it is highly instructive to examine other social animals, as collective risk and consensus-building are ancient evolutionary challenges.

Conradt and Roper (2003, *Nature*; 2005, *Trends in Ecology & Evolution*) developed foundational models differentiating between "despotic" (unshared) and "democratic" (shared) decision-making in animal groups[15]. They defined "consensus costs" as the fitness costs incurred by animals that must forego their own optimal actions to comply with a group decision[18]. Their mathematical models demonstrated that the costs to subordinate group members, and to the group as a whole, are considerably higher under despotic leadership than under democratic consensus[16]. Democratic decision-making evolved primarily because it leads to less extreme decisions, making it highly adaptive even when groups are heterogeneous in composition (e.g., mixed-sex) and when conflicts of interest regarding the optimal outcome are large[15].

The integration of different informational states is also critical to collective risk management. Couzin et al. (2011, *Science*) explored how animal groups avoid being hijacked by extremist minorities[20]. Using both theoretical models and experiments with golden shiners (a schooling fish), they trained a minority of the fish to prefer a yellow target and a majority to prefer a blue target[22]. When only the two opinionated groups were present, the highly opinionated minority was able to dictate the group's direction[22]. However, when researchers introduced just 5 to 10 uninformed individuals—fish with no prior training or strong preference—the uninformed individuals diluted the minority's influence, spontaneously returning control to the numerical majority[22]. This implies that in mixed-sex or highly diverse decision bodies, the presence of members who are not deeply entrenched in a factional dispute serves as a structural buffer

against extreme risk-taking.

Leadership in mammalian societies also exhibits significant variation in sex composition. Smith et al. (2016, *Trends in Ecology & Evolution*) reviewed leadership across mammalian societies in four domains: movement, food acquisition, conflict mediation, and between-group interactions[25]. While male-biased leadership is common, female-biased leadership dominates in species like killer whales, spotted hyenas, and bonobos[27]. In rock hyraxes, leadership is shared but highly contextual: during moderate risk, younger males with high cortisol and low testosterone lead, whereas during acute predation, lower-status males lead; meanwhile, leadership among females is distributed equally[27]. These evolutionary data confirm that mixed-sex decision-making and flexible, context-dependent leadership structures are adaptive responses to varying environmental risks.

Study	**Subject / Species**	**Methodology**	**Key Finding on Group Decision-Making**
Conradt & Roper (2003) [cite: 16]	Theoretical Modeling	Game theory and fitness cost models	Democratic (shared) decisions yield lower consensus costs than despotic decisions, preventing extreme risk.
Couzin et al. (2011) [cite: 23]	Golden Shiners (Fish)	Behavioral experiments and spatial models	Adding 5-10 "uninformed" individuals breaks minority extremism and restores majority-driven consensus.
Smith et al. (2016) [cite: 25]	Mammalian Societies	Comparative meta-analysis	Leadership is highly context-dependent; female leadership is prevalent in specific species and scenarios.

Human Institutions and Collective Risk

With the layers of physiology, behaviour, culture, and evolution established, the analysis turns to human institutional structures. How does the sex composition of decision-making bodies impact the management of collective risk in high-stakes human environments?

Legislatures, Environmental Treaties, and Climate Policy

Climate change represents the ultimate collective risk problem, requiring short-term economic sacrifice for long-term global stability. A robust body of literature indicates that mixed-sex legislatures handle this risk differently than male-dominated ones.

Chattopadhyay and Duflo (2004, *Econometrica*) provided some of the most rigorous causal evidence on this topic by exploiting a randomized policy experiment in India. A 1993 constitutional amendment mandated that one-third of village council chief positions be randomly reserved for women[29]. Studying a sample of 265 village councils across West Bengal and Rajasthan, they found a massive causal effect of female leadership on public goods provision[29]. Female leaders invested significantly more in infrastructure directly relevant to the needs of their gender (e.g., drinking water and roads in West Bengal), while male leaders invested more in education[29]. Furthermore, the presence of a female leader increased the civic engagement of female constituents, who were twice as likely to raise concerns in council meetings[29]. This finding has been highly influential and robustly replicated across development economics literature.

Scaling this up to global climate policy, Mavisakalyan and Tarverdi (2019, *European Journal of Political Economy*) investigated the relationship between female political representation and climate change policy across a large cross-country sample[33]. Utilizing instrumental variable (IV) approaches to address endogeneity, they found that higher female representation in national parliaments causally leads to the adoption of more stringent climate change policies and correspondingly lower carbon dioxide emissions[33].

The Controversy and Critics: The claim that women causally improve environmental outcomes is not without detractors. Critics, such as Windsor et al. (2020), argue that country-level cultural values confound the effect of women-led countries having better outcomes[34]. They posit that the same underlying cultural traits (e.g., egalitarianism, low power distance) that allow women to achieve political power are the actual drivers of progressive environmental policies, rendering the gender of the politician a mere proxy for culture[34]. However, Mavisakalyan and Tarverdi's use of IV strategies—and subsequent replications utilizing robust econometric techniques like System-GMM (Generalised Method of Moments)—explicitly attempt to isolate the causal effect from these unobserved cultural confounders[14]. They maintain that a "critical mass" of at least 30% female representation alters the legislative agenda regardless of the baseline culture, significantly reducing fossil fuel subsidies and increasing environmental taxation[35].

Pandemics and Public Health Crises

The COVID-19 pandemic provided a natural experiment in acute collective risk management.

Early media reports suggested that female-led nations managed the crisis better, but academic scrutiny required separating causation from correlation.

Garikipati and Kambhampati (2021, *Feminist Economics*) conducted a systematic analysis of 194 countries using a novel application of nearest-neighbour matching to compare women-led countries with socio-economically and demographically similar male-led countries[34]. They found that women-led countries locked down earlier and suffered significantly fewer COVID-19 cases and roughly half as many deaths during the first wave of the pandemic[36]. A qualitative analysis of leadership communications revealed that female leaders communicated greater urgency, highlighted the crisis more clearly, and focused on empowering citizens with actionable safety measures[36].

The Controversy and Critics: Similar to the environmental policy debate, the primary critique rests on cultural endogeneity. Critics argue that nations willing to elect a female leader inherently possess higher levels of institutional trust and social cohesion, which are the true variables driving public compliance with lockdowns and health mandates[34]. While Garikipati and Kambhampati's matching methodology partially controls for this, the debate underscores the deep methodological difficulty of perfectly disentangling the "female leadership effect" from the "culture that elects women" effect.

Domain	Study	Sample Size	Effect / Implication	Replication / Causal Identification
Public Goods	Chattopadhyay & Duflo (2004)[29]	265 village councils (India)	Female leaders increase investment in water and roads based on constituent needs.	Highly replicated. Randomized controlled trial (constitutional quota).
Climate Policy	Mavisakalyan & Tarverdi (2019)[33]	Cross-country panel	Higher female parliamentary representation causes stricter climate policies and lower CO2.	Replicated via System-GMM. Causality supported by Instrumental Variables.
Pandemic	Garikipati & Kambhampati	194 countries	Female-led nations	Contested. Nearest-neighb

Risk	(2021)[36]		suffered ~50% fewer deaths in the first wave of COVID-19.	or matching used, but cultural confounds remain debated.

Corporate Boards and Financial Risk

The corporate boardroom is perhaps the most heavily scrutinized arena regarding sex composition and risk. The drive toward mixed-sex boards has been accelerated by legislative quotas (e.g., Norway, California) and institutional investor pressure (e.g., the "Big Three" index funds utilizing their voting power to mandate diversity)[41].

The introduction of Norway's 2003 law requiring 40% female board representation provided a massive shock to board composition, allowing researchers to study quasi-random variation. Ahern and Dittmar (2012, *Quarterly Journal of Economics*) utilized the pre-quota cross-sectional variation in female board representation as an instrumental variable[42]. They found that the constraint imposed by the quota caused a massive 12.4% decline in Tobin's Q (a measure of firm market value) and deteriorated operating performance[42]. They attributed this to the sudden influx of younger, less experienced female directors who lacked CEO experience, which subsequently led to increases in leverage and acquisitions—hallmarks of poorer risk management[43].

Matsa and Miller (2013, *American Economic Journal: Applied Economics*) also studied the Norway quota, using a difference-in-differences approach comparing Norwegian firms to other Nordic companies[45]. They found that female-dominated boards undertook fewer workforce reductions, maintained higher employment levels, and thereby increased labor costs and reduced short-term profits[45]. This suggests a "female style" of corporate leadership that prioritizes stakeholder protection (employees) over aggressive short-term shareholder value maximization.

The Controversy and Critics: Ahern and Dittmar's (2012) findings of severe value destruction have been fiercely contested and largely overturned in recent econometric literature. Eckbo, Nygaard, and Thorburn (2022, *Management Science*) revisited the AD2012 data. They pointed out deep methodological flaws in the original event study, specifically the failure to account for the contemporaneous cross-correlation of stock returns during the event windows[46]. Upon correcting these statistical errors, Eckbo et al. found that the valuation effect of the Norway quota law was statistically insignificant[46]. They concluded that the supply of qualified female directors was entirely sufficient to avoid the negative consequences hypothesized by AD2012[46].

Furthermore, broader evidence complicates the notion that women categorically alter corporate risk. Sila, Gonzalez, and Hagendorff (2016, *Journal of Corporate Finance*) analyzed a large sample of US firms and found absolutely *no* evidence that female board representation affects equity risk[48]. Post and Byron (2015, *Academy of Management Journal*) conducted a comprehensive meta-analysis of 140 studies, finding that female board representation is

positively related to accounting returns (especially in countries with strong shareholder protections) but has a near-zero relationship with market performance[50].

The corporate governance literature suggests that the severe endogeneity of board appointments creates an illusion of female-driven risk reduction. Firms with lower baseline risk or better overall governance may proactively appoint more women, resulting in an omitted variable bias where the board's gender composition reflects, rather than causes, the firm's risk profile (a phenomenon extensively documented by Gormley and Matsa in their analyses of corporate risk and agency conflicts)[1].

Central Banks and Macroeconomic Policy

While corporate boards yield mixed results regarding risk reduction, central banking provides a fascinating, counter-intuitive insight into sex composition and risk. Monetary policy requires balancing the risk of inflation against the risk of unemployment.

Farvaque et al. (2011) and Masciandaro, Profeta, and Romelli (2020, *European Journal of Political Economy*) investigated the impact of female representation on the monetary policy committees of major central banks[53]. Conventional political science stereotypes suggest that women are "dovish," prioritizing social welfare and employment over inflation control[55]. However, the empirical evidence demonstrates the exact opposite.

Masciandaro et al. (2020) estimated a forward-looking Taylor rule and found that, for the same level of expected inflation, a higher share of women on a central bank board is associated with a *higher* interest rate[53]. Female central bankers act more "hawkishly," prioritizing strict inflation control over short-term employment maximization[53]. The authors hypothesize several mechanisms for this: a selection effect where only highly conservative women survive the discriminatory screening of the economics profession, or a signalling effect where women feel compelled to prove they are not "soft" on inflation to maintain credibility[53]. This perfectly illustrates how the institutional layer (selection and signalling) can completely invert the baseline behavioural expectation of female risk preferences.

Juries and High-Stakes Legal Decisions

In the judicial system, juries represent a uniquely isolated decision-making body tasked with managing the ultimate risk: convicting the innocent versus acquitting the guilty. The Capital Jury Project (CJP), directed by William J. Bowers, provided exhaustive empirical data on how jury demographic composition affects death penalty decisions, utilizing 1,200 in-depth interviews from 353 capital cases across 14 states[56].

Bowers and colleagues consistently documented a "white male dominance" effect in capital juries[58]. In simulated and actual capital penalty-phase trials, white male jurors were significantly more likely to sentence defendants to death than female and non-white jurors[58]. Psychological and demographic analysis revealed that women on capital juries are systematically more receptive to mitigating evidence (making complex attributions to the systemic or psychological causes of a defendant's behaviour) and less receptive to aggravating evidence compared to men[60]. Consequently, a shift from single-sex (or male-dominated) juries to mixed-sex juries demonstrably lowers the collective threshold for applying the ultimate punitive risk—state execution.

Summary of Robust Findings

1. Biological baselines are highly context-dependent; exogenous testosterone increases fair bargaining (prosociality) to achieve status, though male physical risk-taking increases in the presence of females.
2. While behavioral risk averages differ (women exhibit greater risk aversion in financial and physical domains), distributions overlap heavily, making individual behavior un-predictable from sex alone.
3. Mandated female political leadership causally redirects collective resources toward infrastructure and welfare priorities preferred by women, a finding robustly replicated through randomized trials.
4. A higher proportion of women in parliament causally leads to more stringent climate change treaties and lower CO2 emissions, even when controlling for cultural endogeneity.
5. Female corporate directors do not systematically destroy value; early studies claiming quotas harmed firm value (Ahern & Dittmar 2012) failed to replicate due to statistical flaws in measuring stock return cross-correlation (Eckbo et al. 2022).
6. Meta-analyses of corporate boards indicate that female representation yields zero to slightly positive effects on financial performance and no significant reduction in equity risk.
7. Counter to stereotypes, women on monetary policy committees adopt more conservative, hawkish stances on inflation, demonstrating how institutional selection effects overwrite baseline behavioral averages.
8. The inclusion of women on capital juries reduces the dominance of male voting blocs, increasing receptivity to mitigating evidence and reducing the application of the death penalty.
9. Evolutionary models demonstrate that introducing unopinionated individuals to a polarized group dilutes the power of extremist minorities, enabling majority-driven democratic consensus.
10. Across domains from labor retention to pandemic management, mixed-sex bodies exhibit a structural preference for long-term stakeholder protection over aggressive short-term maximization.

Contested or Open Questions

- **The "Culture vs. Causation" Debate:** Do female leaders inherently manage pandemics and climate policy better, or do the egalitarian, high-trust cultures that elect women independently drive these superior outcomes? (The Windsor critique).
- **The Tokenism Threshold:** At what exact percentage does a minority sex transition from being a marginalized "token" to wielding structural influence over collective risk? Is the critical mass exactly 30%, 40%, or does it demand strict parity?
- **Selection Effects vs. Treatment Effects:** To what extent do the extreme selection pressures of high-level institutions (e.g., central banking, Fortune 500 CEOs) filter out baseline behavioural sex differences, resulting in female leaders who are virtually indistinguishable from their male counterparts in risk tolerance?
- **Long-term Corporate Performance:** While short-term event studies of board quotas are

heavily contested and dependent on methodology, the multi-decade impact of mixed-sex boards on preventing systemic financial crashes remains difficult to isolate empirically.

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Implications for living together

Note: The following observations describe functional outcomes based on empirical data, operating independently of the naturalistic fallacy (the assumption that what is "natural" is inherently "good").

For couples, families, organisations, and societies, the empirical evidence points toward a clear structural advantage in maintaining mixed-sex decision-making bodies when managing collective risk. Because male and female distributions of risk tolerance, communication styles, and resource prioritization differ on average, a single-sex decision body is statistically likely to suffer from an artificially truncated spectrum of options.

In families and small groups, integrated decision-making acts as a hedge against catastrophic tail risks. Because males, statistically, populate the higher extremes of physical and financial risk-taking, integrating female input systematically lowers the probability of ruinous outcomes while preserving the capacity for necessary calculated risks. Conversely, female risk aversion is balanced by male risk-seeking, optimizing the group's ability to capitalize on high-reward opportunities without over-leveraging their safety.

In large organizations and societies, mixed-sex bodies introduce a "democratic buffer." Just as evolutionary models show that diverse and even "uninformed" individuals prevent a group from

being hijacked by an extremist minority, gender diversity fractures homogenous ideological blocs (such as the white male dominance effect seen in capital juries). Furthermore, the data firmly indicate that mixed-sex bodies prioritize long-term stakeholder survival—be it through stricter climate treaties, prioritizing pandemic health over short-term commerce, or reducing corporate workforce layoffs—over short-term, high-variance maximization. Consequently, any institution designed to endure over multi-generational time horizons will functionally benefit from the stabilization provided by a mixed-sex governance structure.

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