Monopsony Market Concentration and the Value of a Statistical Life in the Meat Production Industry

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ABSTRACT
The meatpacking industry is composed of over 500,000 workers in the United States as of 2021, according to the USDA. The majority of these workers are immigrants, refugees, and other vulnerable populations. Despite this large workforce, there are only four major companies that control over 85% of the U.S. meat production market: JBS, Cargill, Tyson Foods, and National Beef Packing Company. This concentration creates monopsonistic conditions in the labor market. As workers often have fewer employment opportunities, this limits workers' outside work options and suppresses wage bargaining. Standard compensating differentials models typically assume that wages reflect occupational risk through the Value of Statistical Life (VSL). However, constraints faced by workers in a monopsony market, combined with structural constraints, such as immigration status, geographic immobility, and limited credential transferability, wage-risk adjustments fail to occur. In this paper, we examine whether concentrated labor markets in meatpacking lead to disproportionate workplace injury exposure without commensurate wage compensation, thereby misrepresenting the VSL model and raising significant health equity concerns.

KEYWORDS
meat production industry; VSL; wage-risk; constraints; compensating differentials; distortion; monopsony; labor markets; labor economics; health economics

1. INTRODUCTION
In labor economics, a foundational principle is that workers in dangerous occupations must be compensated. When a job has high risks of injury or death, competitive labor markets are expected to produce a wage premium that is correlated with the risks borne. In other words, a compensating differential is a worker's marginal willingness to accept that risk. This premium is the empirical basis for the Value of Statistical Life model (VSL). The model serves as the primary metric used by regulatory agencies to evaluate the benefits of occupational safety interventions (Viscusi and Aldy, 2003). In competitive labor markets, workers can credibly threaten to leave dangerous jobs for safer alternatives. Workers' bargaining power is significant because it incentivizes employers to offer higher wages to compensate for the occupational risks.

This assumption, however, only applies to certain levels of labor market competitiveness. When the market is dominated by a single employer or a small group of employers, workers lose bargaining power to substantiate their compensation differentials. The result is a systematic wedge between the risk workers bear and the wages they receive. If unaccounted for, this wedge could cause VSL estimates derived from observed wages to understate workers' true valuation of safety.

The meatpacking industry presents these conditions from a monopsonistic perspective. The industry is composed of over 500,000 workers in the United States as of 2021, according to the USDA. The majority of these workers are immigrants, refugees, and other vulnerable populations (USDA, 2021). Despite this large workforce, there are only four major firms—JBS, Cargill, Tyson Foods, and National Beef Packing Company—that collectively control over 85% of the U.S. meat production industry (whitehouse.gov).

This substantial industry concentration creates a monopsonistic labor market feature. Workers have fewer employment opportunities and alternatives, limiting career mobility (Johnson et al., 2023), reducing bargaining power (Alderman & Blair, 2024), and suppressing wage negotiation (Hermansen et al, 2025). Standard compensating differentials models typically assume that wages reflect occupational risk through the Value of Statistical Life (VSL). However, within workers' limitations in a monopsony market, combined with structural constraints, such as immigration status, geographic immobility, and limited credential transferability, wage-risk adjustments fail to occur. In this paper, we examine whether concentrated labor markets in meatpacking lead to disproportionate workplace injury exposure without commensurate wage compensation, thereby misrepresenting the VSL model and raising significant health equity concerns.

2. THEORETICAL FRAMEWORK: INTRODUCING THE VALUE OF STATISTICAL LIFE FRAMEWORK

In labor economics, the willingness-to-pay metric for reducing mortality risk is known as the Value of Statistical Life (VSL) Model. Its application includes cost–benefit analysis of safety improvements, and, in our focus, a determinant of compensatory wages for hazardous jobs (Colmer, 2020).

The VSL model includes three major components: (1) using Wages to Value Life, (2) Contingent Valuation, and (3) Compensation Differentials (Gruber, 2022, p. 204-205**)**. There are problems with each of these factors. Using Wages to Value Life, in particular, comprises various defective components, one of which is the omission of leisure time as a determinant of quality of life. The omission of leisure time significantly impacts the contribution of the value of life (Gruber, 2022, p. 204). Regarding Contingent Valuation, this involves directly asking individuals to evaluate the value of their current safety, such that it asks how much individuals would pay to be safe. However, in this case, individuals are not always aware of the trade-offs between safety and money (Gruber, 2022, p. 205). Another component, Compensating Differential, is a consideration of the additional (or reduction) in wage for workers to compensate them for the negative (or positive) amenities of a job, such as increased risk of mortality (Gruber, 2022 p. 205). While all three components inform VSL estimation, this analysis centers on Compensating Differentials, as it is the mechanism most directly distorted under monopsonistic labor market conditions.

Current empirical work estimates this relationship through the wage–risk equation, which models how wages change as workplace risk increases.

The standard wage-risk tradeoff is expressed as:

$$w = w_0 + \beta r$$

Where w represents the wage, w_0 is the baseline wage for a risk-free job, r represents the risk of injury or death, and β represents the compensating wage differentials, how much additional wage workers require to accept higher mortality risk.

However, in practice, wages are influenced by many factors beyond job risk, including education, experience, occupation, and working conditions. To isolate the effect of risk on wages, Viscusi and Aldy (2003) estimate hedonic wage regressions that control for these additional variables.

We can represent the Actual Empirical Wage Equation:

$$w_i = \alpha + \beta_1 H_i + \beta_2 \chi_i + \gamma_1 p_i + \gamma_2 q_i + \gamma_3 WC_i + \varepsilon_i$$

Where w_i represents the wage of the worker i, α is a constant term, H_i represents the vector of personal characteristics (education, age, experience, etc.), χ_i is the vector of job characteristics (industry, occupation, union status), p_i is the fatality risk of the job, q_i is the nonfatal injury risk, WC_i is the workers' compensation benefits, and ε_i is the error term. The terms α, β_1, β_2, β_3, γ_1, γ_2, and γ_3 represent parameters estimated through regression analysis. The β_1 variable is of primary interest, as it captures the wage premium associated with marginal increases in fatality risk and serves as the basis for VSL estimation.

The VSL Model is directly derived from the wage-risk equation from hedonic wage regressions. If a worker accepts an additional wage, β , for bearing a mortality risk Δr, then the Value of Statistical Life is formally expressed as:

$$VSL = \frac{\beta}{\Delta r}$$

Importantly, this measure does not assign a value to any individual life. Instead, it represents the aggregate willingness of workers to accept small increases in mortality risk in exchange for higher wages.

Under the assumption of perfect competition, workers' marginal willingness to accept incremental risk would be fully reflected in the compensating wage differentials. In this case, the coefficient β, which represents the additional wage for additional mortality risk, would accurately reflect workers' true valuation of risk.

However, the representation of the coefficient β does not hold in markets characterized by monopsony. The high concentration of industry reduces workers' power to bargain for wages to reflect their incremental risk, and workers have limited job mobility (Zhou, 2024; Azar and Marinescu, 2024). In such markets, firms can consider workers' constraints in setting wages below the competitive level. As a result, the observed compensating differential may be smaller than workers' true willingness to accept risk:

$$\beta_{observed} < \beta_{true}$$

Therefore, wages fail to reflect the risks workers bear. Consequently, compensating differentials in the Value of Statistical Life (VSL) may underestimate workers' true valuation of mortality risk.

3. OCCUPATIONAL RISKS COMPARISON

This section does not argue that meatpacking is categorically more dangerous than nursing. Instead, it establishes that both industries impose substantial, multi-dimensional occupational risks on workers—physical, biological, mental, and social—and that the observed $53,330 annual wage gap between them cannot be explained by risk differentials alone. This discrepancy motivates the institutional analysis that follows.

3.1 Motivation for Comparison

In the section above, we discussed the compensating differentials of (incremental) mortality risks in workers' compensation. In competitive labor markets, higher occupational risks would correspond with a higher wage premium to sufficiently offset the mortality risk. In other words, the more dangerous the jobs, the higher the earnings. The section tests the prediction through a direct empirical comparison by placing two high-risk occupations: animal slaughtering and processing (meat production industry), and nursing and residential care (nursing industry). We will further examine the observed wage outcomes and occupational risks.

Both industries are exposed to biological agents, rates of physical injuries, and working conditions that impose chronic physiological strain on employees. In standard measures, these two industries are considered to be high-risk industries.

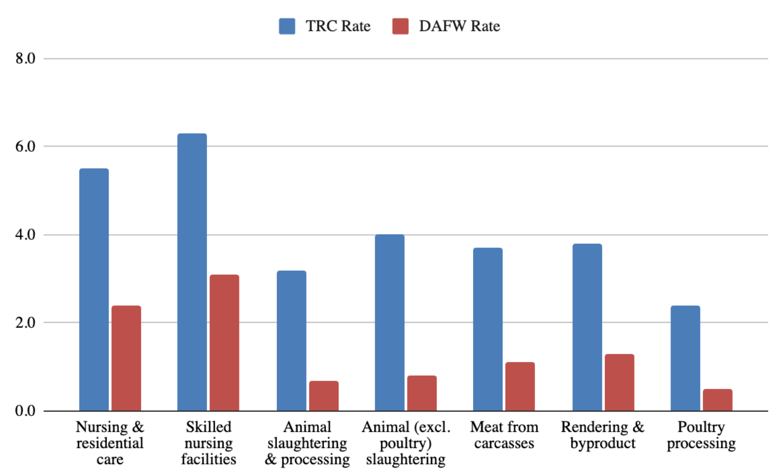
Given these high-risk measures, a comparison between these two occupations is appropriate. According to the Bureau of Labor Statistics, as of May 2022, the mean annual wage of registered nurses is $\$89,010$, while that of meat production workers is $\$35,680$, a gap of approximately 2.50 times. If risk alone determined wages, this gap should track the risk differential closely. The discrepancy between the risk profiles and the wage outcomes of these two occupations exposes the limits of a purely market-driven compensating differentials account. Instead, this discrepancy points toward the role of labor market institutions, such as licensing gaps, employer concentration, search frictions, and barriers to occupational entry. Together, these factors are determinants of compensation for bearing risk, and by how much.

3.2 Occupational Risk Profile Comparison

Data from the Bureau of Labor Statistics and the Occupational Injury and Illness Survey are collected to compare the physical occupational risks across industries.

Table 1: BLS Occupational Injury and Illness Rates (per 100 full-time workers)

Industry	NAICS	Total Recordable Cases	Cases with Days Away, Restriction, or Transfer	Days Away from Work	Job Transfer or Restriction
Nursing & residential care	623	5.5	3.6	2.4	1.2
Skilled nursing facilities	6231	6.3	4.5	3.1	1.4
Animal slaughtering & processing	3116	3.2	2.2	0.7	1.4
Animal (except poultry) slaughtering	311611	4	2.8	0.8	2
Meat processed from carcasses	311612	3.7	2.7	1.1	1.6
Rendering & byproduct processing	311613	3.8	2.5	1.3	1.2
Poultry processing	311615	2.4	1.4	0.5	0.9



Source: BLS Occupational Injury and Illness Survey. Rates per 100 full-time workers. Industry-level figures (NAICS 623, 3116) are employment-weighted aggregates; subsectors are shown for within-industry variation.

The data show that skilled nursing facilities, NAICS 6231, have a Total Recordable Cases (TRC) rate of 6.3, which exceeds the rate for animal slaughtering, NAICS 311611, at 4.0. The TRC data complicate our paper's central claim of the meat production industry's higher occupational risks. Moreover, on the injury frequency metric alone, nursing suggests more dangerous occupation. However, this finding suggests a more careful interpretation rather than the reported data due to the underestimated TRC rates in the meat production industry.

One explanation is employer pressure on workers regarding days away from work (Berkowitz et al, 2023) and differences in mortality risks across these occupations.

The data reported that the Total Recordable Cases (TRC) can consist of limitations of systemic underreported cases, the days-away-from-work rate may persist due to employer pressure to keep workers working, and the lack of mortality premium considerations.

Firstly, TRC rates capture reported incidents, and there is substantial evidence that meatpacking injury rates are systematically underreported (Ramsey et al, 2015). Employers in the industry face strong incentives to suppress recordable cases, such as line-speed pressures, fear of OSHA scrutiny, and the documented vulnerability of a largely immigrant workforce to employment retaliation, all of which contribute to underreporting (Ramsey et al, 2015).

For instance, the Centers for Disease Control and Prevention (CDC) identified 16,233 confirmed cases and 86 deaths among workers in 239 meat and poultry processing facilities across 23 states by May 2020, with attack rates exceeding 9% in reporting states and reaching over 20% in some facilities (Waltenburg et al, 2020). Subsequent expanded reporting across 31 states documented 28,364 cases and 132 deaths (Waltenburg et al, 2020). The reports on occupational risks suggest discrepancies between employer-reported data.

The BLS figures should, therefore, be interpreted as a lower bound for meatpacking risk rather than an accurate point estimation.

Secondly, the days-away-from-work rate (DAFW) may suggest different analyses at the subsector level. Regarding animal slaughtering, NAICS 311611 records a DAFW rate of 0.8, while skilled nursing, NAICS 6231, records 3.1. The DAFW gap between these two industries could propose a hypothesis that the discrepancies in meatpacking injury reports may be due to workers' fear of resulting in job transfer or restriction (rate of 2.0) rather than lost workdays. This may itself reflect employer pressure to keep workers on modified duty rather than off the payroll and generating a recordable lost-time case. A real-world illustration comes from Seaboard Foods in Oklahoma, where plant nurses misdiagnosed injuries as ordinary "break-in pain." Workers faced a choice: push through pain and keep working or call out sick, which would earn a "point" on their record; reaching 12 points could result in termination (McVan, 2021).

Thirdly, the most important variable of the VSL model, the mortality risk in occupations, was not demonstrated in the data. Injury frequency only covers one dimension of occupational risk.

3.3 Biological, Chronic, and Mental Health Risks in Meat Production Workers

Meatpacking workers face substantial health risks across physical, mental, and social dimensions that extend well beyond recorded injury statistics. Biologically, workers are exposed to zoonotic pathogens such as Salmonella, Campylobacter, E. coli, and influenza viruses through direct animal contact, aerosols, and contaminated surfaces (Rahman, et al., 2020; Ali and Alsayeqh, 2022). Chronically, repetitive, high-speed line work drives musculoskeletal disorders, including carpal tunnel syndrome, at rates far above the national average (up to 41.7 per 100 workers versus 6.3 per 10,000 nationally) (Jackson, et al., 2018).

Mentally, job insecurity, long shifts, limited career mobility, and restricted access to care contribute to elevated rates of depression, anxiety, and burnout (Slade & Alleyne, 2021; Rugulies, et al., 2023; Lander, et al., 2016), compounded by COVID-19-related stress and underreporting among racial and ethnic minorities (Waltenburg, et al., 2020; Ramos, et al., 2021).

Socially, dense production lines, dehumanizing repetitive tasks, isolation, immigrant/minority status, and economic precarity further erode worker well-being (Steinberg, et al., 2020; Slade & Alleyne, 2021; Scot, et al., 2026; Waltenburg, et al., 2020; Dyal, et al., 2020).

Because BLS Total Recordable Case rates capture only acute injuries—missing latent pathogen exposure, cumulative musculoskeletal harm, underreported mental health conditions, and social health burdens—any wage-risk gradient based on these rates alone will understate the true compensating differential, and thus understate VSL.

3.4 Biological, Chronic, and Mental Health Risks in Nursing

Registered nurses face a structurally different but comparably serious risk profile. Clinically, they face exposure to bloodborne pathogens such as HIV, Hepatitis B, and Hepatitis C (Kofman, et al., 2025; Moorman, et al., 2020), though greater specialty mobility allows some nurses to shift toward lower-risk roles. Chronically, patient-handling tasks (lifting, repositioning, transferring) drive the largest category of recorded nursing injuries and a substantial share of days-away-from-work cases (Gomaa, et al., 2015; Pompeii, et al., 2009).

Mentally, nurses report markedly elevated anxiety (28.7%) and depression (28.5%) linked to COVID-19 (Lee, et al., 2023), alongside chronic stress and emotional exhaustion (Houry and Howard, 2024). Socially, stigma around mental health discourages care-seeking and limits social support among nursing professionals (Sprung, et al., 2023).

Taken together, the risk profiles of the two occupations are not commensurable on a single dimension. Meatpacking carries higher chronic and latent risks, particularly the mortality risk from long-term respiratory and carcinogenic exposure, that are likely underrepresented in BLS injury statistics. Nursing carries a higher acute injury frequency, better captured in the official record.

For the purpose of this analysis, both occupations are appropriately characterized as high-risk, making the wage differential between them a function of institutional factors rather than risk alone. The consequence for VSL estimation is significant, where wage-risk is estimated from recorded injury rates alone. However, this will understate the true risk burden borne by meatpacking workers and therefore produce VSL estimates that understate these workers' implicit valuation of safety. This methodological concern motivates the institutional analysis in Sections 4.2 and 4.3 to examine why market wages fail to compensate workers for risks.

4. LABOR INSTITUTIONS ANALYSIS IN THE MEAT PRODUCTION INDUSTRY

4.1 Barriers to Entry and Labor Institutions

In the above section, we can see that the health risks among the meat production and nursing industries are greatly similar, impacting all health states of workers. While occupational risks contribute to the workers' wages, institutional empirical research must be performed in order to see labor markets and institutional work differences and gaps between the two fields.

The wage gap between registered nurses and meat production workers cannot be attributed to risk differentials alone. The barriers to entry to nursing greatly contribute to the requirement of completion of a Bachelor of Science in Nursing (BSN). Taking into account tuition and college education, an expectation of $40,000 to $100,000 for the cost of education is presumed. Additionally, nurses are required to pass the NCLEX-RN licensure examination and obtain supervised clinical hours. All of these factors constitute a substantial investment before any wage is earned (rn.ca.gov). These constitutions of foundational creation of the credential requirements would function as a structural, foundational wage floor. Because the supply of licensed nurses is constrained by education and regulations, employers must offer wages that justify the sunk cost of entry.

In contrast, the meat production industry imposes no licensing or credential requirements. Employment typically requires a basic I-9 employment eligibility, and offers on-the-job orientation in days rather than years of education (uscis.gov).

Directly, the consequences of compensating differentials for these two industries diverge. Nursing's institutional barriers, such as licensing and training requirements, would compress labor supply and sustain wage premiums that are largely independent of job risk. In contrast, meatpacking's low level of entry barriers means a very large pool of workers nationally is eligible to fill these positions; there is no credentialing bottleneck restricting the aggregate supply of labor to the industry. This abundance of eligible workers, however, does not translate into an elastic labor supply at the level of any individual firm or local labor market. Because these positions disproportionately employ immigrants, refugees, and economically vulnerable workers who face constrained geographic and occupational mobility, each firm instead faces a comparatively inelastic, upward-sloping labor supply curve, the source of the monopsony power formalized in Section 5.

This asymmetry implies that the observed $\$53,330$ annual wage gap between the two occupations furthers the compounding effect of credentialing, labor supply elasticity, and monopsony power operating in opposite directions across the two industries.

Despite the few barriers to entry, meat production workers' wages are still suppressed by the institutional, monopsonistic market. In this section, we will apply the Mortensen-Pissarides Model to assess the institutional suppression of monopsony power on workers' wages through job match-find rate, steady-state of asset value, Nash Bargaining wage under frictions, and monopsonistic labor markets.

4.2 The Mortensen-Pissarides Model for the Meat Production Industry

A direct test of whether compensating differentials materialize within meatpacking, specifically, comparing plant-level wages to plant-level injury rates, is precluded by data constraints. Firms are not required to publicly disclose plant-level compensation alongside injury records, and the academic literature on within-industry wage-risk gradients in meatpacking is limited precisely because of this opacity. This data gap reflects the same institutional environment of limited transparency and worker vulnerability that this paper argues suppresses compensating differentials in the first place.

In place of direct evidence, we rely on three converging indirect indicators. First, the available literature suggests the wage-risk relationship in meatpacking runs contrary to compensating differentials theory; lower wages are associated with worse safety outcomes rather than better, consistent with economic insecurity compounding occupational risk (Leigh & Vogli, 2016)). Second, the systematic underreporting documented in Section 6 suggests that even if a wage-risk gradient existed in the data, it would be estimated against an artificially compressed measure of risk. Third, the $53,330 wage gap relative to nursing, an occupation with comparable multi-dimensional risk, cannot be explained by risk differentials alone and points instead to institutional asymmetries. Together, these three indicators are consistent with the theoretical prediction that compensating differentials fail to materialize under monopsonistic conditions.

To understand why compensating differentials fail to materialize for workers in the meat production industry, we turn to the search-and-matching framework developed by the Mortensen-Pissarides Model (MP) (1994). The model is a seminal economic framework that explains equilibrium unemployment as a result of frictional unemployment, emphasizing time and cost variables to match workers with jobs. In the standard competitive model, we assume that there is a relocation to higher-paying jobs when workers encounter a wage-risk disparity with their current jobs (Grimwade et al 2020). The relocation would progress until the compensating differential reflects the marginal worker's valuation of safety (Grimwade et al 2020). The search-and-matching frameworks replace the frictionless reallocation with a consideration of a matching process subject to the labor market. The friction allows employers to extract surplus from workers and ultimately suppresses wages below the risk-compensating level.

4.3 The Matching Function and Job Finding Rate

Firstly, we follow (Pissarides, 2000) and take the aggregate matching function from the Cobb-Douglas form:

$$m(u, v) = A \bullet u^{a} \bullet v^{1-a},\ a \in (0, 1)$$

where u is the measure of unemployed workers, v is the measure of vacancies, and A is the matching efficiency. Empirical literature data show broad support for constant returns to scale in this function, even across different economies and time periods, which justifies the restriction that the exponents sum to one (Petrongolo and Pissarides, 2001). Define labor market tightness as $\theta = \frac{v}{u}$. The job-finding rate for workers is then:

$$\lambda(\theta) = \frac{m(u,v)}{v} = A \bullet \theta^{-\alpha}$$

The filling rate of vacancies for firms is then:

$$q(\theta) = \frac{m(u,v)}{v} = A \bullet \theta^{-\alpha}$$

It is good to note that $\lambda'(\theta) > 0$ and $q'(\theta) < 0$. Applying to our empirical claim, meat production workers face structurally and persistently low θ wages, such that contribute to the monopsonistic wage-setting that the standard M-P model does not capture. Many factors could affect the compound, such as industry geography, high employer concentration, and workforce composition.

4.4 Steady-state asset values:

Continuing to apply the Mortensen and Pissarides Model (MP) (1994). Let $W$and U denote the asset values of employment and unemployment for a representative meat production worker. In a steady state, the Bellman equations are:

$$rW = w - \phi(p) + \delta(U - W), rU = b + \lambda(\theta)(W - U)$$

where r represents the worker's discount rate, w represents the wage, $\phi(p)$ represents the flow disutility from bearing injury risk p (with $\phi' > 0$, $\phi'' > 0$), δ is the exogenous job separation rate, and b is the flow value of unemployment inclusive of benefits and home production. The term $\delta(U - W)$ is the expected capital loss from job destruction and $\lambda(\theta)(W - U)$ is the expected capital gain from re-employment.

Take the difference between W and U for the workers' net employment surplus:

$$W - U = \frac{w-b-\phi(p)}{r+\delta+\lambda(\theta)}$$

The worker's net employment surplus demonstrates three key factors in the application to the meat production industry wage-setting, such that $W - U$ is decreasing in δ, which limits bargaining power, while in a high-injury work environment. $W - U$ is increasing in $\lambda(\theta)$, such that workers who can find alternative employment would have more benefits when threatened to quit. Lastly, $W - U$ there is an increase in $w - b$, where workers who are more vulnerable, such as immigrants and the undocumented, have less stability to fall back on, reducing their surplus. Essentially, all three of these variables play a factorial role in workers' surplus.

4.5 Nash Bargaining Wage Under Frictions

Nash bargaining under frictions determines wages by splitting the match surplus between firms and workers based on their relative bargaining power (Acemoglu and Shimer, 2009). On the firm side, let J denote the asset value of a filled vacancy and V the value of an unfilled vacancy. Such that, in steady state:

$$rJ = y - w - \delta J \Rightarrow J = \frac{y - w}{r + \delta}$$

where y represents the output of workers. Concretely, the free entry of vacancies would impact $V = 0$, leading to $q(\theta) \bullet J = c$, such that c represents the flow cost of maintaining an unfilled vacancy. Firms would then have:

$$J = \frac{q(\theta)}{c} \Rightarrow y - w = \frac{c(r+\delta)}{q(\theta)}$$

Under Nash bargaining, the worker's wage is a share of the match surplus; applying the first-order condition and the free-entry condition (Pissarides 2000, eq. 1.17) gives the worker's gain from employment as $W_i - U$:

$$W_i - U = \beta(J_i + W_i - V - U$$

We can apply the first-order condition and substitute the free condition:

$$w^{MP} = (1 - \beta)b + \beta(y + c\theta) + \beta\phi(p)$$

where the worker receives a fraction β of the match surplus and the firm retains the remainder.

In this case, the parameter β fails to capture the true cost of workplace hazards, such that a worker with low bargaining power only has a small fraction of their true risks as a wage premium.

To see the magnitude of the effect, consider a meat production worker with an injury risk that values, has a flow distutility $\phi(p)$, of $\$8,000$ per year. The value is taken from considerations of the TRC rates and chronic health risks documented in Sections 4.2 and 4.3. Under competitive bargaining $\beta = 0.5$, the worker would receive a risk premium $\beta \bullet \phi(p) = \$4,000$ annually. Under the suppressed bargaining conditions of meat production, where geographic isolation, monopsony, and workforce vulnerability contributively suppress β toward 0.1 to 0.2, consistent with evidence on labor market power in concentrated industries. Berger, Herkenhoff, and Mongey (2022) demonstrate using U.S. Census data that dominant employers in concentrated local labor markets face lower labor supply elasticities systematically, generating equilibrium wage markdowns substantially below competitive levels. Consistent with this finding, Dube et al. (2020) estimate bargaining parameters for concentrated settings that imply suppression of β toward 0.1 to 0.2, which we adopt as a conservative lower-bound estimate. Although Dube et al. (2020) estimate these parameters in an online freelance labor market context, the underlying mechanism of workers with limited outside options facing employers with concentrated hiring power is structurally analogous to the geographic and institutional constraints documented in Section 4.6 for meatpacking workers. Subsequently, the worker would bear the full premium risks, but the true premium cost would fall between $\$800$ and $\$1,600$.

In competitive markets, β it is restrained by worker productivity and other career mobility. In meatpacking, as we now show, β is further immobilized by monopsony.

4.6 An Expansion of Imperfect Substitutes in Occupational Alternatives for Meatpacking Workers

The Mortensen-Pissarides framework (MP) assumes that unemployed workers search across a broad set of potential employers. Additionally, it also suggests that the threat of outside employment disciplines wage-setting. This assumption requires that alternative jobs function as meaningful substitutes for workers' current positions. In the meatpacking industry, this condition fails systematically, such that structural factors further alternative employment are inaccessible or economically inferior. Ultimately, these factors functionally eliminate the outside option that compensating differentials theory requires.

4.6.1 Geographic Isolation and Single-Employer Dominance

Meatpacking facilities are disproportionately located in rural, economically depressed communities where the processing plant is often the dominant employer. Geographic placement in remote areas is a structural feature of the industry that eliminates competition from alternative employers and creates captive labor pools. Workers cannot credibly threaten to leave when no comparable employment exists within a realistic commuting radius (MacDonald et al., 1999). Research on COVID-19 outbreaks in Iowa meatpacking communities illustrates the scarce dynamics. In the case, facilities operated as dominant employers in communities of approximately 13,000 people drawn from 30 distinct cultural and language groups, creating isolated economies where exit was structurally constrained rather than merely inconvenient (de-Winton Cummings, et al., 2025)**.** Rural labor markets also suggest lower overall wage structures and restricted career advancement, meaning that even nominally available alternative employment offers materially worse compensation (Hollick, et al., 2020).

4.6.2 Skill Specificity and Human Capital Constraints

While meatpacking imposes no formal credential requirements for entry, the work develops specialized manual skills, such as knife handling, line-speed processing, and carcass management. These skills, moreover, have low transferability to other rural occupations. Research on worker transitions in geographically concentrated industries demonstrates that skill and geographic congruence are critical determinants of successful job shifts, factors largely absent in rural meatpacking communities (Lim, et al., 2023). Beyond skill specificity, educational disparities and limited technical training restrict workers' access to the emerging occupational structure in rural areas, which increasingly favors younger workers and workers with formal education for technical and managerial positions (Chang, et al. 2024). Therefore, workers are not merely geographically limited, but also occupationally constrained by human capital factors that fit few alternative employers.

4.6.3 Immigration Status and Institutional Barriers to Mobility

As mentioned earlier in Section 4.1, the meatpacking workforce is disproportionately composed of immigrant and refugee populations. There are constraints associated with immigration status that make it more difficult for workers to move between employers, extending beyond the search frictions captured in the standard M-P model. For instance, language barriers would limit the awareness of and access to alternative opportunities. In addition, discrimination in hiring for positions outside the industry further narrows the realistic choice set (Donovan, et al., 2021) ; Carlsten, et al., 2021). Consequently, these constraints propose that even where alternative employers exist, they may be functionally inaccessible to a substantial share of the meatpacking workforce.

4.6.4 Empirical Evidence of Constrained Exit

The consequences of these compounding constraints are observable in worker behavior. A study of poultry processing workers in rural North Carolina, an economically slow area where poultry processing was the largest single employer of women, found musculoskeletal symptom rates 2.4 times higher than among community comparison groups employed elsewhere (Lipscomb, et al., 2007). Critically, workers remained in these positions despite awareness of the conditions, demonstrating that continued participation reflected economic necessity rather than compensated preference. This finding is directly inconsistent with the voluntary exchange assumption of hedonic wage theory: workers were not accepting higher risk in exchange for higher wages, but bearing higher risk with no viable alternative.

4.6.5 Implications for the M-P Framework

Returning to the Mortensen-Pissarides model, the job-finding rate $\lambda(\Theta)$ represents the rate at which workers can locate and transition to alternative employment. For meatpacking workers, the effective $\lambda(\Theta)$ is suppressed not only by low labor market tightness Θ, but by the structural barriers documented above that render formally available jobs imperfect or inaccessible substitutes. The result is that workers' net employment surplus $W - \mu$ is compressed from multiple directions simultaneously: geographic isolation limits $\lambda(\Theta)$, immigration and human capital constraints reduce the value of outside options b, flow value of unemployment, and monopsony concentration suppresses the wage w. Under these conditions, the Nash bargaining wage derived in Section 4.5 understates even the already-suppressed equilibrium, because the outside option that disciplines employer wage-setting is weaker than the model assumes. The compensating differential is attenuated by monopsony power, as the absence of credible outside options undermines the threat of exit that is necessary for workers to obtain compensation for undesirable job characteristics.

5. VSL ESTIMATION AND MONOPSONY DISTORTION

5.1 Impact of Monopsony Labor Market

Within the M-P framework, the assumption is that no single employer is large enough to affect the matching rate. However, the institutions of a monopsony labor market violate this assumption. The four dominating companies, Tyson Foods, JBS, Cargill, and National Beef, all control over 85% of the meat production industry (whitehouse.gov). Geographically, workers in more isolated areas face at least one potential employer within a realistic commuting or relocation radius (MacDonald et al, 1999). When employers have market power over wages, they internalize the effect of their wage offers on labor supply and, therefore, have more incentives to set wages below the competitive level.

In monopsony labor markets, firms have an upward slope for the labor supply curve, rather than a perfectly elastic supply to the competitive market (Manning, 2003). It is important to distinguish this firm-level elasticity, ε_{ls}, which demonstrates a firm's wage-setting power, from the aggregate elasticity of labor supply to the industry as a whole. Even where entry barriers are low and the pool of eligible workers nationwide is large, monopsony power can persist at the firm level if workers face few alternative employers within a feasible commuting or relocation radius (MacDonald et al., 1999).

Take employment at the firm:

$$N(w, x) = \frac{R(w,x)}{q(w,x}$$

where $R(w, x)$ is the recruitment flow and $q(w, x)$ represents the quit rate; therefore, the elasticity is defined as the percent change in labor supply when wages change.

Now, consider the log of the labor supply curve:

$$n_f = \frac{1}{\varepsilon}(w_f - b_f) \Rightarrow \varepsilon = \frac{\partial lnN}{\partial lnw} \Rightarrow \varepsilon_{ls} = \frac{\partial lnL^s}{\partial lnw}$$

Take the firm-level labor supply elasticity and apply it to the marginal labor cost to marginal product:

$$w^{monopsony} = y \bullet (1 - \frac{1}{\varepsilon_{ls}})$$

Berger, Herkenhoff, and Mongey (2022) show that in concentrated local labor markets, dominant employers face structurally lower labor supply elasticities than their smaller competitors, with welfare losses from labor market power reaching 7.6% of output relative to the efficient allocation, consistent with substantial wage markdowns in high-concentration industries. For the purpose of this analysis, we follow Dube et al. (2020) in applying $\varepsilon_{ls} \in [2, 5]$ as an empirical range for concentrated manufacturing settings, which implies wages 20 to 50% below the competitive level. We treat this as a conservative estimate given that meatpacking's four-firm concentration ratio exceeds 85%, placing it at the upper end of the concentration distribution documented in Berger et al. (2022).

5.2 The Unified Wage Equation: Frictions and Monopsony

Frictional job search-match and monopsonistic labor markets portray a relatedness, in which there is a relationship in highly concentrated industries. In such industries, ε_{ls} is a function for tightness and concentration (Gerger et al, 2012). As market concentration rises, high-market-share firms often possess greater ability to coordinate. The ability to coordinate would reduce competitive intensity and influence labor market outcomes.

$$\varepsilon_{ls} = \varepsilon_{ls}(\theta, HHI), \frac{\partial \varepsilon_{ls}}{\partial \theta} > 0, \frac{\partial \varepsilon_{ls}}{\partial HHI} < 0$$

As θ decreases, workers' career optionality would also decrease. Ultimately, this would lead to labor supply to any individual firm becoming less elastic, and the monopsony cascade would deepen. Combining the Nash bargaining wage of Pissarides (2000) with the monopsony markdown of Manning (2003), we derive the following compound wage equation:

$$w^* = [(1 - \beta(\theta))b + \beta(\theta)(y + c\theta) + \beta(\theta)\phi(p)] \bullet (1 - \frac{1}{\varepsilon_{ls}(\theta, HHI)})$$

Explicitly, the wage suppression factor is proportionate to every component of the M-P model, especially the risk premium. Therefore, the compensating differential for meat production workers is:

$$\Delta w^{risk} = \beta(\theta) \bullet \phi(p) \bullet (1 - \frac{1}{\varepsilon_{ls}(\theta, HHI)}) \ll \phi(p)$$

where the ratio $\frac{\Delta w^{risk}}{\phi(p)}$ would be significantly and strictly less than 1 when frictional factors and market power converge. Appropriately, the meat production industry respectively upholds these two conditions, where workers would have to bear full risk premiums $\phi(p)$ but only receive a small fraction in wages.

The relationship of workers' wage risk implies possible causality. Higher injury rates would increase the separation rate δ, reducing workers' surplus $W - U$ and limiting workers' bargaining power. Through these combined equilibrium conditions, they ultimately lead to a lower equilibrium wage w^*.

Differentiating w^* with respect to δ would give a negative effect on two important determinants. Firstly, the higher separations would market tightness θ^*, meaning that wages would be lower, according to the M–P model. Secondly, the decline θ^* would reduce the labor supply elasticity for firms ε_{ls}. This would lead to the strengthening of monopsony power and further suppress wages in workers' compensation.

Together, higher risk and lower wages would synchronize in equilibrium, contrary to the standard compensating differential economic theory. In such conditions, the observed wage–risk gradient cannot be used to meaningfully estimate the Value of a Statistical Life (VSL) without correcting for the institutional structure of the monopsony labor market.

5.3 Risk-to-Wage Ratio and VSL Implications

In Section 5.2, we established the theoretical mechanisms of monopsonistic labor markets in suppressing compensating differentials. In this section, we apply those findings by deriving an empirical VSL estimate and comparing it to standard regulatory benchmarks. In doing so, we can see the magnitude of the distortion and how institutions can produce gaps rather than a reflection of worker preferences.

5.4 Deriving the Observed VSL for Meat Production Workers

Recall from Section 3, where VSL is expressed as:

$$VSL = \frac{\beta}{\Delta r}$$

where β is the compensating wage differential, the additional annual wage a worker accepts per unit of incremental mortality risk, and Δr is the marginal increase in fatality risk.

To compute an observed VSL for meatpacking, we require two empirical inputs: an estimate of the annual wage premium attributable to occupational risk and an estimate of the industry-specific fatality rate.

For the fatality rate, the BLS Census of Fatal Occupational Injuries in 2023 will be utilized. The fatality rate for animal slaughtering and processing (NAICS 3116) is approximately 11 deaths per 100,000 full-time workers, or $\Delta r = 0.00011$ (BLS CFOI, 2023). According to Section 4.2, we can assume that this figure is itself likely a lower bound given the underreporting dynamics. However, we proceed with the official estimate to establish a baseline.

Table 2: Total fatal injuries in number, per 100,000 full-time workers, BLS

Industry	NAICS	Total fatal injuries (number)
Animal slaughtering & processing	3116	11

For the wage premium, we isolate the risk component of the meat production wage by comparing the mean annual wage of meat, poultry, and fish cutters and trimmers ($35,090, BLS OEWS 2022) against the federal minimum wage annualized at full-time hours ($15,080). The residual of approximately $20,010 represents the total above-minimum compensation. We must isolate the portion attributable to occupational risk rather than to other job characteristics. Following the approach of Viscusi and Aldy (2003), we apply a conservative risk-attribution share of 15%, which is consistent with hedonic wage regression estimates for low-skill manufacturing. This, then, yields an implied annual risk premium of approximately $3,002.

Now, we can plug these values into the VSL formula:

$$VSL_{observed} = \frac{\$3{,}002}{0.00011} \approx \$27.3\ million$$

This figure appears to be relatively high compared to the EPA's standard VSL benchmark of $\$7.4 - \$10.4$ a million (EPA, 2023). However, when applying the monopsony institutional model, the true VSL value is much lower.

5.5 Adjusting for Monopsony Suppression

Keeping the observed wage premium of $3,002, we note that this represents the compensating differential as actually paid, not necessarily the differential workers would receive absent monopsony power. Applying the markdown derived in Section 5.2, under the midpoint assumption, workers retain approximately 65% of the competitive premium; the implied "true" premium under frictionless bargaining is $\Phi(p)\ true \approx$ $4,618, yielding $VSL_{corrected} \approx$ $42.0 million versus $VSL_{observed} \approx$ $27.3 million.

Both figures are sensitive to two underlying assumptions of the 15% risk-attribution share applied to the above-minimum wage residual, and the fatality rate Δr used in the denominator. Because Δr is small (0.00011), modest changes in either assumption produce large shifts in the implied VSL. Table 3 reports this sensitivity across a plausible range of values.

The role of Δr is particularly important. The baseline figures use the official BLS Census of Fatal Occupational Injuries rate of 11 per 100,000, which, as discussed in Sections 3.3 and 6, captures only acute, traumatic workplace deaths. It excludes mortality from chronic occupational exposures, such as zoonotic infection, carcinogen exposure, and COVID-19, as well as injuries diverted from official records by on-site clinics. If the true mortality risk borne by meatpacking workers is three to five times the officially recorded rate, a range consistent with the underreporting evidence cited above, both $VSL_{observed}$ and $VSL_{corrected}$ fall to within or below the EPA's $7.4–$10.4 million benchmark range (Table 3).

This pattern aligns with the theoretical prediction of Section 2: under monopsony, $\beta_{observed} < \beta_{true}$, and both quantities should be weakly lower than VSL the estimates derived from more competitive labor markets once measured against a common, accurate risk denominator. The central finding of this section is, therefore, a relationship: the meatpacking wage-risk gradient is consistent with substantial monopsony suppression only if the true mortality risk workers face is several times larger than what is officially recorded, a possibility for which independent evidence already exists in the underreporting literature. The gap between workers' true valuation of safety and their actual compensation manifests partly as a wage gap and partly as an unmeasured risk gap, and BLS data alone cannot separate the two.

Table 3:

Table A: Varying the risk-attribution share (Δr fixed at official 0.00011, markdown fixed at 35%)

Risk-attribution share	β-observed	VSL observed
5%	$1,001	$9.1 million
10%	$2,001	$18.2 million
15% (baseline)	$3,002	$27.3 million
20%	$4,002	$36.4 million

Table A shows how sensitive the observed VSL estimate is to the risk-attribution share assumption (the percentage of above-minimum wages assumed to reflect occupational risk compensation, currently set at 15% in the paper). Holding the fatality rate fixed at the official BLS rate (0.00011), $VSL_{observed}$ ranges from $9.1 million to $36.4 million as the share varies from 5% to 20%, demonstrating that this single, unestimated assumption has an outsized effect on the final figure.

Table B: Varying the monopsony markdown (share fixed at 15%, Δr fixed at official 0.00011)

Suppression (1-f)	f (shared retained)	ϕ (p) true	VSL corrected
50% (ε ls=2)	0.5	$6,004	$54.6 million
35% (midpoint)	0.65	$4,618	$42.0 million
20% (ε ls=5)	0.8	$4,618	#34.1 million

Table B shows how sensitive the corrected VSL estimate is to the monopsony markdown assumption (the share of the competitive wage premium that workers actually retain, derived from Dube et al.'s ε_{ls} range of 2–5). Holding the risk-attribution share fixed at 15% and Δr at the official rate, $VSL_{corrected}$ ranges from $34.1 million to $54.6 million as the suppression factor varies from 20% to 50%, showing that even within the empirically supported range for ε_{ls}, the corrected VSL figure shifts by over $20 million.

Table C - Varying Δr (shared fixed at 15%, markdown fixed at 35%)

Δr assumption	Δr value	VSL observed	VSL corrected
Official BLS CFOI	0.00011	$27.3 million	$42.0 million
2x offcial	0.00022	$13.6 million	$21.0 million
3x official	0.00033	$9.1 million	$14.0 million
5x official	0.00055	$5.5 million	$8.4 million

Table C shows how both VSL estimates respond to the fatality rate (Δr) used in the denominator, holding the risk-attribution share fixed at 15% and the markdown at the midpoint (35% suppression). Using the official BLS rate (0.00011), $VSL_{observed}$ and $VSL_{corrected}$ are \$27.3M and \$42.0M respectively, both above the EPA benchmark of \$7.4–\$10.4M. But as Δr is scaled up to reflect underreported chronic and latent mortality risk (2x to 5x the official rate), both estimates fall sharply, landing within or below the EPA range once Δr reaches roughly 3–5x the official figure.

6. INSTITUTIONAL HEALTHCARE CONTROL AND INJURY UNDERREPORTING IN MEATPACKING

Monopsony power in the meatpacking industry extends beyond wage-setting. The institutional impact expands into a dimension that standard labor economics models rarely capture, such that employer control extends to workers' access to medical care.

Most meat and poultry production plants have on-site workplace clinics (OWCs). Injured workers are required to visit these clinics before seeking outside medical care or intervention (Berkowitz et al, 2023). This institutional arrangement controls the point of first medical contact. Employers effectively determine whether an injury is recorded on official Occupational Safety and Health Administration (OSHA) logs at all. OWCs classify many injuries as first aid, which are not OSHA-recordable, and workers face retaliation for reporting injuries or seeking outside care, leading to underreporting (Rosenman et al, 2006; Rowland et al, 2024). These injuries, treated or undertreated, within the plant clinics are systematically excluded from the Bureau of Labor Statistics (BLS) Total Recordable Case (TRC) rates analyzed in Section 4.2. There are estimates suggesting that 61-68% of work-related injuries and illnesses are not captured in the meat production industry (Rosenman et al, 2006).

The OWCs, therefore, function as a filtration mechanism. They are suppressing the observable injury record that regulators, researchers, and workers themselves rely upon to assess occupational risk. This creates a direct relationship with VSL estimations. If the injury data used to estimate the wage–risk is artificially compressed by the employer, then the compensating differential β in hedonic wage regression is estimated using a truncated measure of risk. As a result, the implied VSL would understate workers' true valuation of safety.

Moreover, workers are frequently returned to the production line regardless of injury severity (Berkowitz, 2016). Those who seek outside medical care without employer authorization risk having their injuries classified as non-work-related, leaving them personally liable for all associated medical costs (Berkowitz et al, 2023).

In an interview with a nurse at Tyson, she provided an employee manual outlining Tyson's procedures for handling musculoskeletal injuries. Although nurse managers are responsible for deciding when injured workers should see a doctor, Nurse J reported that plant managers, often without medical training, frequently pressure nurses to halt medical care and intervene in treatment decisions. She claims that the delayed care at Tyson is reflected in OSHA inspections (Driver, 2022).

The monopsony power is expansive. Employers have the ability to control not only the wage offer but the worker's physical access to care. The suppression of compensating differentials is facilitated by the suppression of injury visibility.

Additionally, the punitive attendance systems within the meat production industry incentivize workers to go to work, regardless of their health states. If a worker calls in sick, they will receive a point on their employee profile. In an interview with Kim Cordova, president of UFCW, a union that represents the JBS plant in Greeley, Colorado, she states that “they'll give the point, and then the worker has to fight to have it removed,” she said. “‘They make it really difficult to call in while sick, so workers are compelled to come into work even if they’re symptomatic’” (Schlitz, 2020). The problem worsens as workers speaking nearly 40 languages must submit call screenshots to the union to remove points from the English-only hotline, Cordova noted.

Workers, therefore, face a coerced choice between bearing injury silently and risking their employment. The consequence of occupational risk measurement is significant. Days-away-from-work rates (DAFW) are already low in meat production relative to nursing, as shown in Table 1. They are further deflated by these coercive structures. Workers would be on modified or restricted duty, instead of formal medical leave, to avoid creating lost-time cases.

Together, employer control over occupational injury claims, financial obstacles to external care, and punitive attendance policies create an institutional framework that consistently discourages reporting and undercompensates workplace risk. These factors contribute to the argument that brings the BLS injury data to an unreliable basis for estimating the Value of Statistical Life (VSL) in the meat production sector.

7. CONCLUSION

This paper examines how the standard compensating differentials model of the Value of Statistical Life (VSL) is structurally undermined in labor markets characterized by monopsony power, search frictions, and workforce vulnerability. Under competitive conditions, the hedonic wage regression coefficient β captures workers' marginal willingness to accept incremental mortality risk, and the VSL derived from it reflects an equilibrium trade-off between wages and safety.

In the meatpacking industry, none of these conditions hold. Some factors evaluated in the study are the major four-firm concentration ratio exceeding 85%, the geographic isolation of processing facilities, the disproportionate representation of immigrant and undocumented workers with constrained outside options, and the employer control over healthcare access documented in Section 6, collectively demonstrating that the observed wage-risk gradient is a suppressed compensating differential.

The compound wage equation derived in Section 4.2 formalizes that when labor supply elasticity ε_{ls} is low, and Nash bargaining power $\beta(\theta)$ is compressed by monopsony, the risk premium workers receive is a small fraction of the flow disutility $\phi(p)$ they actually bear. VSL estimates derived from meatpacking wages, therefore, understate these workers' true valuation of safety by a margin proportionate to the degree of institutional suppression. As a consequence, a bias appears that is not correctable through standard hedonic regression controls.

In Sections 4 and 5, we examine the occupational comparison between meatpacking and nursing and establish a $53,330 annual wage gap between the two industries that cannot be explained by risk differentials alone. Both industries have incremental health burdens across all health states, physical, mental, and social health domains. The divergence in wages reflects instead the compounding of institutional asymmetries operating in opposite directions. In nursing, credentialing and educational requirements limit labor supply and structurally establish a wage floor. In meatpacking, with few entry barriers, the pool of eligible workers nationally is large, but high employer concentration and geographic isolation mean that within any given local labor market, workers face only a small number of potential employers. This combination of an abundant, substitutable workforce at the industry level paired with an inelastic, upward-sloping labor supply curve at the firm level is what allows the four major firms to suppress wages below the wage-risk-compensating level. The observed compensating differential in meatpacking is an institutional constraint. Ultimately, the institutional constraints reflect the limited bargaining power between a highly concentrated market class and a structurally constrained workforce.

The policy implications of the monopsony analysis in the meat production industry are concrete. First, injured meatpacking workers should have a guaranteed right to seek outside medical care without employer interference. This is enforceable by OSHA with consequences for non-compliance to help restore the honesty of the injury data. Second, enforcing labor market antitrust by applying Herfindahl-Hirschman Index (HHI) thresholds to local labor markets, not just the meat production industry, would address the employer concentration that suppresses ε_{ls} and compresses $\beta(\theta)$ in the M-P framework. Each of these interventions targets a specific parameter in the theoretical framework developed here to directly tackle the issues identified in the model. Third, the sensitivity analysis in Section 5.5 suggests that regulators' reliance on acute-injury-based fatality statistics may itself be a source of the apparent anomaly in meatpacking VSL estimates. Incorporating broader measures of occupational mortality risk, including chronic disease, zoonotic infection, and exposure-related cancer, into the risk denominators used for VSL-based safety benchmarks would likely bring wage-risk gradients in concentrated industries like meatpacking back into alignment with the theoretical prediction that monopsony power weakly lowers, rather than inflates, observed compensating differentials relative to competitive benchmarks.

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