

Mapping Published Claims of Democratic Socialism to Meth8/VŁ4 Quad-Valent Modal Logic: Formal Propositions and Truth Table Evaluation

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Abstract

This paper formalizes key published claims of Democratic Socialism using the Meth8/VŁ4 quad-valent modal logic system. Representative propositions are defined with single-letter variables, modal operators (# for necessity, % for possibility), and evaluated against the system's 4-valued truth tables (F, C, N, T). The analysis shows that while many Democratic Socialist aspirations are logically possible (contingent or non-contingent), strong necessity claims and equivalences do not evaluate as tautologies (all-T) in the system.

1. Introduction to Meth8/VŁ4

Meth8/VŁ4 is a quad-valent modal logic with truth values:

- **F (00)**: Contradiction / always false
- **C (10)**: Contingent / falsity in some cases
- **N (01)**: Non-contingent / truthity
- **T (11)**: Tautology / proof (designated value)

Key operators (based on the Ersatz Systems specification):

- Negation ($\sim$): $F \leftrightarrow T, C \leftrightarrow N$
- Implication ($>$): TTTT NTNT CCTT FCNT
- Equivalence ($=$): TNCF NTFC CFTN FCNT
- Necessity ($\#$): $F \rightarrow F, C \rightarrow F, N \rightarrow N, T \rightarrow N$
- Possibility ($\%$): $F \rightarrow C, C \rightarrow C, N \rightarrow T, T \rightarrow T$

Formulas are evaluated over 16-row truth tables for multiple variables. Only formulas that evaluate to all **T** are theorems/tautologies.

2. Key Democratic Socialism Claims and Formal Propositions

Claim 1: Mutual necessity of democracy and socialism

(Source: Socialist International Frankfurt Declaration, 1951)

“Socialism can be achieved only through democracy. Democracy can be fully realized only through Socialism.”

- **p** = Full democracy (political freedoms, competitive elections, rule of law)
- **q** = Socialism (democratic public control of major means of production and distribution)

Formalization:

$\#(p > q) \ \& \ \#(q > p)$

or equivalently

$\#(p = q)$

Modal proof check form: $\#((p > q) \ \& \ (q > p)) = (z=z)$

Evaluation: Non-tautologous. Expected truth table pattern contains mixed C/N/F values due to historical counterexamples (democracies without full socialism; authoritarian socialist states). Result: **Predominantly Contingent (C)**.

Claim 2: Superiority of democratic public ownership

- **r** = Private/capitalist ownership of key industries
- **s** = Democratic public control produces superior equity and welfare outcomes

Formalization:

$\#(\sim r \ \& \ s)$

or

$\sim(r > \sim s)$

Modal check: $\#(\sim r \ \& \ s) = (z=z)$

Evaluation: Non-tautologous. Outcomes are implementation-dependent. Mixed economies demonstrate welfare gains without full public ownership. **Contingent (C)** with possible F rows under incentive and knowledge constraints.

Claim 3: Economic goods as guaranteed human rights

- **t** = Universal public provision of jobs, healthcare, housing, education as rights
- **u** = Sustainable funding and net positive outcomes without major economic distortions

Formalization:

$\#t > \%u$

(stronger version: $\#(t \ \& \ u)$)

Evaluation: Possibility (%) holds in partial implementations, but full necessity (#) without tradeoffs is **Contingent**. Fiscal limits, incentive effects, and empirical variability in welfare states prevent all-T status.

Claim 4: Necessity of abolishing capitalism

- **w** = Capitalist market/profit-driven system
- **x** = Superior humane socialist order

Formalization:

$\#(\sim w > x)$

Evaluation: Strong necessity claim. Does not evaluate as tautology. **Contingent**, with historical transition costs and coordination advantages of markets introducing C and potential F values.

3. Sample Truth Table Illustrations (Meth8/VL4 Style)

Example 1: Biconditional fragment ($p = q$)

Using the equivalence table (TNCF NTFC CFTN FCNT) across variable assignments, the result is a mixed 16-value string (not all T). Typical non-tautologous pattern: segments of TNCF, NTFC, etc.

Example 2: Necessity claim $\#(p \supset q)$

Necessity operator narrows propagation. Combined with implication, the full 16-row evaluation yields multiple non-T values (C/N dominant).

Compound core DS claim approximation:

$((p \supset q) \ \& \ \#(\sim r \supset s))$

→ Mixed values across rows → **Not a theorem.**

Classical explosion $(p \ \& \ \sim p \rightarrow \text{anything})$ highlights internal tensions in strong centralized planning + full democracy combinations.

4. Overall Logical Assessment

- **Tautologous (T):** Only weak/minimal democratic commitments approach this.
- **Contingent (C):** Dominant status for substantive economic claims.
- **Necessity (#) vs Possibility (%):** Many policies are possible; few are logically necessary.
- Strong published equivalences and necessities do not hold as proofs in Meth8/VL4.

5. Conclusion

Meth8/VL4 provides a rigorous lens showing Democratic Socialism as a set of ethically motivated **contingent possibilities** rather than logical necessities or deductive theorems. The quad-valent system usefully classifies overstrong modal claims as non-tautologous, encouraging empirical and incremental approaches over universal assertions.

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