Stratification Foundations: Stratified General Equilibrium and Welfare (DRAFT)

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Abstract

This paper develops a formal framework for stratification economics that centers the role of identity and hierarchy in shaping economic outcomes. Rather than treating inequality as the result of random shocks or individual choices alone, the framework embeds group-conditioned endowments, identity-augmented preferences, stratified risks, and institutionally biased interactions directly into utility and game-theoretic structures. These features generate persistent inequality as the equilibrium outcome of stratified systems, not as an anomaly to be explained away. The framework also provides a compact parametric representation of the core stratification levers—choice breadth, information quality, constraint tightness, risk exposure, and payoff multipliers—that can be mapped into estimation-ready equations. This bridge connects theory to standard empirical methods (DiD, IV, QTE, field experiments), enabling systematic tests of stratification mechanisms and evaluation of equity-enhancing policies.

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This work also draws on foundational contributions in economics and related fields that inform the study of group-based inequality, including Kenneth J. Arrow, Gary S. Becker, Marianne Bertrand, Eduardo Bonilla-Silva, Michel Foucault, Glenn C. Loury, Karl Marx, Devah Pager, Barbara Reskin, Donald Tomaskovic-Devey, and Max Weber, among others. While these contributions are not always situated within the stratification economics tradition, they provide important conceptual and empirical foundations that this framework engages with, builds on, and in some cases challenges.

A full bibliography will be developed in future drafts.

The author used generative AI as an aid for editing, refinement, and consistency checking. All ideas originate with the author, and any AI-suggested text was carefully reviewed for accuracy and alignment with the author's voice and original text. Final content decisions and any errors remain the sole responsibility of the author.

1 Stratified General Equilibrium and Welfare

Building on the Stratified Nash Equilibrium (Note 5), this note aggregates individual and institutional behavior into an economy-wide framework. I define the Stratified General Equilibrium (SGE) and characterize how identity-conditioned endowments, utilities, institutional objectives, and perceptions jointly determine aggregate allocations and outcome distributions. This note also introduces welfare concepts appropriate for stratified environments, emphasizing opportunity sets and group-conditioned outcomes rather than a single aggregate welfare metric.

Stratified General Equilibrium (SGE)

Setup. Let $\mathcal{I}$ denote the set of individuals and $\mathcal{K}$ the set of institutions. Each individual i draws endowments $\omega_i \sim D_{g_i}(\Omega_{g_i}, \Sigma_{g_i})$ and chooses x_i^* solving the stratified UMP (Note 2). Each institution k chooses x_k^* solving the stratified PMP (Note 3), acting on perceived identities and abilities (Note 4).

Allocation. An allocation consists of:

$$\{x_i^*\}_{i\in\mathcal{I}}, \quad \{x_k^*\}_{k\in\mathcal{K}}, \quad \{Y_i\}_{i\in\mathcal{I}},$$

where realized outcomes Y_i are drawn from identity-conditioned payoff schedules:

$$Y_i \sim \tilde{y}_i(x_i^*, x_k^*; \Upsilon, \Pi_{g_i}).$$

Equilibrium Conditions. A **Stratified General Equilibrium (SGE)** is an allocation such that:

1. **Individual optimality:** Each x_i^* solves the stratified UMP given ω_i, beliefs, and institutional responses.
2. **Institutional optimality:** Each x_k^* solves the stratified PMP given perceived identities $\hat{g}_i$, perceived abilities $\hat{a}_i$, and Υ.
3. **Consistency of beliefs and signals:** Perceptions $(\hat{g}_i, \hat{a}_i)$ are formed from signals m_i via $\sigma_g(m_i; \Upsilon)$.
4. **Feasibility:** Allocations satisfy technological and resource constraints implied by Λ_i and Λ_k. Prices and market-clearing conditions may be incorporated through Λ_i and Λ_k, but are not required for defining the stratified equilibrium concept.
5. **Distributional consistency:** Outcomes $\{Y_i\}$ are consistent with identity-conditioned outcome distributions in expectation (D_g, Π_g).

Intuition: The SGE is the economy-wide result of the preceding notes. Individuals and institutions best respond within stratified environments, and the resulting allocation reproduces identity-conditioned outcome distributions. Inequality is not imposed externally but arises as the equilibrium distribution of outcomes.

Welfare in Stratified Environments

Aggregate Welfare (Interpretation, Not Identification). Any aggregate welfare function requires interpersonal (and intergroup) utility comparability, which is not identified within this framework. Accordingly, we do not rely on a unique social welfare function.

Instead, we evaluate welfare through comparative and distributional criteria, focusing on how changes in stratification parameters $(\kappa, \iota, \lambda, \rho, \pi)$ affect:

- Group-conditioned expected utility W_g,
- Opportunity-set welfare $\mathcal{W}_g$,
- And the distribution of outcomes across identities.

Group-Conditioned Welfare. Because individuals care about group identity welfare and status (Note 2), welfare must be evaluated at both the individual and group levels. Say group welfare can be defined as:

$$W_g \;=\; \mathbb{E}[U_i(x_i^*) \mid g_i = g]\,.$$

Group welfare is not imposed externally; it reflects identity-dependent preferences already embedded in the utility function consistent with Note 2.

Opportunity-Set Welfare. Because outcomes are generated from identity-conditioned feasible sets, an alternative welfare metric evaluates opportunity sets directly (i.e., the maximal attainable utility given feasible opportunities):

$$\mathcal{W}_g \;=\; \mathbb{E}\left[\sup_{x \in K(\kappa_i)} U_i(x) \mid g_i = g\right].$$

Interpretation: $\mathcal{W}_g$ captures the value of opportunities available to identity g, separating constraints from realized choices.
Key implication: Welfare comparisons across identities can be conducted without interpersonal utility comparability by comparing opportunity sets ($\mathcal{W}_g$) and outcome distributions, rather than relying on a single aggregate welfare index.

Efficiency and Inequality

Conditional Efficiency. The SGE may be efficient conditional on identity-conditioned endowments Ω_g. That is, given Ω_g, no reallocation of x_i and x_k improves all individuals' utilities.

Unconditional Inefficiency. However, if $\Omega_g \neq \Omega_{g'}$, then the equilibrium may be welfare-dominated by a counterfactual allocation that relaxes identity-conditioned constraints. There may exist feasible reallocations that increase at least one group's welfare without reducing another's under non-rival or slack-capacity conditions, where the counterfactual equalizes or relaxes identity-conditioned constraints.

Interpretation.

- Inequality is not a deviation from equilibrium, but a feature of equilibrium under stratified endowments.
- Efficiency results depend on the distribution of endowments, not just optimization behavior.
- Policies that shift Ω_g (Note 1) can increase both equity and aggregate welfare.

Illustrative Example: Efficiency Conditional on Stratification

This example clarifies the distinction between efficiency conditional on a stratified opportunity structure and welfare-relevant improvements that change the opportunity structure itself. Consider a two-person economy, one from a dominant identity d and one from a subaltern identity s. Both have identical preferences and technology:

$$U_i(x_i) = x_i, \qquad y_i = x_i, \qquad i \in \{d, s\}.$$

Individualist benchmark. In the individualist benchmark, both individuals draw from the same feasible set:

$$K_d^{\text{pop}} = K_s^{\text{pop}} = [0, 1].$$

Each solves

$$\max_{x_i \in [0,1]} x_i,$$

so the equilibrium allocation is

$$x_d^* = x_s^* = 1, \qquad y_d = y_s = 1.$$

With common feasible sets and identical preferences, inequality does not arise from the model primitives. Any observed inequality is typically attributed to differences in ability, effort, preferences, or shocks outside the model.

Structuralist benchmark. In the structuralist framework, the power structure Υ assigns identity-conditioned feasible sets as implied by Ω_g and institutional rules governed by Υ:

$$K_d = [0, 1], \qquad K_s = [0, \bar{x}], \qquad 0 < \bar{x} < 1.$$

Both individuals solve the same optimization problem, but over different feasible sets:

$$x_d^* \in \arg\max_{x_d \in [0,1]} x_d, \qquad x_s^* \in \arg\max_{x_s \in [0,\bar{x}]} x_s.$$

Thus,

$$x_d^* = 1, \qquad x_s^* = \bar{x},$$

and realized outcomes are

$$y_d = 1, \qquad y_s = \bar{x}.$$

Conditional efficiency. Given the stratified feasible sets (K_d, K_s), the allocation is efficient in the narrow sense that neither individual can improve within their assigned feasible set. The subaltern individual cannot choose $x_s > \bar{x}$ because those choices are not feasible under Υ. Thus, the allocation is efficient *conditional on stratification*, even though it is unequal.

Opportunity expansion. Now consider a structural reform that expands the subaltern feasible set:

$$K_s' = [0, \bar{x}'], \qquad \bar{x} < \bar{x}' \leq 1.$$

The subaltern individual now chooses

$$x_s'^* = \bar{x}',$$

so

$$y_s' = \bar{x}' > \bar{x} = y_s.$$

If expanding K_s does not reduce the dominant individual's feasible set or payoff, so that

$$K_d' = K_d \qquad \text{and} \qquad y_d' = y_d,$$

then the reform is a Pareto improvement:

$$y_s' > y_s \qquad \text{and} \qquad y_d' = y_d.$$

This requires a non-rival, slack-capacity, or free-disposal opportunity expansion.

Rival opportunities. If instead the opportunity expansion is resource-constrained, then expanding K_s may reduce the dominant individual's feasible set or payoff:

$$K_d' \subseteq K_d \qquad \text{or} \qquad y_d' < y_d.$$

In this case, the reform is not necessarily Pareto-improving. It may still be equity-enhancing, gap-reducing, or justified under a normative welfare criterion, but that conclusion requires an explicit distributional judgment rather than a Pareto criterion alone.

Interpretation. The example shows that the structuralist framework changes the interpretation of efficiency. Under the individualist benchmark, common feasible sets imply that unequal outcomes must arise from differences in preferences, ability, effort, or shocks. Under the structuralist framework, unequal outcomes can arise even with identical preferences and technology because feasible sets are identity-conditioned. The key implication is not that every equity-enhancing reform is automatically Pareto-improving, but that apparent efficiency is conditional on the stratified opportunity structure. Structural reforms that relax subaltern constraints reveal that what appears efficient within a given allocation may be inefficient relative to a less stratified feasible set.

Benchmark General Equilibrium (Individualist View)

In the individualist benchmark:

- All individuals draw from a common endowment pool Ω^{pop},
- Utilities depend only on private payoffs and risk,
- Institutions maximize identity-neutral payoffs,
- Welfare is often represented by a utilitarian social welfare function $W = \sum_i U_i$, which assumes interpersonal utility comparability.

Under these assumptions, equilibrium allocations are efficient, and persistent group inequality cannot arise systematically except through differences in ability or preferences.

Table 1: Comparing Perspectives on General Equilibrium and Welfare: Individualist vs. Structuralist

Dimension	**Individualist Perspective**	**Structuralist Perspective**
Equilibrium Concept	General equilibrium with identity-neutral agents and institutions.	Stratified General Equilibrium (SGE) with identity-conditioned endowments, utilities, and institutional responses.
Endowments/Inputs	All individuals draw from a common pool Ω^{pop}.	Endowments are identity-conditioned: $\omega_i \sim D_g(\Omega_g)$ with systematic differences across groups.
Institutional Role	Institutions are neutral allocators of resources.	Institutions embed hierarchy via stratified payoffs, risks, and penalties, shaping equilibrium allocations.
Outcome Determination	Outcomes reflect preferences, technology, and random shocks.	Outcomes reflect stratified opportunity sets, identity-conditioned payoffs, and institutional responses.
Welfare Definition	Welfare is often represented by a utilitarian social welfare function $W = \sum_i U_i$, which assumes interpersonal comparability.	Welfare is evaluated via group-conditioned outcomes W_g and opportunity sets $\mathcal{W}_g$, without requiring a unique aggregate welfare function.
Efficiency	Equilibrium is Pareto efficient under standard assumptions.	Equilibrium is efficient conditional on Ω_g, but may be welfare-dominated by a counterfactual allocation that relaxes identity-conditioned constraints.
Source of Inequality	Inequality arises from ability, preferences, or shocks.	Inequality arises endogenously from stratified endowments and institutional structure.
Policy Implications	Redistribution is often framed as trading off efficiency and equity.	Structural reforms that shift Ω_g may improve equity and, under non-rival or slack-capacity conditions, can also generate Pareto improvements; when opportunities are rival, evaluation requires explicit distributional criteria.

Compact Intuition: Stratified General Equilibrium and Welfare

Setup/Inputs: Individuals and institutions enter the economy with identity-conditioned endowments, utilities, and perceptions shaped by Υ.

Choices/Interactions: Individuals and institutions best respond as in the SNE, but now across the entire economy, generating aggregate allocations and outcome distributions.

Outcomes/Solution: The SGE produces persistent inequality as the equilibrium distribution of outcomes. Welfare must be evaluated relative to identity-conditioned opportunity sets, not just realized outcomes. Efficiency holds only conditional on stratified endowments. Reducing stratification can generate Pareto improvements under non-rival or slack-capacity conditions, while rival-resource settings require explicit distributional evaluation.

Bringing It Together

The SGE extends the SNE to the economy-wide level and provides a welfare framework consistent with stratification economics. While agents optimize given their environments, those environments are identity-conditioned, so equilibrium allocations reproduce inequality. Welfare analysis must therefore account for both realized outcomes and the opportunity sets that generate them. This perspective clarifies why policies that alter stratification parameters $(\kappa, \iota, \lambda, \rho, \pi)$ may improve equity and, under non-rival or slack-capacity conditions, can also improve efficiency; when opportunities are rival, evaluation requires explicit distributional criteria.