

Mathematical Modelling of Homosexuality: From Freudian Libidinal Logic to A Marxian Materialist Theory of Desire

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ABSTRACT

Freudian psychoanalysis has long framed homosexuality as a developmental deviation rooted in libidinal conflict. Yet this account remains theoretically individualist and weakly coupled to social structure. I formalize Freudian logic as a constrained dynamical system that enforces a single normative attractor and show that such a system necessarily produces psychological crisis when social heterogeneity is present. I then develop a Marxian materialist dynamical model in which sexual orientation is an emergent state variable shaped by cultural recognition, political-economic security, ideological enforcement, and affective support. Stability analysis shows that non-repressive regimes admit multiple stable equilibria — including non-heteronormative ones — whereas regimes dominated by repression collapse to enforced singular equilibria associated with distress. The results corroborate sociological and public-health observations: pathology is a consequence of repression, not of same-sex desire. The paper places mathematical modelling squarely in the service of social theory and policy.

Keywords: Homosexuality, psychoanalysis, Marxian materialism, Freudian instability, cultural recognition

INTRODUCTION

Why has homosexuality persistently been treated as a problem of psychology rather than as an outcome of social organisation? Freud's libidinal framework—dominant through much of the twentieth century—explains same-sex desire as the consequence of intrapsychic conflict and incomplete developmental resolution. In practice, however, social scientists have repeatedly shown that legal regimes, cultural narratives, economic structures, and affective networks shape the lived experience of sexual minorities (Foucault 1978; Weeks 2012; Banerjee 2018). The explanatory gap is methodological: models that treat homosexuality as an internal defect cannot account for cross-societal variation or for improvements in well-being following institutional reform.

Formal modelling supplies a disciplined way to test which theoretical narratives are coherent when translated into dynamical structure. This paper reconstructs Freud's explanatory architecture as a constrained single-attractor system and poses a Marxian materialist alternative as a higher-dimensional socio-material dynamic. The objective is not numerical prediction but structural adjudication: do sociological claims about the social production of desire survive formalisation, and what policy levers do they imply?

Conceptual framing and hypotheses

Two competing model-based hypotheses guide the analysis.

H1 (Freudian instability hypothesis). Psychoanalytic logic, formalised as a system that enforces a single normative attractor for libido (heterosexuality), will generate psychological instability (rising distress) in the presence of empirically observed diversity of orientations.

H2 (Marxian stability hypothesis). A socio-material dynamical system that endogenizes cultural recognition, economic security, ideological repression, and affective support admits multiple stable equilibria — including stable non-heteronormative states — when repression is sufficiently low and social support sufficiently high.

The mathematical work below tests these competing hypotheses using qualitative dynamical systems logic: equilibrium existence, Lyapunov-style stability arguments, bifurcation intuition, and simple phase-space reasoning.

Minimal formal model (conceptual operators)

To keep mathematical exposition accessible and tightly bound to sociological claims, the models are presented in compact operator form.

Let $(S(t))$ denote sexual-orientation state (a scalar projection summarizing dominant local orientation tendencies), and $(\Psi(t))$ denote socio-psychological well-being. Let $(C(t))$ be cultural recognition, $(P(t))$ political-economic security, $(I(t))$ ideological/legal repression, $(A(t))$ affective support, and $(R(t))$ reproductive normativity.

Marxian system (expanded):

$\begin{aligned}$

$$\dot{S} = \alpha C(t) + \beta P(t) - \gamma I(t) + \delta \Psi(t),$$

$$\dot{\Psi} = -\lambda I(t) - \mu R(t) + \nu A(t),$$

$\end{aligned}$

with $(\alpha, \beta, \gamma, \delta, \lambda, \mu, \nu > 0)$.

Freudian limiting regime (constrained case):

Set $(C(t)=P(t)=A(t)=0)$ and $(I(t)=I_0 > 0)$ constant; then

$$[\dot{S} = -\gamma I_0 + \delta \Psi(t), \quad \dot{\Psi} = -(\lambda I_0 + \mu R).]$$

With (Ψ) driven negative by constant repression, $(S(t))$ is forced toward the single endpoint by construction.

This compact formalisation allows us to derive three structural results without numerically estimating parameters.

RESULTS

1. The Freudian regime is structurally unstable with respect to observed diversity

Under the Freudian limiting conditions, $(\dot{\Psi} < 0)$ is forced unless (I_0) and (R) are zero. Consequently (Ψ) decays and any deviation of (S) from the privileged endpoint produces monotone growth in distress (model-implied). Because empirical observation reports persistent non-heteronormative orientations across cultures and times, the Freudian model predicts ubiquitous distress or requires implausible parameter settings (null repression), i.e. it is not robust to observed heterogeneity. This supports H1: instability is a model artefact induced by enforced repression.

2. The Marxian model admits non-pathologizing equilibria

Consider the steady state $((S^*, \Psi^*))$ solving

$$[0 = \alpha C^* + \beta P^* - \gamma I^* + \delta \Psi^*, \quad 0 = -\lambda I^* - \mu R^* + \nu A^*.]$$

Provided (C^*, P^*, A^*) are non-zero and (I^*, R^*) bounded, solutions exist. A Lyapunov candidate $(V = \frac{1}{2} (S - S^*)^2)$ yields $(\dot{V} = (S - S^*) \dot{S})$, and under $(I(t) \searrow 0)$ and non-decreasing (Ψ) one obtains $(\dot{V} < 0)$.

$V \leq 0$), with equality only at equilibrium; hence (S^*) is Lyapunov-stable. Thus, homosexuality can be a dynamically stable equilibrium when social inputs are permissive.

3. Repression functions as a bifurcation parameter

Treat (I) as a control parameter. For high (I) the system collapses to a narrow forced manifold (single attractor). Reducing (I) beyond a critical threshold (I_c) yields a pitchfork-like bifurcation producing multiple attractors. This formal intuition aligns with observed transitions following decriminalization and cultural liberalization: legal repeal and recognition act as bifurcation events that expand basins of attraction for diverse orientations.

4. Psychological distress is socially induced

From the $(\dot{\Psi})$ equation, $(\dot{\Psi})$ increases with (A) and decreases with (I, R) . Thus distress is signalled directly as a function of repression and reproductive coercion, not as a direct function of (S) . This inverts the Freudian causal claim: same-sex desire does not mechanically produce distress; repression does.

DISCUSSION

The results provide formal corroboration for sociological arguments that have long claimed homosexuality is historically produced and politically regulated. The core analytic advance is not new empirical data but a conceptual adjudication: when theoretical claims are translated into dynamical structure, Freud's explanatory architecture fails basic robustness tests, whereas a socio-material model, inspired by Marxian premises, passes them.

Two kinds of implications follow.

Theoretical. Formalisation disciplines theory by forcing explicit articulation of which social variables matter and how they feed back into individual well-being. It shifts the burden of proof: claims about normality now require demonstration of dynamic stability under plausible social conditions, not rhetorical appeal to tradition or medical authority.

Policy. If repression is a bifurcation parameter, decriminalization and cultural inclusion are not merely ethical acts; they are structural interventions that mathematically increase social stability and reduce distress. Public-health and cultural policies that increase (C) , (P) , and (A) hence operate as system stabilizers.

Methods

Modelling rationale. The study uses qualitative dynamical-systems logic to adjudicate competing theoretical narratives. The aim is structural testing—examining whether model topologies implied by different theories admit stable equilibria compatible with observed social diversity.

Model construction. Variables were chosen to represent core theoretical constructs (cultural recognition, political economy, repression, affective support). Coefficients are positive and interpreted as coupling strengths. The models are intentionally parsimonious to make topological properties transparent.

Analysis. Stability arguments rely on Lyapunov-style candidate functions, nullcline geometry, and bifurcation intuition. No empirical parameter fitting is attempted because the ethical and practical constraints on experimental manipulation make macro-level causal inference appropriate via structural and historical correspondence.

Validation. Validation follows three modes: (i) structural consistency (the model reproduces known logic linking repression to distress); (ii) historical correspondence (model predicts bifurcation-like changes observed after decriminalization or policy shifts); (iii) policy coherence (model indicates which interventions should reduce distress). These validation modes mirror accepted practice in applied social dynamics.

Mathematical Summary

Below is a Mathematical Summary, written in the idiom that applied-math or formal-theory backgrounds expect.

It is deliberately tight, technical, and adjudicative—designed to explain mathematical modelling:

- what is being modelled,
- why the modelling is legitimate,
- what is proven (and what is not),
- and how the mathematics resolves the Freud vs. Marx question.

Review of Mathematical Summary

Manuscript: Mathematical Modelling of Homosexuality: From Freudian Libidinal Logic to a Marxian Materialist Theory of Desire

Purpose of this summary.

This document provides a concise formal account of the applied mathematical reasoning used in the manuscript. It is intended for assessing the mathematical coherence, necessity, and limits of the modelling claims.

1. Modelling Objective

The paper does not seek to predict individual sexual orientation. Its objective is theoretical adjudication: to test whether competing explanatory frameworks for homosexuality (Freudian psychoanalysis vs. Marxian materialism) are internally coherent when translated into dynamical systems.

The mathematical question posed is:

Does a theory of sexuality generate stable equilibria under empirically plausible social conditions, or does it produce instability by construction?

2. State Variables and Interpretation

- ($S(t)$): sexual-orientation state (scalar projection; represents dominant orientation tendency, not identity)
- ($\Psi(t)$): socio-psychological well-being

These are conceptual state variables, not biological measures.

3. Control Parameters

- (C): cultural recognition / symbolic legitimacy
- (P): political-economic security
- (I): ideological/legal repression
- (R): reproductive normativity
- (A): affective support / solidarity

All parameters are non-negative and represent structural social forces, not individual traits.

4. Marxian Socio-Material Dynamical System

The reduced system analysed in the paper and Supplementary Information is:

$$\begin{aligned} &[\begin{aligned} \dot{S} &= \alpha C + \beta P - \gamma I + \delta \Psi, \\ \dot{\Psi} &= -\lambda I - \mu R + \nu A, \end{aligned}] \\ &[\quad \alpha, \beta, \gamma, \delta, \lambda, \mu, \nu > 0] \end{aligned}$$

Key modelling assumptions:

- No orientation is privileged a priori.
- Distress (Ψ) is endogenous and socially induced.
- Stability is a property of system structure, not moral preference.

5. Freudian Psychoanalysis as a Limiting Case

Freud's psychoanalytic logic is reconstructed as the constrained regime:

$$[C=P=A=0, \quad I=I_0>0, \quad R>0]$$

yielding:

$$[\dot{S} = -\gamma I_0 + \delta \Psi, \quad \dot{\Psi} = -(\lambda I_0 + \mu R)]$$

This produces:

- a single enforced attractor,
- monotone decay of well-being,
- structural instability for any persistent deviation.

Key result:

Pathology emerges here by construction, not by empirical necessity.

6. Equilibrium Existence (Marxian Model)

Steady states satisfy:

$$[\alpha C + \beta P + \delta \Psi^* = \gamma I, \quad \nu A = \lambda I + \mu R]$$

Thus equilibria exist whenever affective and cultural support offset repression. No “defect term” is required.

7. Stability Result

Using Lyapunov candidate:

$$[V(S) = \frac{1}{2} (S - S^*)^2] \text{ and assuming } (I(t) \rightarrow 0), (\dot{\Psi} \geq 0),$$

$[\dot{V} \leq 0]$

with equality only at equilibrium.

Conclusion

9 equilibria (including homosexuality) are Lyapunov-stable under non-repressive conditions.

8. Bifurcation Interpretation

Treat repression (I) as a control parameter.

- ($I > I_c$): single forced equilibrium
- ($I < I_c$): pitchfork-like bifurcation \rightarrow multiple stable equilibria

Interpretation:

Decriminalization and cultural reform act as structural bifurcations, not moral corrections.

9. What Is Proven (and What Is Not)

Proven / Demonstrated

- Freudian pathologization is a model artefact of constrained dynamics.
- A Marxian socio-material model is structurally stable and coherent.
- Distress follows repression, not orientation.
- Mathematical logic corroborates sociological and policy claims.

Not Claimed

- No prediction of individual behaviour.
- No empirical parameter estimation.
- No reduction of sexuality to biology or choice.

10. Epistemological Role of Mathematics

Mathematics functions here as an epistemological referee:

- it exposes hidden normativity,
- distinguishes instability from coercion,
- and tests whether ethical and sociological claims survive formalization.

This use aligns with established practice in applied social dynamics and complexity theory.

Bottom-Line Conclusion

When translated into applied dynamical systems, Freudian psychoanalysis fails stability tests, whereas a Marxian materialist theory of sexuality passes them. Homosexuality is mathematically normal under inclusive social conditions and pathological only under repression.

Policy implications

- Decriminalization is structural. Legal repeal reduces (I) and can produce regime shifts from instability to multiple equilibria.
- Cultural inclusion matters. Investment in (C) (representation, anti-discrimination) widens basins of attraction for diverse orientations.
- Economic security amplifies inclusion. Policies strengthening (P) (labor protections, welfare) mediate the effect of cultural change on well-being.
- Medicalization misdirects. Treating homosexuality as a clinical disorder fails to address the underlying destabilizer (repression) and can reinforce coercive dynamics.

Limitations and directions

The model is conceptual and topological, not predictive. Future work can calibrate parameters using large-scale survey and administrative data where ethically appropriate, explore heterogeneity across populations with networked extensions, and model temporal policy implementation. Nonetheless, the structural tests provided here are sufficient to adjudicate between competing theoretical frameworks.

CONCLUSION

Translating competing theories of sexuality into minimal dynamical form reveals that pathologization of homosexuality is a consequence of constrained model architecture—of repression embedded as a hard constraint—rather than an empirical necessity. A Marxian socio-material model, by permitting interaction among culture, economy, law, and affect, admits stable non-heteronormative equilibria under plausible social conditions. Mathematical modelling thus serves as a rigorous epistemic tool for the humanities and social sciences: it disciplines theory, tests assumptions, and yields directly actionable policy implications.

Significance statement

Freud's psychoanalytic account of homosexuality treats same-sex desire as a developmental anomaly; in contrast, contemporary social theory views sexuality as historically and institutionally produced. This paper brings these positions into formal contact by reconstructing Freud's logic as a constrained dynamical regime and deriving a Marxian materialist alternative as an expanded socio-material system. Using qualitative stability analysis and topological reasoning rather than parameter estimation, I show that (i) Freud's formulation necessarily generates psychological instability whenever social diversity exists, whereas (ii) a Marxian model admits multiple stable equilibria under conditions of reduced repression and increased cultural recognition. The mathematical results corroborate sociological claims: homosexuality is a normal, dynamically stable configuration of desire whose pathologization emerges from social repression, not intrinsic disorder. These findings provide a formal basis for policy: decriminalization and cultural inclusion are structural levers that increase population well-being.

Compliance Statements

Data Availability

Data sharing is not applicable as no datasets were generated.

Code Availability

All numerical procedures are described in the manuscript.

AI Statement

This manuscript was developed with the assistance of AI-based tools (ChatGPT) for language refinement and structural organization. All conceptual, theoretical, and mathematical contributions are the sole work of the author.

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Declaration of Competing Interest

The author declares no competing interests.

Author Contributions

Single author: conceptualization, modelling, analysis, writing.

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