Gains from Trade in Gun Policy: A Compensation-Based Benchmark*

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Abstract

Policies restricting gun sales face substantial political opposition and constitutional constraints. In this paper, we ask how costly it would be to induce potential handgun buyers to choose less lethal alternatives. Pairing stated-choice experiments with a behavioral model of firearm choice, we estimate the payments required to induce substitution away from handguns toward long guns or no gun purchase. We then compare these payments with the resulting mortality benefits. We find substantial gains from trade: many prospective handgun buyers require relatively little compensation to switch and targeted compensation can avert homicides at a social cost well below conventional estimates of the value of a statistical life. The extent to which these gains can be realized through compensation, however, depends on the state's information about which consumers would change their choices and at what price. Without this information, uniform subsidies pay consumers who would choose an alternative anyway and overcompensate those willing to switch for less, sharply increasing government expenditure and reducing the optimal scale of compensation.

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1 Introduction

Approximately 45,000 people die from firearm injuries each year in the United States, including roughly 20,000 homicides.[1] Handguns account for a disproportionate share of these deaths, representing approximately 90% of homicides where firearm type is identified.[2] Yet policies that restrict gun ownership face intense political opposition (Cook and Goss, 2020): proposed regulations routinely fail in Congress, and even modest restrictions mobilize well-organized advocacy (Goss, 2006; Lacombe, 2021; Joslyn, 2020). Existing work emphasizes the unusually strong political organization and identity of gun owners as one source of this asymmetry (Goss, 2006; Lacombe, 2021). A complementary possibility is that firearm regulation has a particularly difficult incidence: it imposes salient private losses on an identifiable group of gun owners and prospective buyers while generating benefits that are dispersed across people who may never know whether they would have been affected (Olson, 1965; Arnold, 1990).

Compensation provides a way to quantify the underlying conflict of interest. Prospective handgun buyers place private value on choosing a handgun, while substitution away from handguns may generate benefits for others through reduced firearm mortality in expectation. Whether there are gains from trade depends on the relative magnitude of these valuations: if the social benefit of inducing a buyer to substitute exceeds the private loss the buyer would incur, there is, in principle, scope to compensate the buyer while leaving society better off. We therefore estimate how much prospective handgun buyers would have to be paid to choose a long gun or forgo a gun purchase altogether and compare these private costs with the expected mortality benefits of the resulting substitution. This framework also allows us to examine how the viability of compensation-based policy depends on the government's ability both to direct payments toward consumers whose choices would change and to tailor those payments to the amount of compensation each consumer requires in order to switch.

[1] CDC WONDER database, 2022 data.
[2] FBI Uniform Crime Reports, 2019–2022.

Why focus on substitution away from handguns? Handguns account for the vast majority of firearm homicides and are more easily concealed than long guns.[3] They are also easier to pick up, load and fire, making them more suitable for impulsive acts of violence. Substitution from handguns toward long guns may therefore reduce firearm mortality even when consumers continue to own a firearm.[4]

Substitution may also preserve much of the private value that motivates firearm ownership. Most firearm owners report personal and household safety as their primary motivation for ownership (Alsan et al., 2026). Long guns can also serve this protective function, potentially allowing consumers to retain the benefits of firearm ownership while reducing the risks associated with handguns.

Constitutional constraints provide a second motivation for considering compensation. Following *District of Columbia v. Heller* (2008) and subsequent decisions, courts have placed meaningful limits on restrictions on access to commonly owned firearms (Cook et al., 2009; Blocher and Miller, 2018). Compensation leaves this access unchanged: consumers remain free to purchase any legal firearm, but receive an incentive to choose a less lethal alternative. Compensation-based approaches have proven politically viable in other domains, including agricultural subsidies, cash-for-clunkers programs, and tax credits for electric vehicles (Goulder and Parry, 2008).

The magnitude of private losses incurred by gun buyers as a result of firearm regulation are not directly observed to us. To estimate those losses, we combine a stated-choice experiment with a behavioral model of firearm choice to recover the distribution of prospective first-time handgun buyers' willingness to accept (WTA) to choose a long gun or forgo a gun purchase instead. The model uses randomized variation in prices and choice sets to recover heterogeneity in preferences across firearm categories and in consumers' consideration of those categories, allowing us to estimate WTA for substitution.

[3]FBI Uniform Crime Reports, 2019–2022; Bureau of Justice Statistics, Guns Used in Crime https://bjs.ojp.gov/press-release/guns-used-crime.

[4]While, for the sake of our exercise in the main text, we assume that there is a homogeneous causal effect of handguns on gun homicide risk, in Appendix E we allow for a richer selection-on-observables mapping.

We focus on gun-naïve households—those without existing firearms—because the literature identifies causal effects of gun ownership at the extensive margin (Duggan, 2001; Cook and Ludwig, 2006). For these households, inducing substitution away from a handgun changes whether the household enters handgun ownership at all, rather than merely changing the composition of an existing firearm stock. We then combine the estimated substitution responses with evidence on the relationship between firearm ownership and homicide to quantify the resulting expected mortality effects, and compare those benefits with the private costs of changing consumers' choices and the fiscal costs of financing compensation.

We use two hypothetical benchmarks to separate the underlying gains from trade from the informational requirements of realizing them through compensation. Under perfect targeting, the social planner observes each prospective handgun buyer's WTA and offers exactly that amount to induce substitution. This minimizes the government expenditure required to achieve any given reduction in handgun purchases. Under a uniform subsidy, the planner cannot observe individual preferences and instead offers the same subsidy to any new buyer who chooses a long gun or the outside option. Relative to perfect targeting, this policy requires greater expenditure both because some switchers receive more than their WTA and because consumers who would have chosen a subsidized alternative even without the policy receive windfall payments.

Our analysis is a benchmarking exercise rather than a specific policy proposal. The resulting welfare benchmark helps distinguish the underlying gains from trade from the informational constraints that determine how costly they are to realize through compensation.

These benchmarks separate two components of the political-economy problem. Perfect targeting measures the gains from trade available when compensation can fully reflect heterogeneity in buyers' WTA. Comparing this benchmark with a uniform subsidy then isolates the additional cost created by the government's inability to target and tailor payments to individual buyers.

A natural alternative is to tax firearms to reflect their social costs. California, for example,

implemented an 11% excise tax on firearms and ammunition in 2024. In Appendix D we compute, under ideal conditions, an optimal Pigouvian tax of over 150%; Rosenberg (2025) computes an even higher optimal tax on handguns. Taxes of this magnitude would likely face substantial political opposition and might draw constitutional scrutiny as an undue burden on access to firearms.

We compute the welfare-maximizing scale of compensation by comparing the marginal social cost of inducing additional substitution with the marginal mortality benefit. Under perfect targeting, the social cost of inducing a buyer to switch consists of the buyer's WTA and the cost of raising the funds used for compensation. The payment itself is a transfer rather than a resource cost; with a 25 percent marginal excess burden of taxation, the marginal social cost is therefore 1.25 times the buyer's WTA. We compare this cost with the value of the resulting reduction in mortality using the $13 million value of a statistical life used by the Department of Health and Human Services (U.S. Department of Health and Human Services, 2024).[5]

The estimates identify clear social gains from trade. Among prospective handgun buyers, median WTA is approximately $815, while mean WTA exceeds $2,000. Under perfect targeting, the welfare-maximizing policy induces 27–48% of prospective handgun buyers to switch, depending on assumptions about the mortality risk associated with long guns, and averts 60–220 homicides annually.

Information about individual WTA is critical to achieving these gains. For a given number of switchers, uniform subsidies require 5–6 times as much government expenditure as targeted compensation. At the welfare-maximizing uniform subsidy, only 36% of program expenditure goes to consumers whose choices actually change; the remaining 64% goes to consumers who would have chosen a subsidized alternative even without the policy. Because these payments are transfers, the uniform subsidy can still raise welfare, but it does so by routing billions of publicly financed dollars to households whose behavior is unchanged, in

[5]While we use the HHS VSL to set our threshold out of convenience, any societal agreed upon value of saving an expected life through reduced gun violence can be used in our framework

exchange for behavior change by a minority of recipients. This fiscal burden may constrain implementation, although the broad distribution of payments could also influence, positively or negatively, political support for such a policy.

Our first contribution is to the political economy of regulation. Existing work emphasizes how concentrated interests, political organization, and identity can sustain opposition to policies with diffuse benefits (Olson, 1965; Goss, 2006; Lacombe, 2021). We complement this literature by directly measuring the private economic stakes borne by prospective handgun buyers. This provides a benchmark for comparing those private stakes with the social benefits of changing their behavior.

Our second contribution is to show how limits on the government's ability to observe heterogeneous private stakes affect the scope for realizing gains from trade. Even when the social benefits of changing behavior exceed the private losses, governments may not know which consumers would change their choices at different payment levels. In our setting, this constraint is quantitatively important: uniform payments require substantially more public expenditure than compensation tailored to individual buyers. The comparison therefore shows how informational constraints can limit the government's ability to bargain around concentrated private losses.

Our third contribution is methodological. Political scientists have frequently used stated-choice experiments to study multidimensional preferences (Hainmueller et al., 2014), and prior work has used such designs to recover politically meaningful trade-offs from observed choices (Graham and Svolik, 2020). We build on this approach by combining such stated-choice experiments with a behavioral model of firearm choice to recover the distribution of WTA and the alternatives consumers would choose instead. We then combine these estimates with evidence from the mortality literature and standard valuations of mortality risk to quantify the gains from trade. More broadly, this approach illustrates how choice models can use survey data to recover the magnitude and distribution of private stakes that are otherwise difficult to observe directly.

Empirically, we build on the demand framework of Moshary et al. (2025), which uses stated-choice data to estimate firearm preferences and consideration sets. Here, we use that framework to recover the distribution of WTA for substitution across firearm categories and combine these estimates with evidence on the mortality effects of gun ownership. Thus, while Moshary et al. (2025) characterizes consumer demand for firearms, this paper uses those preferences to quantify the gains from trade associated with substitution away from handguns and the value of targeting and tailoring compensation.

The remainder of the paper proceeds as follows. Section 2 describes the stated-choice experiment used to elicit firearm preferences. Section 3 presents the search cost demand model and discusses identification. Section 4 reports the estimated model's predictions for market shares in the status quo. Section 5 develops the counterfactual analysis, including the translation from individual to household market shares, the mortality model, and results for both policy scenarios. Section 6 discusses implications and concludes.

2 Data: Stated Choice Experiment

Our analysis uses data from a stated-choice experiment designed to elicit preferences over firearms. Stated-choice experiments of this kind are a standard tool for measuring multidimensional preferences in political science (Hainmueller et al., 2014). Rather than estimating the average effects of individual attributes, we use the choice data to estimate a structural model of firearm demand that allows us to evaluate counterfactual substitution across firearm categories. This section describes the experimental design and the features of the data most relevant to our analysis. Complete details of the experiment are provided in Moshary et al. (2025).

2.1 Experimental Design

Sample. The experiment was fielded online in March and April 2022 to 22,522 U.S. adults in partnership with The Harris Poll. Survey participants were drawn from the general population available to The Harris Poll. Among respondents, 4,018 report owning a gun, interest in buying a gun in the next 12 months, and/or interest in purchasing a gun more generally. This set comprises the estimation sample.

Choice Tasks. Each respondent completed seven choice tasks. In each task, respondents were presented with three firearm alternatives and asked, in a forced-choice hypothetical purchase scenario, to select their most preferred option. Respondents were then asked whether they would actually buy their most preferred alternative at the quoted price. The first choice elicits trade-offs among firearm alternatives, while the follow-up purchase question allows us to observe the extensive margin.

Attributes. In each choice task, respondents were shown pictures of each alternative firearm, alongside information on price, brand, caliber, capacity, and action type. We estimate part-worths for category (Pistol, Revolver, Rifle, Shotgun), brand (e.g., Smith & Wesson, Glock, Remington), and price.

Randomization. For each task, prices were varied independently of other attributes, allowing identification of price sensitivity. The composition of choice sets—the three gun models available in each task—was also randomized, providing variation used to identify consideration set formation.

2.2 Consideration Sets

A key feature of the experimental design is that it elicits both choices and *consideration sets*. Before the choice tasks, respondents report which types of firearms they would consider among pistols, revolvers, shotguns, and/or rifles. The alternatives in each task were then

drawn primarily from these stated categories but tasks occasionally included options outside the reported consideration set. We therefore observe directly whether a respondent considers handguns, long guns, or both, while also observing choices involving firearms outside the respondent's stated consideration set. The latter variation is important for estimating preferences over non-considered categories, and ultimately, the compensation required to induce substitution toward them.

2.3 Sample Characteristics

Table 1 reports summary statistics for the respondents. The sample is roughly balanced by gender and somewhat older than the general population, consistent with the demographics of gun ownership in the United States. Approximately two-thirds of respondents currently own firearms.

Table 1: Sample Characteristics

	Mean
Male	0.48
Age	48.8
Household income <$50k	0.42
Household income $50k–$100k	0.37
Household income >$100k	0.21
College educated	0.31
Currently owns a gun	0.64
No gun in household	0.18

The distinction between respondents from gun-owning households and those from gun-naïve households is central to our analysis. For households that already own a handgun, an additional purchase changes the stock of firearms but not the extensive margin of gun ownership. For a gun-naïve household, in contrast, a purchase moves the household from no handgun to handgun ownership. The literature linking gun ownership to homicide identifies causal effects at this extensive margin (Duggan, 2001; Cook and Ludwig, 2006).

We define gun-naïve households as those in which the respondent reports no current gun

ownership. Approximately 17.7% of prospective buyers in our sample come from gun-naïve households. To translate our individual-level demand estimates into household ownership shares, we must determine the population share of gun-naïve households in the market. Gallup surveys indicate that the share of U.S. households owning a firearm has remained relatively stable at approximately 44%. In steady state, entry by gun-naïve households must therefore be offset by divestiture among incumbent gun-owning households. Because our survey samples both existing gun owners and gun-naïve prospective buyers, mapping the composition of our sample into population shares requires an assumption about the timing of this divestiture. We assume that exiting households divest their firearms before the survey, so that the survey frame consists of incumbent households that remain gun owners and gun-naïve households currently in the market. Combining the composition of this sample with the 44% population firearm ownership rate implies that 7.9% of households are gun-naïve and in the market, of whom 92.3% purchase a firearm under the status quo, yielding 7.3% of households as new gun-owning entrants.[6]

2.4 Design Features and Limitations

Stated choice experiments offer several advantages for our analysis. The randomized variation in prices and choice sets allows us to estimate substitution patterns that would be difficult to recover from transaction data. The two-stage design—selecting a preferred alternative, then deciding whether to purchase—provides information on both intensive and extensive margins of demand. Eliciting consideration sets directly provides information on the search process. These features are particularly useful in the firearms market, where

[6]Let E denote the population share of gun-naïve households in the market and S the share of incumbent households that remain gun owners. Gun-naïve households constitute 17.7% of our estimation sample, implying $E/(S+E) = 0.177$. The demand model predicts that $p = 0.923$ of these households purchase a firearm, while steady state requires $S + pE = 0.44$. Solving yields $E = 0.079$, $pE = 0.073$, and $S = 0.367$. Taken literally, this calibration implies substantial turnover in household gun ownership. We instead view this as likely evidence that incumbent gun owners are underrepresented in our survey relative to gun-naïve prospective buyers, and treat the calculation as an internally consistent normalization rather than a serious estimate of household turnover. Importantly, the choice of E scales aggregate program costs and averted deaths proportionally and therefore does not affect optimal subsidies, cost per averted death, or our cost-benefit conclusions.

transaction data are limited.

The main limitation of stated choice data is that choices are hypothetical. Respondents may not fully account for budgets, storage, or other real-world constraints. We address this concern in two ways. First, the experimental design presents realistic scenarios with plausible prices. Second, Moshary et al. (2025) validates stated preferences against revealed-preference data where available. More broadly, evidence on hypothetical bias suggests that it primarily affects absolute willingness-to-pay rather than marginal rates of substitution between attributes (Carlsson and Martinsson, 2001). Our counterfactuals rely primarily on relative trade-offs—in particular, the compensation required to induce substitution from handguns to long guns or no purchase.

3 Model: Demand Estimation with Consideration Data

This section presents the structural model of firearm demand developed in Moshary et al. (2025). In addition to respondents' choices, our data include their stated consideration sets. We incorporate this information using a search-cost framework in which consumers choose which firearm categories to consider before choosing among available products in those categories. Modeling consideration is important for our counterfactual analysis because inducing a consumer to substitute away from a handgun may require not only changing their choice among considered products, but also inducing them to consider a different firearm category.

3.1 Model Setup

Products and Categories. The market consists of J products organized into K categories. In our application, the four categories are pistol, revolver, rifle, and shotgun. Products correspond to specific firearm profiles defined by brand, price, and feature combinations. The outside option is always available and requires no search cost. Let $\mathcal{K} = \{1, \ldots, K\}$ de-

note the set of categories and $\mathcal{J}_k$ denote the set of products in category k.

Consumer Problem. Consumer i makes decisions in two stages. First, the consumer observes their search cost κ_i and chooses a consideration set $\mathcal{C}_i \subseteq \mathcal{K}$, paying κ_i for each category they include. The consumer then observes the utilities of all products in the considered categories and chooses the utility-maximizing option from $\mathcal{C}_i \cup \{0\}$, where 0 denotes the outside option.

3.2 Utility Specification

Product Utility. Consumer i's utility from purchasing product j in category k is:

$$u_{ij} = \alpha_{ik} + x_j'\beta_i + \gamma_i p_j + \varepsilon_{ij} \tag{1}$$

where α_{ik} is consumer i's preference for category k, x_j is a vector of product attributes (brand dummies, features), β_i is consumer i's vector of preferences for those characteristics, p_j is the price of product j, $\gamma_i < 0$ is consumer i's price sensitivity, and ε_{ij} is an idiosyncratic taste shock distributed Type I Extreme Value. We allow preferences to vary across consumers. Individual preference parameters $(\alpha_i, \beta_i, \gamma_i, \kappa_i)$ are drawn from a joint population distribution:

$$(\alpha_i, \beta_i, \gamma_i, \kappa_i) \sim F(\cdot|\theta) \tag{2}$$

where θ parametrizes its mean and the variance–covariance matrix.

Outside Option. The outside option has utility:

$$u_{i0} = \varepsilon_{i0} \tag{3}$$

where ε_{i0} is also distributed Type I Extreme Value. The outside option is normalized to have zero mean utility.

Category-Level Expected Utility. Before searching a category, consumer i does not observe the product-level shocks $\{\varepsilon_{ij}\}_{j\in\mathcal{J}_k}$. The expected purchase utility from category k, conditional on consideration, is:

$$V_{ik} = \mathbb{E}\left[\max_{j\in\mathcal{J}_k} u_{ij}\right] \tag{4}$$

Under the Type I Extreme Value assumption, expected maximum utility is equal to the inclusive value plus Euler's constant. Because this additive constant is common across consideration sets and therefore does not affect the consumer's decision, we normalize it to zero and write:

$$V_{ik} = \log\left(\sum_{j\in\mathcal{J}_k} \exp\left(\alpha_{ik} + x_j'\beta_i + \gamma_i p_j\right)\right). \tag{5}$$

3.3 Consideration Set Formation

Optimal Consideration. Consumer i chooses the consideration set that maximizes expected utility net of search costs:

$$\max_{\mathcal{C}\subseteq\mathcal{K}} \left\{\mathbb{E}\left[\max_{j\in\bigcup_{k\in\mathcal{C}}\mathcal{J}_k\cup\{0\}} u_{ij}\right] - |\mathcal{C}|\cdot\kappa_i\right\}. \tag{6}$$

Adding a category expands the set of products available to the consumer but requires paying an additional search cost κ_i. The consumer therefore considers a category when the expected utility gain from expanding the choice set is sufficient to justify this cost.

Solving the Consideration Problem. Using the inclusive values defined above, the optimal consideration set is:

$$\mathcal{C}_i^* = \arg\max_{\mathcal{C}\subseteq\mathcal{K}} \left\{\log\left(1 + \sum_{k\in\mathcal{C}} \exp(V_{ik})\right) - |\mathcal{C}|\cdot\kappa_i\right\}. \tag{7}$$

The term 1 reflects the normalized utility of the outside option. Because there are only four firearm categories, we solve the consideration problem by enumerating all 2^4 possible

consideration sets.

Intuition. Consumers with stronger preferences for a category are more likely to consider it, while consumers with lower search costs consider more categories. Search costs are not themselves a primary object of interest in our analysis. Rather, modeling consideration allows us to better recover consumers' underlying preferences, including preferences for categories they do not currently consider.

3.4 Choice Probabilities

Let $\delta_{ij} = \alpha_{ik} + x_j'\beta_i + \gamma_i p_j$ denote the deterministic component of utility. Given consideration set $\mathcal{C}_i$, the probability that consumer i chooses product j in category $k \in \mathcal{C}_i$ is:

$$P(j|\mathcal{C}_i) = \frac{\exp(\delta_{ij})}{\exp(\delta_{i0}) + \sum_{k' \in \mathcal{C}_i} \sum_{j' \in \mathcal{J}_{k'}} \exp(\delta_{ij'})}. \tag{8}$$

This is the standard multinomial logit choice probability conditional on the consumer's consideration set.

3.5 Identification

Price Sensitivity (γ_i). Price sensitivity is identified by the randomized variation in prices across choice tasks. Holding other attributes fixed, we observe how choice probabilities change with price. The coefficient γ_i measures the marginal utility of money and allows us to translate utility differences into dollar-denominated willingness-to-accept.

Attribute Preferences (β_i). Preferences over product attributes (brand, features) are identified by randomized variation in the attributes present in each choice set. For example, comparing choices across tasks that differ solely in the brand of one product reveals the preference for that brand.

Category Preferences (α_{ik}). Category preferences are identified by choices among products within and across categories, holding other attributes fixed. The relative frequency of choosing handguns vs. long guns (conditional on both being in the consideration set) identifies the category preference parameters.

Search Cost (κ_i). The search cost is identified by variation in consideration sets, *holding fixed the inclusive values of categories*. Conditional on preferences, consumers with the same inclusive values but different consideration sets must differ in their search costs: consumers who consider more categories have lower search costs.

3.6 Estimation

We estimate the model using hierarchical Bayesian methods implemented in the `bayesm` package (Rossi et al., 2005). The estimation uses Markov Chain Monte Carlo (MCMC) with a Metropolis-in-Gibbs sampler, following the approach in Moshary et al. (2025).

The hierarchical structure treats individual-level preference parameters $(\alpha_i, \beta_i, \gamma_i, \kappa_i)$ as draws from a population distribution characterized by hyperparameters θ. The Gibbs sampler alternates between: (1) drawing individual-level parameters conditional on the hyperparameters and data, using a Metropolis-Hastings step to account for the nonlinear consideration set model; and (2) drawing hyperparameters conditional on the individual-level parameters. We use the posterior draws to construct the distribution of willingness-to-accept used in the counterfactual analysis. For additional estimation details, see Appendix A.

3.7 Estimation Results Summary

Table 2 summarizes the estimated parameters for the full sample and for the gun-naïve subsample that is the focus of our counterfactual analysis.

Three features of the estimates are particularly relevant for our counterfactual analysis. First, consumers are price-sensitive, with a median price coefficient of -0.16 per \$100. This

Table 2: Estimated Model Parameters

	Full Sample			Gun-Naïve Subsample		
Parameter	Mean	Median	[5th, 95th]	Mean	Median	[5th, 95th]
Price (per $100)	−0.34	−0.16	[−1.25, −0.02]	−0.38	−0.19	[−1.41, −0.02]
Handgun intercept	0.56	0.59	[−3.55, 4.66]	0.61	0.59	[−3.40, 4.65]
Long gun intercept	0.05	0.09	[−3.64, 3.72]	−0.05	−0.09	[−3.67, 3.69]
Search cost ($)	420	126	[9, 1,659]	395	110	[8, 1,575]

Notes: Posterior distribution summaries across all respondent-draw combinations; brackets report the 5th and 95th percentiles. Category intercepts are simple averages across subcategories (4 for handguns, 10 for long guns). Search cost is converted to dollars using each draw's price coefficient. Gun-naïve households exhibit slightly higher price sensitivity and a stronger preference for handguns relative to long guns.

price sensitivity allows us to express the compensation required to induce substitution in dollar terms. Second, there is substantial heterogeneity in preferences for handguns relative to long guns. Third, search costs are meaningful, with a median of roughly $126. Thus, for some consumers who do not currently consider rifles or shotguns, inducing substitution requires overcoming a substantial cost of considering an alternative category.

4 Model Results: Status Quo

4.1 Simulation Procedure

We simulate status quo choices from the estimated model. For each respondent i and posterior draw, we compute the optimal consideration set $\mathcal{C}_i^*$, draw product-level utility shocks ε_{ij}, and record the utility-maximizing choice. We repeat this process for multiple posterior draws to integrate over parameter uncertainty. Repeating this procedure across posterior draws yields predicted market shares that integrate over both preference heterogeneity and parameter uncertainty.

4.2 Market Shares

Panel A of Table 3 reports predicted market shares for the full sample of prospective gun buyers and also for the sample of gun naïve buyers separately. In the full sample, handguns account for 58.2% of predicted choices, with pistols accounting for the largest share. Long guns account for 34.8%, while 7% choose the outside option and do not purchase a firearm.

Table 3: Status Quo Predictions: Market Shares, Consideration Sets, and Household Ownership

	Full Sample	Gun-Naive
Panel A: Predicted individual market shares		
Handguns	**58.2%**	**63.6%**
Pistol	38.3%	43.0%
Revolver	19.9%	20.6%
Long Guns	**34.8%**	**28.7%**
Semi-auto rifle/shotgun	12.2%	10.0%
Other rifle	10.1%	7.4%
Other shotgun	12.6%	11.4%
Outside Option	**7.0%**	**7.7%**
Panel B: Gun categories considered, gun-naïve handgun buyers		
Handguns only		42.3%
Handguns + long guns		57.7%
Panel C: Status quo household gun ownership		
Handgun household	39.3%	
Long-gun-only household	4.7%	
No gun	56.0%	

Notes: Panel A reports simulated individual-level market shares from the estimated model. Panel B conditions on gun-naïve respondents whose predicted choice is a handgun; the outside option (no purchase) is always available and requires no search cost. Panel C reports shares of all U.S. households, combining the model's gun-naïve predictions with incumbent-owner shares calibrated from Gallup (2020) and English (2021); the implied any-gun share is 44.0%.

Gun-naïve buyers are more likely to choose handguns than buyers in the full sample (63.6% vs. 58.2%). Correspondingly, long guns account for a smaller share of their predicted choices (28.7% compared with 34.8%). The outside-option shares are similar across the two groups (7.7% and 7.0%, respectively).

4.3 Consideration Sets

Panel B of Table 3 reports the distribution of consideration sets among gun-naïve buyers whose predicted status quo choice is a handgun. Among these buyers, 57.7% already consider both long guns and handguns. For these consumers, inducing substitution to a long gun requires compensating them for choosing a less-preferred product, but does not require expanding their consideration set. The remaining 42.3% consider only handguns. For these consumers, a subsidy must also induce them to consider long guns, although this need not increase total search costs if they substitute long guns for handguns in their consideration set.

This distinction has important implications for willingness-to-accept. For consumers who already consider long guns, WTA reflects the utility difference between the handgun and long gun, scaled by price sensitivity. For many consumers who do not consider long guns, the subsidy must also induce search.

4.4 Translation to Household-Level Ownership

Status Quo Household Ownership. To apply causal estimates of firearm ownership on mortality, we convert our individual-level market share estimates (Panel A of Table 3) into predicted household firearm ownership. We construct status quo household ownership shares by gun type as follows. The steady-state calibration in Section 2 implies that 7.9% of households are gun-naïve and in the market; we treat the remaining 36.7% of gun-owning households as incumbent gun owners whose ownership predates the current period. We allocate incumbent households between handgun owners and long-gun-only owners using ownership ratios from the 2021 National Firearms Survey (English, 2021), yielding baseline shares of approximately 30.4% handgun households and 6.3% long-gun-only households. We then add the gun-naive households' predicted choices from our demand model to obtain the status quo ownership shares reported in Panel C of Table 3.

In our policy counterfactuals, we connect simulated changes in individual purchases to

changes in ownership shares as follows. Let s_{HG}^{gn} denote the share of gun-naïve households choosing handguns. A policy that reduces this share by Δs changes household-level handgun ownership by:

$$\Delta(\text{HG households}) = f_{gn} \cdot \Delta s \tag{9}$$

where $f_{gn} = 0.079$ is the fraction of households that are gun-naïve and in the market. For example, reducing the handgun share among gun-naïve households from 63.6% to 50% implies a 1.07 pp reduction of the household-level handgun ownership share.

4.5 Summary and implications for counterfactuals

The estimated model implies that 63.6% of gun-naïve households would choose handguns in the status quo, quantifying the margin targeted by our counterfactual policies. The estimates also reveal substantial heterogeneity in consideration sets. Some handgun buyers already consider long guns, so inducing substitution requires only compensating them for choosing a less-preferred product. For others, compensation must also induce them to consider the long gun category.

The next section uses the predicted market shares and substitution patterns to evaluate the cost and mortality effects of compensation-based policies.

5 Counterfactual Analysis

This section evaluates compensation-based policies that reduce handgun purchases. We first define willingness to accept for substitution away from handguns. We then present a mortality model that translates changes in gun ownership into averted firearm homicides. We use these components to compare two policy scenarios: perfect targeting and uniform subsidies.

5.1 Willingness to Accept

Willingness to accept (WTA) is the minimum payment required to induce a household that would choose a handgun in the status quo to instead choose a less lethal alternative, either a long gun or the outside option. Our main analysis takes a post-consideration perspective: consumers have already formed their consideration sets when the subsidy is introduced, but may expand those sets in response to the subsidy before deciding whether—and what—to purchase. This perspective reflects the consumers in our sample, who are already in the market for a firearm and have therefore likely considered some alternatives before the policy is introduced. In the appendix, we also estimate counterfactuals from a pre-consideration perspective, in which consumers learn about the subsidy before forming their consideration sets. We view this case as potentially more relevant for the long-run effects of a permanent policy.

First, consider substitution to a long gun. Let $U_i^{HG}(\mathcal{C}_i)$ denote consumer i's utility from their preferred handgun among the options in their consideration set $\mathcal{C}_i$. When $\mathcal{C}_i$ contains a long gun, let $U_i^{LG}(\mathcal{C}_i)$ denote their utility from the preferred long gun in $\mathcal{C}_i$. A subsidy s for choosing an alternative to a handgun raises the utility of each long-gun option by $-\gamma_i s$, where $\gamma_i < 0$ is price sensitivity.

For consumers whose status quo consideration set $\mathcal{C}_i$ contains a long gun, one route to substitution is simply to make the preferred long gun already considered more attractive than the preferred handgun. The minimum payment required along this route is the monetized utility gap:

$$\frac{U_i^{HG}(\mathcal{C}_i) - U_i^{LG}(\mathcal{C}_i)}{-\gamma_i}. \tag{10}$$

The subsidy may also make it worthwhile to search one or more additional long-gun categories by raising their inclusive values. Because the subsidy is paid for the outside option as well, it also raises the value of the consumer's existing choice set; the consumer's search decision weighs both effects. For consumers who do not initially consider any long guns, only this

search-expansion route to substitution to a long gun is available. Numerically, we find the smallest subsidy at which the consumer chooses a long gun rather than a handgun, accounting for any expansion of the consideration set induced by the subsidy. We define this minimum subsidy as WTA_i^{LG}.

The outside option encompasses both non-purchase and alternatives to firearms not explicitly modeled in the conjoint (e.g., a Taser). Because the outside option is always in the consumer's consideration set, no additional search is required. Let U_i^{out} denote its utility. The minimum subsidy to induce a switch to the outside option is:

$$\text{WTA}_i^{out} = \frac{U_i^{HG}(\mathcal{C}_i) - U_i^{out}}{-\gamma_i}. \tag{11}$$

The consumer's overall WTA to switch away from a handgun purchase is the minimum of the two:

$$\text{WTA}_i = \min\left\{\text{WTA}_i^{LG}, \text{WTA}_i^{out}\right\}. \tag{12}$$

The consumer switches to whichever alternative requires the smaller subsidy. Let $d_i \in \{\text{LG}, \text{out}\}$ denote the switch destination:

$$d_i = \begin{cases} \text{LG} & \text{if } \text{WTA}_i^{LG} < \text{WTA}_i^{out} \\ \text{out} & \text{otherwise.} \end{cases} \tag{13}$$

Our estimates imply that, among status quo handgun buyers, 78.2% have a long gun as their minimum-WTA alternative and 21.8% have the outside option.

5.2 WTA Distribution

Figure 1 plots the distribution of WTA among gun-naïve handgun buyers. The distribution is highly right-skewed: the median consumer requires $815 to switch, while the mean requires $2,118 due to a long right tail (the 25th and 75th percentiles are $295 and $2,121, and the

95th percentile is $8,055). This skewness implies that many consumers can be induced to switch away from handguns at modest cost, but reaching the most committed handgun buyers is expensive.

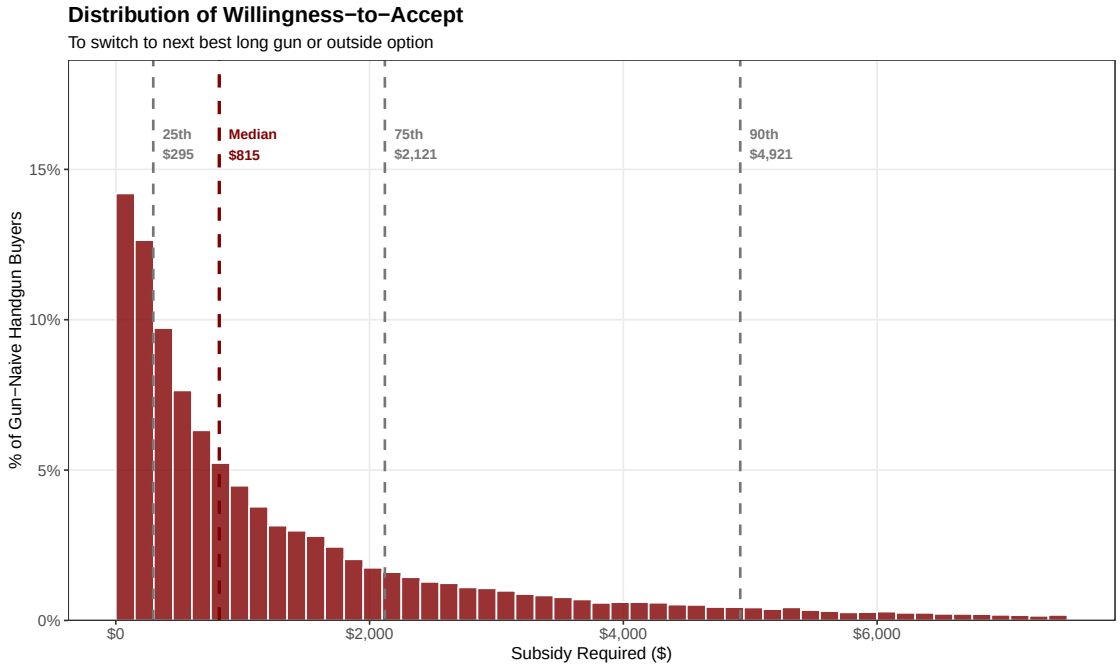


Figure 1: Distribution of Willingness to Accept Among Gun-Naïve Handgun Buyers

5.3 From Ownership to Homicides: The Mortality Model

To translate changes in gun ownership into averted homicides, we model homicides as a function of gun ownership with constant elasticity:

$$H = H_0 \cdot \left(\frac{G}{G_0}\right)^{\varepsilon} \tag{14}$$

where H denotes homicides, G the share of households owning a firearm, subscript 0 denotes status quo values, and ε is the elasticity of homicides with respect to gun ownership. This specification implies that a 1% increase in gun ownership leads to an ε% increase in homicides.

We calibrate the elasticity at $\varepsilon = 0.2$. Prior work, including Duggan (2001) and Cook

and Ludwig (2006), places the extensive-margin elasticity in the range of 0.1 to 0.3.[7] Our counterfactual likewise focuses on the extensive margin, making these estimates appropriate for our setting.

Our analysis focuses on homicides as a measure of harm. Gun ownership may generate additional externalities—including non-fatal injuries and psychological trauma—that are serious and consequential but not captured in our model. These outcomes are important in their own right and could be incorporated into a similar framework with appropriate data.

A natural concern is whether policies targeting legal first-time buyers can meaningfully affect homicide rates, given the association between gun violence and criminal activity. However, many homicides occur between people who know one another, including intimate partners, family members, friends, and acquaintances (Bureau of Justice Statistics, 2022). Thus, reductions in homicide need not operate through changes in access to firearms through criminal markets. Changes in the weapons available within households can also affect the lethality of domestic disputes and other interpersonal conflicts that escalate to violence. This "instrumentality" effect, whereby weapon lethality shapes the probability of death conditional on a violent incident, is well documented in the public health literature (Braga and Cook, 2018). Legal first-time buyers are precisely the population for whom this household weapon-choice margin matters.

Because handguns account for the majority of homicides, consistent with their ease of concealment and use in close-quarters confrontations, we specify separate elasticities by firearm type, applying the same constant-elasticity form to each category: $H_{HG} = H_{HG,0}\left(G_{HG}/G_{HG,0}\right)^{\varepsilon_{HG}}$ for handgun homicides and $H_{LG} = H_{LG,0}\left(G_{LG}/G_{LG,0}\right)^{\varepsilon_{LG}}$ for long gun homicides, where G_{HG} and G_{LG} denote handgun and long-gun-only household shares.

Two Scenarios. We consider two scenarios for the relative effects of handgun and long gun ownership on homicide. The optimistic scenario ($\varepsilon_{HG} = 0.22$, $\varepsilon_{LG} = 0$) reflects the

[7] Duggan (2001) proxies for gun prevalence using magazine subscriptions, capturing changes in ownership driven by legal acquisition rather than criminal markets. Cook and Ludwig (2006) proxies for gun ownership with the fraction of suicides using a firearm.

view that handguns are disproportionately associated with homicide risk, while long guns contribute relatively little (and under this assumption, any contribution of long-guns is non-incremental). The pessimistic scenario ($\varepsilon_{HG} = \varepsilon_{LG} = 0.2$) instead assumes that long guns present an equal proportional effect as handguns. It is worth noting that this still implies that long guns present a much smaller absolute effect because the baseline homicide rate per long gun is lower than the corresponding rate for handguns.[8]

Both scenarios interpret the disparity between handgun and long gun homicide rates as reflecting a *treatment* effect of weapon type: a given individual switching from a handgun to a long gun causes a decreased risk of homicide. This interpretation is consistent with the physical differences between handguns and long guns and with evidence that many homicides arise from escalated interpersonal conflicts, where weapon type can determine whether an incident becomes fatal (Cook and Ludwig, 2000).[9]

If differences in homicide rates instead reflect selection into weapon type, this calibration would overstate the mortality benefits of substitution. In the extreme, if long guns were equally or more lethal for the relevant marginal buyers, substitution could yield little reduction in homicides or even increase them. This distinction also clarifies the role of different margins: if long guns are less lethal than handguns, both substitution to long guns and movement to the outside option reduce homicides, whereas if lethality differences are small, the extensive margin drives the results.

A more difficult concern is selection on characteristics we do not observe. The accuracy of our mortality-benefit calculation depends on whether the handgun buyers induced to switch have similar homicide risk to other handgun buyers. We do not observe the joint distribution of WTA and violence risk, so we cannot determine the magnitude or direction of this selection

[8]The value 0.22 preserves the calibrated aggregate response when the entire effect is attributed to handguns. For a proportional change in gun ownership, the aggregate elasticity is the homicide-share-weighted average of the category elasticities, $\varepsilon = \frac{H_{HG,0}}{H_0}\varepsilon_{HG} + \frac{H_{LG,0}}{H_0}\varepsilon_{LG}$. Setting $\varepsilon_{LG} = 0$ and solving gives $\varepsilon_{HG} = 0.2 \times 17{,}609/16{,}024 = 0.22$. The pessimistic scenario, $\varepsilon_{HG} = \varepsilon_{LG} = 0.2$, reproduces the aggregate elasticity directly.

[9]Further evidence that most firearms are not purchased with criminal intent is that the median time from retail sale to recovery at a crime scene is approximately nine years (Bureau of Alcohol, Tobacco, Firearms, and Explosives).

from our data. One reason selection could matter is that consumers contemplating a handgun purchase for an imminent criminal purpose may be both less willing to substitute and less likely to participate in a survey such as ours, which would tend to make marginal switchers lower risk than other handgun buyers. At the same time, homicide risk need not reflect criminal intent at the time of purchase: firearms recovered in connection with crimes are often recovered years after their initial retail sale. Appendix E examines the more limited question of how selection of switchers on observable characteristics affects the estimates.

Averted Homicides Calculation. A policy that changes the household handgun ownership share from $G_{HG,0}$ to G'_{HG} and long-gun-only ownership share from $G_{LG,0}$ to G'_{LG} averts:

$$\text{Averted homicides} = \left[H_{HG,0} - H_{HG,0} \cdot \left(\frac{G'_{HG}}{G_{HG,0}}\right)^{\varepsilon_{HG}}\right] - \left[H_{LG,0} \cdot \left(\frac{G'_{LG}}{G_{LG,0}}\right)^{\varepsilon_{LG}} - H_{LG,0}\right]. \tag{15}$$

The first bracket captures deaths averted through a reduction in handgun ownership; the second captures additional deaths from increased long-gun ownership (if $\varepsilon_{LG} > 0$).

A Note on the Mechanism. Our counterfactual assumes that gun-naïve households have approximately unit demand over the horizon relevant for the policy: a household induced to substitute from a handgun to a long gun does not subsequently purchase the handgun it was paid to forgo. In our survey, gun-naïve households overwhelmingly cite personal safety as the concern motivating their purchase. Acquiring a long gun or another protective alternative, such as a Taser, may meet that need, reducing the incremental value of additional firearms. The analogy to home security systems is useful: one suffices. To the extent consumers continue to value an additional handgun even after acquiring a long gun, our counterfactual would overstate the reduction in handgun ownership.

5.4 Perfect Targeting

The planner offers each gun-naïve status quo handgun buyer their exact WTA to switch away from a handgun purchase. Under perfect targeting, a consumer with willingness to accept WTA_i receives exactly this amount and is therefore indifferent between purchasing a handgun and switching to an alternative. The transfer itself is not a social cost: the payment received by the consumer is offset by the cost to the government. The welfare cost of inducing the consumer to switch is instead the foregone consumer surplus, WTA_i, together with the excess burden λWTA_i associated with financing the transfer, for a total social cost of $(1+\lambda)\text{WTA}_i$. We set $\lambda = 0.25$, the marginal excess burden of taxation prescribed for federal benefit-cost analysis (Office of Management and Budget, 2023) and at the conservative end of classic general-equilibrium estimates (Ballard et al., 1985).

For a policy inducing the n consumers with the lowest WTA to switch, government expenditures are

$$G_A(n) = \sum_{i=1}^{n} \text{WTA}_{(i)}, \tag{16}$$

where $\text{WTA}_{(i)}$ is the ith order statistic. The associated welfare cost is $(1+\lambda)G_A(n)$. Perfect targeting minimizes the government expenditure required to achieve a given level of substitution and therefore provides a lower bound on the fiscal cost of such a policy.

In constructing this benchmark, we target compensation based solely on consumers' WTA to switch away from handguns. The planner observes each prospective handgun buyer's WTA and induces buyers to switch in order of WTA. Switch destinations may affect the resulting mortality consequences but not the targeting rule. This reflects the object of the policy exercise—reducing handgun purchases—rather than solving for the unconstrained policy that minimizes firearm mortality.

Given this targeting rule, the remaining question is how far up the WTA distribution the planner should proceed. We characterize the optimal policy by comparing these welfare costs with the homicide mortality benefits of inducing consumers to switch away from handgun

purchases. We use a value of statistical life (VSL) of $13 million, rounding down the $13.1 million central estimate in current federal regulatory guidance (U.S. Department of Health and Human Services, 2024).

We take the constant-elasticity mortality specification literally as firearm ownership changes.[10] In this case, the mortality benefit of a substitution is not constant: reducing handgun ownership changes the mortality benefit of subsequent reductions, while substitution toward long guns changes long gun ownership and therefore, in the pessimistic scenario, the mortality consequences of subsequent increases. We therefore determine the optimal stopping point numerically. Ordering consumers by WTA, let (H_n, L_n) denote handgun and long gun ownership after inducing the first n consumers to switch. For each candidate stopping point n, we calculate

$$W(n) = \text{VSL}\left[M(H_0, L_0) - M(H_n, L_n)\right] - (1+\lambda)\sum_{i=1}^{n} \text{WTA}_{(i)}, \tag{17}$$

where $M(H, L)$ is given by the constant-elasticity mortality specification. The optimal stopping point is

$$n^* = \arg \max_{n \in \{0,\ldots,N\}} W(n). \tag{18}$$

This approach allows the mortality consequences of substitution to evolve with firearm ownership and does not require the marginal-benefit and marginal-cost schedules to cross only once.

A side effect of the constant-elasticity specification with $\varepsilon < 1$ is that homicides per handgun-owning household rise as handgun ownership falls. Because buyers are induced to switch in order of WTA, this is consistent with harder-to-induce handgun buyers posing greater homicide risk. This is not true if we use a local-linear approximation to the homicide-ownership relationship, where the marginal homicide effect of reducing handgun ownership is unchanged as ownership falls. As we lack direct evidence on the shape of the homicide-

[10] In Appendix C we show that our results are robust to using a local linear approximation to the constant-elasticity formulation.

ownership relationship, we report both, with the constant elasticity in the main text and local-linear approximation in Appendix C.

The first two columns of Table 4 report optimal policies under alternative assumptions about long gun homicide elasticities. Throughout, we summarize cost-effectiveness by the *net cost per averted death*: the welfare cost of the policy—forgone consumer surplus plus the excess burden of financing the payments, with transfers counted at zero—divided by averted homicides. In both cases, the optimal targeted policy is cost-effective: the net cost per averted death ($5.5–5.9 million) falls well below the $13 million VSL. Under the more optimistic assumption, the optimal policy operates at a larger scale because increases in long gun ownership do not offset the mortality benefits of reducing handgun ownership. Deaths averted rise steeply at low subsidy levels and flatten well before full diversion; under the optimistic elasticities, a $5,000 maximum subsidy (nearly seven times the optimum) would less than double the deaths averted. Appendix G displays the full curves under both elasticity assumptions.

5.5 Uniform Subsidy

If the planner cannot observe individual WTA, they must offer the same subsidy S to everyone who chooses a long gun or the outside option (e.g., a Taser).[11] Because both alternatives receive the same subsidy, the policy does not induce substitution between long guns and the outside option; their relative attractiveness remains unchanged.

Under a uniform subsidy S, three types of households receive the subsidy: switchers (households induced to switch away from handguns), inframarginal long-gun buyers, and inframarginal outside-option buyers. Accordingly, the total government expenditure is:

$$G_B(S) = S \cdot \left(N_{\text{switch}}(S) + N_{LG}^{\text{orig}} + N_{out}^{\text{orig}} \right). \tag{19}$$

[11] Our counterfactual assumes that eligibility for payments conditional on choosing the outside option, including non-purchase, can be verified. As a benchmarking exercise, we abstract from the administrative and enforcement challenges involved in implementing such payments.

Table 4: Optimal Subsidies: Targeted vs. Uniform

	Targeted Subsidies		Uniform Subsidies	
	$\varepsilon_{LG} = 0$	$\varepsilon_{LG} = 0.2$	$\varepsilon_{LG} = 0$	$\varepsilon_{LG} = 0.2$
Optimal subsidy	\$745	\$330	\$412	\$178
Mean (median) subsidy paid	\$310 (\$278)	\$156 (\$152)	\$412	\$178
% switching	47.5%	27.3%	32.4%	16.0%
Averted deaths	220	60	148	35
Government expenditure	\$0.97B	\$0.28B	\$2.43B	\$0.86B
Net cost per life	\$5.5M	\$5.9M	\$6.8M	\$8.7M
Net welfare gain	\$1.64B	\$0.43B	\$0.91B	\$0.15B
Positive net welfare?	**Yes**	**Yes**	**Yes**	**Yes**

Notes: For targeted subsidies, the optimal subsidy is the maximum payment; each switcher receives exactly their willingness to accept. Under the uniform subsidy every recipient, including inframarginal long gun and outside-option buyers, receives the same payment. Net cost counts transfers at zero: it equals forgone switcher surplus plus the excess burden ($\lambda = 0.25$) on total government expenditure; for targeted subsidies payments equal WTA exactly, so net cost is $(1 + \lambda)$ times expenditure. Expenditure per averted death under the uniform subsidy is \$16.4 million (optimistic) and \$24.3 million (pessimistic); the difference from net cost reflects windfall and overcompensation transfers.

Relative to perfect targeting, a uniform subsidy requires greater expenditure to induce a given amount of substitution for two reasons. First, switchers receive the common subsidy S even when their WTA is substantially lower. Second, inframarginal buyers receive the subsidy even though their behavior is unchanged. Our predicted market shares imply that these windfall payments can be substantial. Among gun-naïve households, the predicted status quo long gun share is 28.7% and the predicted outside option share is 7.7%; any uniform subsidy therefore provides payments to these 36.4% of gun-naïve households whose behavior is unchanged. Total welfare under subsidy S is therefore

$$W_B(S) = \text{VSL}\left[M(H_0, L_0) - M(H_S, L_S)\right] - \sum_{i:\,\text{WTA}_i \le S} \text{WTA}_i - \lambda G_B(S), \tag{20}$$

where (H_S, L_S) denotes handgun and long-gun ownership under subsidy S. We choose the subsidy S that maximizes $W_B(S)$. Unlike under perfect targeting, increasing the subsidy

raises payments not only to newly induced switchers but also to all inframarginal recipients, making additional substitution increasingly costly to finance.

The third column of Table 4 reports the optimal uniform subsidy under optimistic elasticity assumptions. The optimal uniform subsidy of $412 induces fewer handgun buyers to switch than perfect targeting (32.4% vs. 47.5%) and averts fewer deaths (148 vs. 220), yet requires two and a half times the government expenditure ($2.43B vs. $0.97B). Expenditure per averted death, at $16.4 million, exceeds the VSL; most of that expenditure, however, consists of transfers to inframarginal recipients and to switchers compensated beyond their WTA. The net social cost per averted homicide is $6.8 million, below the $13 million VSL, so the policy raises welfare—but the wedge between the fiscal and welfare cost is itself economically meaningful: the policy requires financing a $2.43 billion program in which most dollars flow to households whose behavior is unchanged. The optimum maximizes $W_B(S)$ on a grid of candidate subsidy levels; Appendix F discusses the numerical construction of the marginal cost and benefit schedules.

Table 5 decomposes program expenditures at the optimum. Only 36% of payments go to switchers, totaling $0.88 billion, compared with their collective WTA of $0.41 billion. The remaining 64% goes to inframarginal long-gun and outside-option buyers.

Table 5: Cost Decomposition: Uniform Subsidy at $412

Component	Cost	% of Total
Payment to switchers	$0.88 billion	36%
Windfall to LG buyers	$1.23 billion	50%
Windfall to outside buyers	$0.33 billion	14%
Total	**$2.43 billion**	100%

Under the pessimistic elasticity assumption ($\varepsilon_{LG} = 0.2$), the optimal uniform subsidy falls to $178, inducing 16% of handgun buyers to switch and averting 35 deaths. The mortality benefit from inducing a handgun buyer to switch is substantially smaller because most switchers substitute toward long guns, which reduce, but do not eliminate, gun homicide

risk under this assumption. The net social cost per averted death rises to $8.7 million—still below the VSL, but half again the targeted policy's $5.9 million—while expenditure per averted death reaches $24.3 million, nearly twice the VSL. The composition of spending also deteriorates: at the pessimistic optimum, 78% of the $0.86 billion outlay is windfall to inframarginal buyers.

5.6 Information Rents

Table 4 highlights the value of information for targeting. For a given share of handgun buyers induced to switch, a uniform subsidy requires 5–6 times as much government expenditure as perfect targeting. The gap arises because limited information forces the planner to pay both information rents to switchers whose WTA lies below the subsidy and windfall payments to households whose behavior is unchanged. Because these rents are transfers, most of the gap is not a resource cost—but every transfer must be financed through distortionary taxation, and the transfers accrue to gun-purchasing households, which may complicate the politics of such a program.

The consequences for the optimal policy are substantial. Relative to perfect targeting, the inability to observe individual WTA reduces the optimal scale of the policy, raises the net cost of the homicide reductions achieved, and substantially increases the government expenditure required to achieve them.

We illustrate these forces in two figures. Figure 2 shows that the optimal uniform subsidy reaches only the left tail of the WTA distribution, whereas perfect targeting induces substitution much further into the distribution. Figure 3 plots marginal benefit and marginal cost curves for both policy regimes. The marginal benefit curves (maroon for optimistic, gray for pessimistic) are identical across policies, as they depend only on the mortality consequences of inducing additional handgun buyers to switch. The marginal cost curves differ sharply: under perfect targeting (Scenario A), the marginal welfare cost reflects the WTA of the marginal switcher together with the excess burden of financing the targeted payment.

Under a uniform subsidy (Scenario B), raising the subsidy also increases payments to inframarginal recipients and to switchers whose WTA lies below the subsidy. The gap between the marginal cost curves captures the additional cost created by the planner's inability to observe individual preferences.

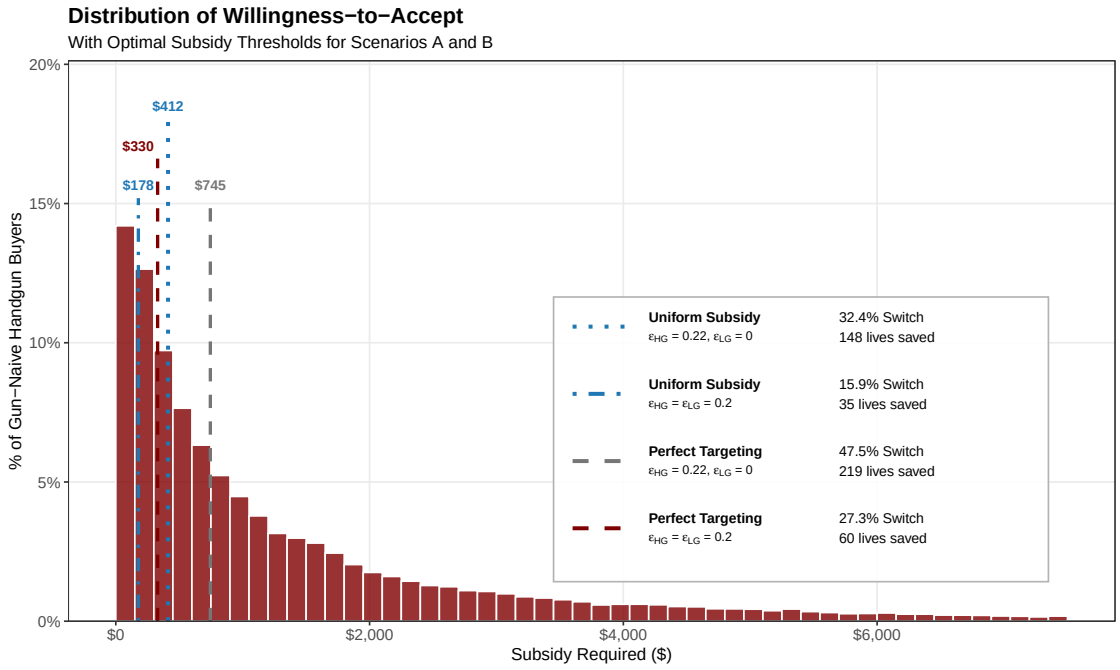


Figure 2: WTA Distribution with Optimal Subsidy Thresholds (Scenarios A and B)

5.7 Summary of Results

Our counterfactual analysis yields two main findings. First, compensation can reduce handgun purchases at welfare costs below the value of the resulting reduction in homicide under both mortality scenarios. Second, the effectiveness and fiscal scale of compensation-based policy depend heavily on targeting. Uniform subsidies generate information rents to both inframarginal recipients and low-WTA switchers, reducing the optimal scale of the policy and substantially increasing the government expenditure required to achieve a given amount of substitution. These rents are transfers rather than resource costs, but they are a defining feature of the policy's political economy because a large share of publicly financed payments

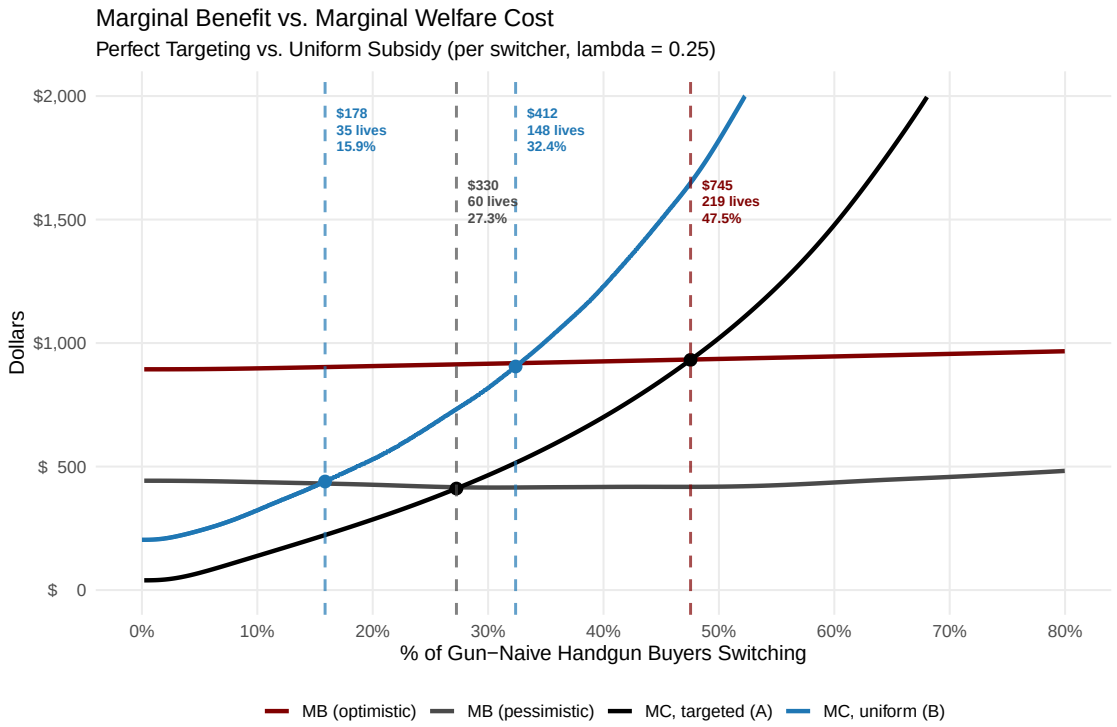


Figure 3: Marginal Benefit and Marginal Cost Curves (Scenarios A and B)

goes to households whose behavior is unchanged. These results suggest that even partial screening mechanisms that improve the alignment between payments and consumers' WTA may yield substantial gains over a uniform subsidy.

6 Conclusion

Gun violence remains one of America's most intractable policy challenges. This paper studies an alternative approach: compensation rather than prohibition. We ask whether the mortality benefits of inducing prospective handgun buyers to choose less lethal alternatives exceed the welfare costs of changing their choices and financing the expenditures required to do so. We also examine how the viability of compensation-based policy depends on the government's ability to target payments based on heterogeneity in consumers' willingness to accept.

Our analysis yields three main findings. First, targeted compensation is cost-effective

under either assumption about the relationship between long-gun ownership and homicide. Under the pessimistic assumption, the optimal targeted policy averts 60 homicides annually at a net social cost of approximately $5.9 million per averted homicide; under the optimistic assumption, it averts 220 homicides at approximately $5.5 million each. Both are well below the $13 million VSL and generate substantial net welfare gains. Second, targeting materially improves policy performance. Relative to the optimal uniform subsidy, the optimal targeted policy averts roughly 50% more homicides while requiring only 40% of the government expenditure. Uniform subsidies must make excess payments to low-WTA switchers and windfall payments to inframarginal buyers, raising the net cost per averted homicide by roughly 25–50%. Third, these results make information about preference heterogeneity central to the viability of compensation-based policy. The ability to distinguish buyers by the compensation required to change their behavior sharply reduces the fiscal cost of achieving a given behavioral response and avoids large transfers to households whose behavior is unchanged, a feature that may matter as much politically as economically.

We do not propose a specific policy implementation. Our contribution is instead to provide a benchmark for both policy design and the current equilibrium. The results indicate substantial potential welfare gains from inducing substitution away from handguns even when compensating participating consumers for their private losses. Their failure to be realized therefore points beyond consumer preferences alone toward the practical, informational, political, and legal barriers to implementation documented throughout the paper.

More broadly, our analysis suggests scope for policies that address the underlying needs motivating firearm purchases rather than restricting firearm ownership itself. Gun-naïve households overwhelmingly cite personal safety as the concern motivating their purchase, and a substantial share of prospective handgun buyers are willing to substitute to a long gun or the outside option for relatively modest compensation. Together, these findings suggest that many prospective buyers may value the protection they associate with firearm ownership more strongly than the handgun itself. This leaves scope for demand-side policies that direct

consumers toward alternatives capable of meeting that need while posing lower social costs.[12]

Several limitations point to directions for future research. Our analysis relies on stated-choice data because transaction data that would allow us to estimate firearm demand from realized purchases are not available. As with any stated-choice design, reported choices may not fully reflect realized behavior. We focus on partial equilibrium effects, abstracting from responses through secondary markets, supply-side pricing, and criminal acquisition. Implementation would also raise additional issues around verification, arbitrage, and fraud that we do not address. Finally, intermediate policy designs between perfect WTA targeting and uniform subsidies—partial screening, menu-based approaches, conditional subsidies—might capture some of the gains from targeting while remaining more feasible to implement.

[12]Potential alternatives include non-lethal firearms, home security systems, or community safety programs. In particular, non-lethal firearms such as the Byrna, a CO2-powered launcher that fires pepper balls and other non-lethal projectiles, offer a form factor similar to handguns while posing far lower mortality risk. Alsan et al. (2026) document potential consumer interest in such alternatives.

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A Estimation Details

This appendix provides technical details on the estimation of the search cost demand model. The exposition follows Moshary et al. (2025), which develops the full model and estimation procedure.

Model Setup. Consumers know their category-level preferences β_i' but must incur search cost γ_i to learn their idiosyncratic match ε_{ijt} for all models in a category. We impose a sign restriction so that $\gamma_i \geq 0$ for all consumers.

Inclusive Value. The inclusive value for category l for individual i is:

$$IV_{il} = \ln \left[\sum_{k \in l} \exp(X_k' \beta_i - \alpha_i \cdot \bar{p}_k) \right] \tag{21}$$

where $\bar{p}_k$ is the average price in category k.

Consideration Set Constraints. With four firearm categories, each consumer chooses one of the following consideration sets: (1) most preferred category only, (2) most and second-most preferred, (3) all but least preferred, or (4) all categories. The model implies the following revealed preference constraints for consideration set l_i:

$$IV_{il} \geq IV_{i,l+1} - \exp(\gamma_i) \tag{22}$$

$$IV_{il} - \exp(\gamma_i) \geq IV_{i,l-1} \tag{23}$$

$$\min_{c \in l_i} IV_{ic} \geq \max_{c \notin l_i} IV_{ic} \tag{24}$$

The first two inequalities ensure that the respondent does weakly worse by considering one more or fewer category. The third ensures that the worst considered category is weakly preferred to the best non-considered category.

Modified Likelihood. The likelihood is modified to include an indicator that the consideration set constraints hold:

$$P(y_{it}|\theta_i) = s_{ijt} \cdot P(\mathcal{C}_t|l_i) \cdot \mathbf{1}\{l_i|\theta_i\} \tag{25}$$

where s_{ijt} is the standard logit probability, $P(\mathcal{C}_t|l_i)$ is the probability of observing choice set $\mathcal{C}_t$ given stated consideration set l_i, and $\mathbf{1}\{l_i|\theta_i\}$ indicates that the consideration set constraints are satisfied.

Identification. To estimate the distribution of search costs, the conjoint includes choice tasks where respondents evaluate firearms from categories outside their stated consideration set. For each non-considered category (of which there may be up to three), one of the seven choice tasks is randomly selected to feature an alternative from that non-considered category. In 13.3% of these tasks, respondents choose the non-considered alternative, providing the identifying variation.

Hierarchical Prior. The search cost model uses the following priors:

$$V_\theta \sim IW(\nu, V) \tag{26}$$

$$\text{vec}(\Delta)|V_\theta \sim N(\text{vec}(\bar{\Delta}), V_\theta \otimes 100 \cdot I) \tag{27}$$

where $u_i \sim MVN(0, V_\theta)$.

MCMC Algorithm. The estimation proceeds as follows:

1) **Initialize.** For each respondent, run a separate logit based on the stated consideration set to obtain initial $\hat{\beta}_i$. For non-considered categories, draw from the truncated distribution satisfying the inequality constraints.

2) **Metropolis Step for θ.** For each respondent i, generate candidate draws $\tilde{\theta}_i \sim$

$MVN(\theta_{i(s)}, b^2 V_{\theta(s)})$ where $b = 0.66$ is a scaling parameter. Accept with probability:

$$a = \min \left\{ 1, \frac{P(Y|\tilde{\theta}_i) P(\tilde{\theta}_i|\Delta_{(s)}, V_{\theta(s)})}{P(Y|\theta_{i(s)}) P(\theta_{i(s)}|\Delta_{(s)}, V_{\theta(s)})} \right\} \tag{28}$$

3) **Gibbs Step for Δ, V.** Draw hyperparameters from their conditional distributions:

$$\text{vec}(\Delta_{(s+1)})|V_{(s)}, \vec{\theta}_{(s+1)} \sim N\left((Z'Z + 0.01 \cdot I)^{-1}(Z'\theta_{(s+1)} + 0.01 \cdot \text{vec}(\bar{\Delta})), V_{(s)} \otimes (Z'Z + 0.01 \cdot I)^{-1}\right) \tag{29}$$

$$V_{(s+1)}|\Delta_{(s)}, \vec{\theta}_{(s+1)} \sim IW(\nu + n, V + S) \tag{30}$$

where $S = (\theta - Z\tilde{\Delta})'(\theta - Z\tilde{\Delta}) + 0.01 \cdot (\tilde{\Delta} - \bar{\Delta})'(\tilde{\Delta} - \bar{\Delta})$ and $\tilde{\Delta} = (Z'Z + 0.01 \cdot I)^{-1}(Z'\theta + 0.01 \cdot \bar{\Delta})$.

4) Return to step 2.

MCMC Details. The Markov chain is run for 500,000 iterations with a burn-in of 50,000 draws. We retain every 500th draw, yielding 900 posterior draws.

B Ex-Ante Willingness to Accept

This appendix presents an alternative computation of willingness to accept based on an ex-ante criterion in which the consumer is aware of the subsidy before choosing which firearm categories to search. The main text computes WTA under an ex-post "can't unsearch" interpretation: the consumer has already searched their status quo categories, and the subsidy can only add long gun categories to the consideration set. The ex-post interpretation therefore implies a consumer continues to consider any handgun category they would have chosen to consider absent the subsidy. This section instead allows the consumer to re-optimize search given the subsidized inclusive values, potentially dropping handgun categories entirely.

Methodology. Under the ex-ante interpretation, the consumer re-optimizes their consideration set from scratch given the subsidized long gun inclusive values. Let $\mathcal{C}^*(D)$ denote the consumer's optimal consideration set when long gun inclusive values are scaled by the subsidy, i.e., $\widetilde{IV}_{ik} = IV_{ik} \cdot \exp(|\gamma_i| \cdot D)$ for each long gun category k, and the consideration set is determined by the greedy search algorithm with first-free search costs. We define the ex-ante WTA as the minimum D such that the consumer is diverted from purchasing a handgun through one of two paths:

- **Path A:** If no handgun category appears in $\mathcal{C}^*(D)$, the consumer never searches handguns and therefore never observes the product-level shocks ε_{ij} for handgun products. The consumer is diverted regardless of whether they ultimately choose a long gun or the outside option.

- **Path B:** If a handgun category remains in $\mathcal{C}^*(D)$, the consumer observes the corresponding handgun product shocks. The consumer is diverted if either the best subsidized long gun or the subsidized outside option exceeds the realized utility of the preferred considered handgun:

$$\max\left\{\max_{j\in LG\cap\mathcal{C}^*(D)}\left(U_{ij}+|\gamma_i|D\right),\ U_i^{out}+|\gamma_i|D\right\} > U_i^{HG}\left(\mathcal{C}^*(D)\right). \tag{31}$$

We compute D by binary search to \$0.01 precision.

Results. Figure B.1 plots the ex-ante WTA distribution and Figure B.2 shows averted homicides under the optimistic elasticity specification. The ex-ante WTA distribution is shifted modestly to the left relative to the main results. Table B.1 reports the Scenario A results.

Table B.1: Scenario A: Perfect Targeting (Ex-Ante WTA)

	Optimistic ($\varepsilon_{HG} = 0.22$, $\varepsilon_{LG} = 0$)	Pessimistic ($\varepsilon_{HG} = \varepsilon_{LG} = 0.2$)
% of HG buyers switching	49.7%	29.0%
Maximum subsidy	\$748	\$329
Averted deaths	230	61
Government expenditure	\$1.00 billion	\$0.29 billion
Net cost per life	\$5.4 million	\$6.0 million

Under perfect targeting, the ex-ante WTA averts more homicides (230 vs. 220 under the optimistic scenario) at similar net cost per averted death. The mean ex-ante WTA is \$1,990 (vs. \$2,118 for ex-post), the median is \$755 (vs. \$815), and 79.6% of switchers go to long guns (vs. 78.2%). The maximum subsidy at the optimum is nearly identical (\$748 vs. \$745).

Under uniform subsidies (Scenario B), the optimistic optimal subsidy is \$412, inducing 34.3% of handgun buyers to switch and averting 157 homicides at a net cost of \$6.6 million per averted death; under the pessimistic elasticity the optimum is \$178, averting 37 homicides at \$8.7 million each. Both match the main-text optima closely. Figure B.3 displays the marginal benefit and marginal cost curves.

Discussion. The ex-ante and ex-post WTA distributions are highly correlated (correlation = 0.99), and the qualitative conclusions of the paper are unchanged under the alternative criterion. Both interpretations are defensible from different modeling perspectives. The ex-post interpretation corresponds to a setting where the consumer has already incurred the cost of searching their status quo categories and cannot undo that search; the subsidy can only expand the consideration set. The ex-ante interpretation corresponds to a setting where the consumer has not yet committed to any search and re-optimizes given the subsidized inclusive values, consistent with the search cost model's timing assumptions. Under the ex-

ante criterion, consumers who would drop handguns from their consideration set entirely are diverted at lower cost (Path A), while those who would retain a handgun category face the analogous requirement evaluated within the re-optimized consideration set: the subsidized alternative must beat the preferred handgun the consumer would actually encounter (Path B). For a consumer who retains the category of their status quo choice, this is exactly the main text's comparison; for the minority whose re-optimized set drops the chosen category but retains the other handgun category, the relevant comparison is against the weakly less attractive retained handgun. The fact that results are robust to this choice reinforces the paper's main conclusions about the gains from inducing substitution and the informational constraints on realizing them.

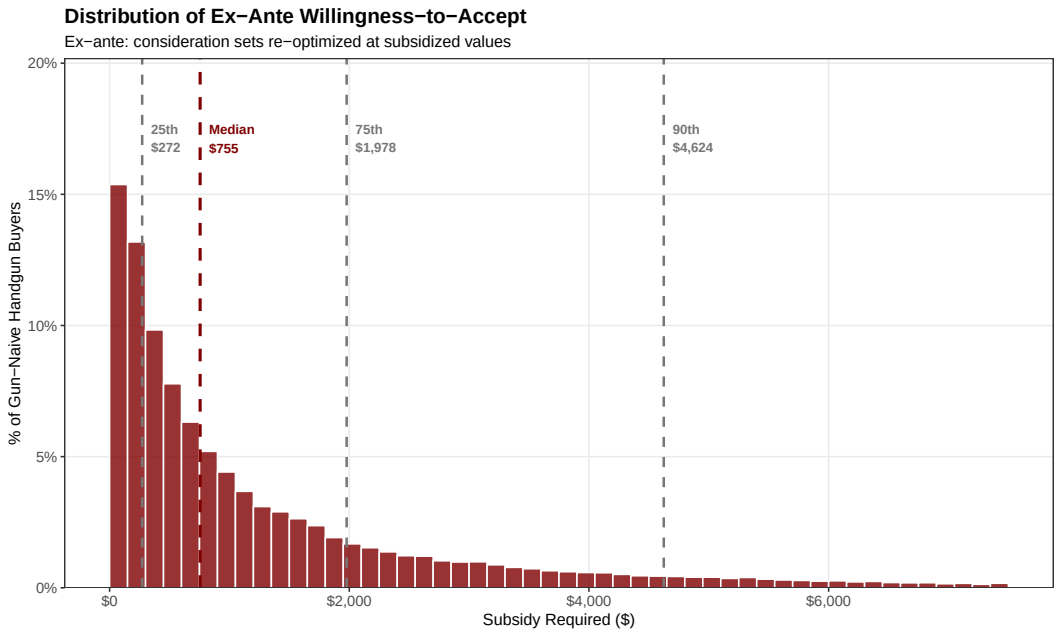


Figure B.1: Distribution of ex-ante WTA among gun-naïve handgun buyers. Vertical lines mark the 25th, 50th (median), 75th, and 90th percentiles.

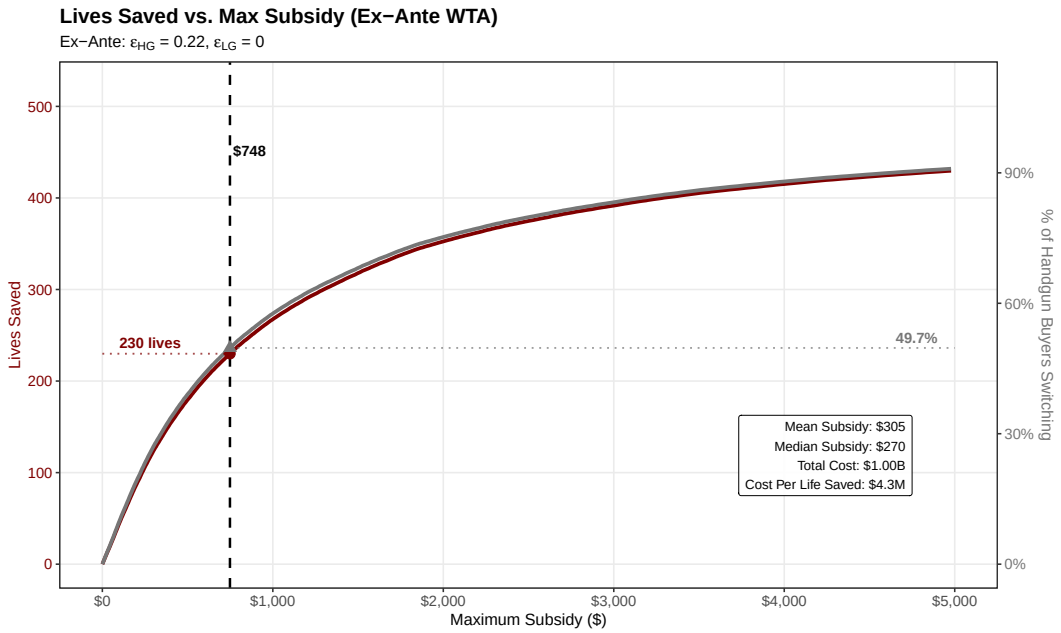


Figure B.2: Averted homicides as a function of the maximum subsidy under ex-ante WTA and the optimistic elasticity ($\varepsilon_{HG} = 0.22$, $\varepsilon_{LG} = 0$).

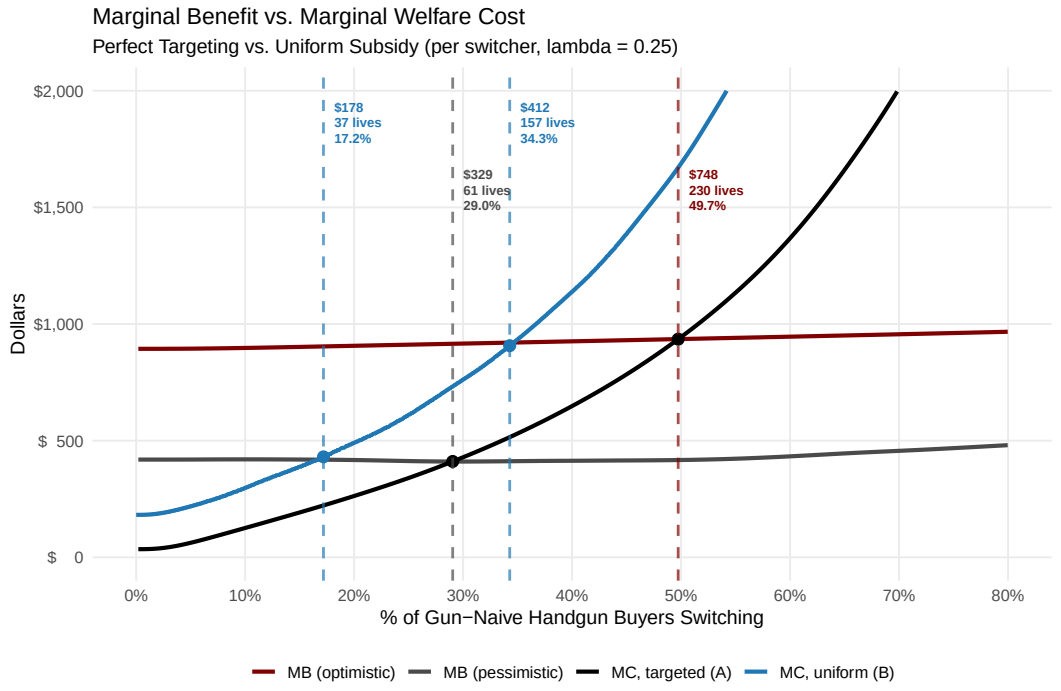


Figure B.3: Marginal benefit vs. marginal cost under ex-ante WTA for both Scenario A (perfect targeting) and Scenario B (uniform subsidy).

C Optimal Policies Under the Local-Linear Mortality Approximation

In this section, we interpret the estimated mortality elasticities locally, holding fixed the marginal mortality effects evaluated at observed handgun and long gun ownership. Let b_i denote the monetized mortality benefit from inducing consumer i to switch, which may depend on whether the consumer substitutes to a long gun or to the outside option (relevant in the pessimistic scenario). The welfare contribution of inducing consumer i is then

$$\Delta W_i = b_i - (1+\lambda)\text{WTA}_i. \tag{32}$$

When the mortality benefit is common across switchers, $b_i = b$, as in the optimistic scenario, this yields the familiar stopping rule: proceeding up the WTA distribution, consumers are induced to switch until the marginal consumer satisfies $(1+\lambda)\text{WTA}_{n^*} = b$. For the uniform subsidy, we choose the subsidy that maximizes the analog of $W_B(S)$ from Section 5, with the constant-elasticity mortality term replaced by the sum of the linear per-switcher benefits b_i over the induced switch set.

The results are qualitatively and quantitatively similar to those in Section 5. The key visible difference in Figure C.1 is that the marginal benefit curve in the pessimistic scenario slopes downward in the number of switchers. This happens because the destination of the switcher is more likely to be a long gun rather than the outside option as WTA increases.

D Taxation Benchmark

This appendix benchmarks the compensation policies studied in the main text against a tax on handguns. The benchmark uses the same demand estimates, the same mortality model, and the same \$13 million VSL test as the main analysis, so differences across instruments reflect the economics of the instruments themselves rather than differences in calibration.

Table C.1: Optimal Subsidies Under the Local-Linear Mortality Approximation: Targeted vs. Uniform

	Targeted Subsidies		Uniform Subsidies	
	$\varepsilon_{LG} = 0$	$\varepsilon_{LG} = 0.2$	$\varepsilon_{LG} = 0$	$\varepsilon_{LG} = 0.2$
Optimal subsidy	\$711	\$273	\$399	\$152
Mean (median) subsidy paid	\$298 (\$269)	\$132 (\$130)	\$399	\$152
% switching	46.2%	23.3%	31.7%	13.6%
Averted deaths	208	48	143	29
Government expenditure	\$0.91B	\$0.20B	\$2.34B	\$0.71B
Net cost per life	\$5.5M	\$5.3M	\$6.8M	\$8.4M
Net welfare gain	\$1.57B	\$0.37B	\$0.88B	\$0.13B
Positive net welfare?	**Yes**	**Yes**	**Yes**	**Yes**

Notes: Analog of the main text's Table 4 with the marginal mortality benefit per switcher held constant at its status quo value (the local-linear approximation) rather than evolving with ownership under the constant-elasticity specification. All other inputs—the WTA distribution, destinations, the excess burden $\lambda = 0.25$, and the \$13 million VSL—are identical. For targeted subsidies, the optimal subsidy is the maximum payment; each switcher receives exactly their willingness to accept. Under the uniform subsidy every recipient, including inframarginal long gun and outside-option buyers, receives the same payment. Net cost counts transfers at zero. Expenditure per averted death under the uniform subsidy is \$16.4 million (optimistic) and \$24.3 million (pessimistic).

Table C.2: Cost Decomposition: Uniform Subsidy at \$399 (Local-Linear Mortality Approximation)

Component	Cost	% of Total
Payment to switchers	\$0.83 billion	35%
Windfall to LG buyers	\$1.19 billion	51%
Windfall to outside buyers	\$0.32 billion	14%
Total	**\$2.34 billion**	100%

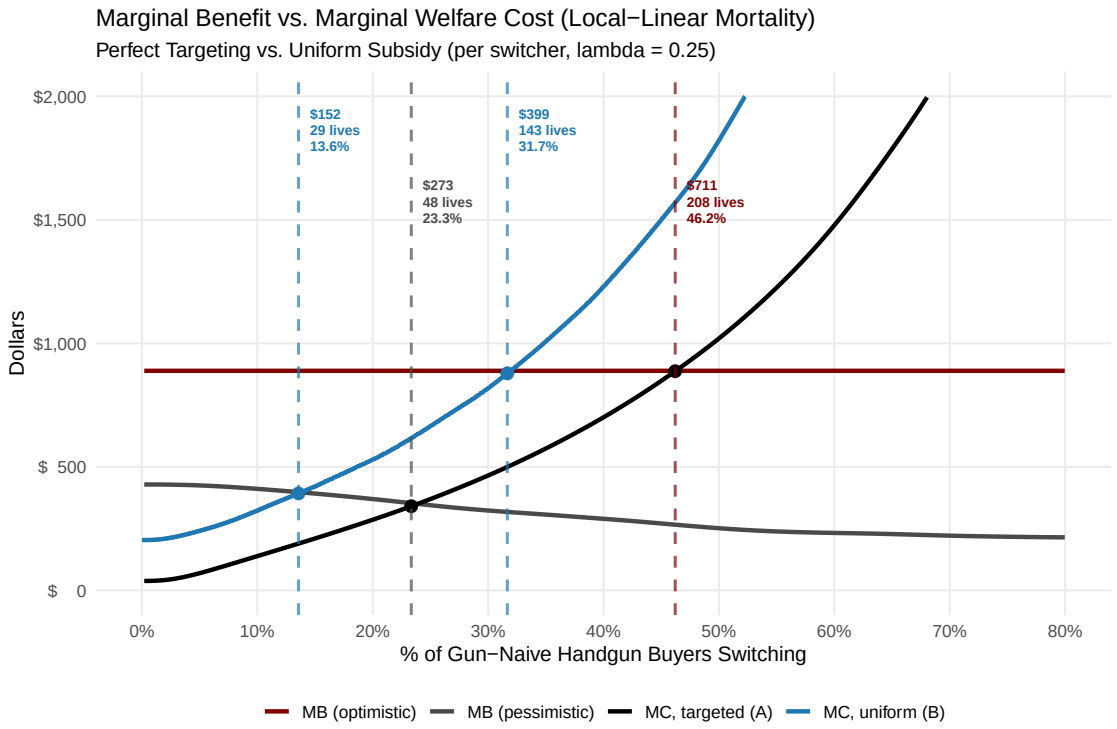


Figure C.1: Marginal Benefit and Marginal Cost Curves Under the Local-Linear Mortality Approximation (Scenarios A and B). The marginal benefit per switcher is constant in the optimistic scenario and varies in the pessimistic scenario only through the realized composition of switch destinations; the marginal cost curves are identical to those in Figure 3.

For all of the analysis, we assume that a tax is fully passed through to consumers, as found by Drango et al. (2025).[13]

D.1 Optimal Handgun Taxation

Methodology. A tax T on handguns operates on the same margin as the subsidy but with the opposite sign. Rather than raising the value of the alternatives, it lowers the value of the handgun. For each gun-naïve handgun buyer we compute a tax analog of WTA, the minimum T that diverts the buyer to a long gun or the outside option. We find this threshold by binary search using the same "can't unsearch" criterion used in the main text, with the taxed handgun inclusive values entering the consumer's search decision.

Because the subsidy applies to every non-handgun alternative, including the outside option, the two instruments present each consumer with the same decision problem at equal magnitudes. A subsidy s adds $-\gamma_i s$ to the utility of every non-handgun alternative, while an equal-sized handgun tax subtracts the same amount from the utility of every handgun option. Because only differences in utilities matter, this equivalence holds for search decisions as well as purchase decisions. The tax threshold therefore *equals* the subsidy WTA for every buyer, and the two instruments induce the same switch destinations. We verify this equivalence computationally: the two thresholds agree to within \$0.02 for all 56,301 gun-naïve handgun buyer draws. Thus, at a given magnitude, carrots and sticks move exactly the same people at exactly the same magnitudes; what distinguishes them is who pays, and how the payments are counted.[14]

[13] Their estimate comes from California's 11% firearms excise tax implemented in 2024; pass-through need not remain complete at the substantially higher tax rates considered below.

[14] This equivalence depends on the subsidy also paying for the outside option. A subsidy redeemable only against a long-gun purchase would create a stronger incentive to search for long guns than an equal-sized handgun tax, because the subsidy directly raises the value of long guns discovered through search whereas the tax leaves the outside option unchanged. The instruments would no longer generate the same switching thresholds or destinations: a handgun tax can also induce consumers to choose the outside option, while a long-gun-only subsidy cannot.

Cost accounting. We report counterfactuals under three alternative treatments of tax revenue. Under *full-burden* accounting, tax revenue receives no social credit: the social cost of the tax equals the consumer surplus lost by switchers plus the revenue collected from non-switchers. Under *lump-sum-rebate* accounting, tax revenue is returned to consumers through a lump-sum transfer that is independent of their firearm choices. Because the rebate does not depend on whether a consumer buys a handgun, buys a long gun, or exits the market, it does not affect purchase or search decisions. Tax payments are therefore transfers, and the welfare cost of the tax is the consumer surplus lost by switchers. Finally, under *symmetric marginal-cost-of-public-funds* accounting, tax revenue has fiscal value because it substitutes for other distortionary sources of public funds. Using the same $\lambda = 0.25$ as in the subsidy analysis, welfare is therefore $\text{VSL} \times L - \text{DWL} + \lambda R$, where L is averted homicides and R is tax revenue.

Optimal Uniform Tax. A uniform tax has a self-targeting property that makes it closely related to the perfectly targeted subsidy. Because each buyer's tax threshold exactly equals their subsidy WTA, the two instruments rank buyers in the same order. As the tax rises, the buyers induced to leave handguns are exactly those who would be cheapest to induce under perfect targeting. The difference is informational. Perfect targeting requires the government to observe each buyer's WTA and offer an individualized payment, whereas a uniform tax induces all buyers with WTA below the tax to switch without requiring the government to observe individual preferences.

Under lump-sum-rebate accounting, the optimal tax is \$940 under the optimistic elasticities, approximately $(1 + \lambda)$ times the \$745 maximum payment under perfect targeting ($1.25 \times \$745 = \$931$). The factor $(1 + \lambda)$ follows directly from the stopping conditions: perfect targeting stops when the marginal mortality benefit equals $(1 + \lambda)$ times the marginal buyer's WTA, while the rebated tax—which avoids the financing cost associated with subsidy payments—stops when the marginal benefit equals the buyer's WTA itself, and therefore

optimally proceeds farther down the same WTA ordering (53.9% versus 47.5% of buyers). Under the local linear mortality approximation of Appendix C, in which the marginal mortality benefit per switcher is constant, the relationship would hold exactly. Our reported optima instead maximize welfare under the constant-elasticity mortality specification, so the marginal benefit per switcher drifts as the policy expands. In the optimistic scenario it rises as handgun ownership falls—from \$933 per switcher at the targeting optimum to \$940 at the tax optimum—so the optimal tax slightly exceeds $(1 + \lambda)$ times the targeting cutoff. In the pessimistic scenario the drift runs the other way: the switcher mix shifts toward long guns along the WTA path, lowering the marginal benefit, so the optimal tax of \$404 falls slightly below $1.25 \times \$330 = \$413$.

Under symmetric marginal-cost-of-public-funds accounting, the tax has a second benefit: buyers who continue to purchase handguns generate revenue that substitutes for other distortionary sources of public funds. This revenue motive raises the optimal tax. Under the optimistic elasticities, the optimum rises to \$1,098, inducing 58.0% of buyers to switch and averting 269.4 homicides; the tax generates \$3.04 billion in revenue and \$1.60 billion in deadweight loss, for net welfare gains of \$2.66 billion. Under the pessimistic elasticities, the optimal tax is \$605, inducing 42.0% of buyers to switch and averting 90.9 homicides, with \$2.31 billion in revenue, \$0.72 billion in deadweight loss, and \$1.04 billion in net welfare gains.

Full-burden accounting gives the opposite result. If tax revenue receives no social credit, payments by buyers who continue to purchase handguns add to the social cost of the policy without producing any offsetting benefit. No positive tax then passes the \$13 million VSL test. Among positive taxes, the tax minimizing social cost per averted homicide is \$251 under the optimistic elasticities, inducing 21.8% of buyers to switch and averting 99.2 homicides at \$14.81 million per averted homicide. Under the pessimistic elasticities, the corresponding tax is \$246, inducing 21.4% of buyers to switch and averting 47.5 homicides at \$30.43 million per averted homicide. Under this accounting convention, the welfare-maximizing tax is therefore

zero. Table D.1 summarizes.

Table D.1: Uniform Handgun Tax

	Optimistic ($\varepsilon_{HG} = 0.22$, $\varepsilon_{LG} = 0$)	Pessimistic ($\varepsilon_{HG} = \varepsilon_{LG} = 0.2$)
Lump-sum-rebate accounting		
Optimal tax	\$940	\$404
% of HG buyers switching	53.9%	31.9%
Averted homicides	249.5	69.6
Deadweight loss	\$1.32 billion	\$0.39 billion
Net welfare	\$1.92 billion	\$0.51 billion
Symmetric marginal-cost-of-public-funds accounting		
Optimal tax	\$1,098	\$605
% of HG buyers switching	58.0%	42.0%
Averted homicides	269.4	90.9
Deadweight loss	\$1.60 billion	\$0.72 billion
Tax revenue	\$3.04 billion	\$2.31 billion
Net welfare	\$2.66 billion	\$1.04 billion
Full-burden accounting		
Optimal tax	\$0	\$0
Most cost-effective positive tax	\$251	\$246
% of HG buyers switching	21.8%	21.4%
Averted homicides	99.2	47.5
Minimum cost per averted homicide	\$14.81 million	\$30.43 million

Notes: Estimates in the final three rows of panel three reflect the most cost-effective positive tax.

Discussion. The main advantage of a uniform handgun tax is also the source of its incidence. The tax is self-targeting: buyers with the lowest WTA leave handguns first, so the policymaker need not observe individual preferences to direct the behavioral response toward those who are cheapest to divert. But the same uniform tax is also paid by buyers with higher WTA who continue to purchase handguns. Whether this is a virtue or a cost depends on how those payments are valued. They are neutral transfers under lump-sum-rebate accounting and a fiscal benefit when tax revenue substitutes for other distortionary revenue, but a burden under full-burden accounting.

This distinction may also matter for political feasibility. Separate state-level excise taxes on firearms remain unusual and recent: California introduced an 11% tax in 2024 (California Assembly Bill 28, 2023), and Colorado followed with a 6.5% tax in 2025 (Colorado Proposition KK, 2024). These rates are substantially below the tax levels that maximize welfare in our counterfactuals. This gap is consistent with political weight being placed on the incidence of firearm taxes on buyers who continue to purchase, although it could also reflect legal, administrative, or other political constraints that our model does not capture.

E Selection on Homicide Risk and Observable Targeting

The mortality model in Section 5 treats diverted buyers as carrying the average homicide risk of the buyer pool. Switchers, however, may not be randomly drawn with respect to homicide risk. In particular, if WTA correlates with homicide risk, the switch set differs from the pool in its risk composition, causing the homogeneous-risk counterfactual to misstate the number of deaths averted.

We cannot directly evaluate this possibility because we do not observe the homicide risk associated with a handgun purchase by buyers with different WTA. We can, however, ask whether WTA varies systematically across observable characteristics along which such risk

might differ. We first document these gradients and then show how the mortality calculation could incorporate heterogeneous risk if suitable risk estimates became available.

E.1 Willingness to Accept by Demographic Cell

Table E.1 reports median WTA and the share of buyers diverted at the two policy-relevant subsidy levels, by demographic group, among the 711 gun-naïve prospective handgun buyers in our sample.[15]

Table E.1: WTA and Diversion Rates by Demographic Group

		Median WTA	% diverted at $S = \$412$	% diverted at $S = \$745$
Sex	Male	\$923	32.5%	47.4%
	Female	\$805	35.3%	50.1%
Age	18–29	\$1,264	26.0%	38.4%
	30–44	\$978	29.3%	43.9%
	45–64	\$732	36.4%	52.2%
	65+	\$435	49.8%	66.9%
Income	<\$50k	\$814	35.8%	50.9%
	\$50–100k	\$894	33.5%	48.3%
	>\$100k	\$1,278	27.2%	41.2%
Education	College	\$785	36.6%	51.3%
	No college	\$882	33.3%	48.2%

Note: $S = \$412$ is the optimal uniform subsidy (Scenario B, optimistic); $S = \$745$ is the maximum subsidy paid under perfect targeting (Scenario A, optimistic). Gradients are essentially unchanged in a joint regression; the demographic dimensions are only mildly correlated.

Three gradients are apparent. WTA falls roughly monotonically with age, by about a factor of three from the youngest to the oldest group, so switchers skew older. WTA also rises with income, so switchers skew lower-income. The sex gradient is smaller, with men somewhat more attached to handguns than women. Thus, the buyers induced to switch at

[15] Statistics are respondent-level: each respondent's switching probability is averaged over posterior draws, then averaged within group. Race shows no independent gradient: unconditional differences across racial groups are fully accounted for by age (minority respondents in our sample are roughly ten years younger on average), and race coefficients are small and insignificant once age is controlled for.

a given subsidy are observably different from the buyer pool as a whole. Whether these differences raise or lower the homicide benefit of the policy depends on how the homicide risk associated with a handgun purchase varies across these groups.

E.2 Incorporating Heterogeneous Homicide Risk

The framework could accommodate such heterogeneity directly if suitable estimates of homicide risk by buyer characteristics become available. Let r_g denote the expected homicide risk associated with a handgun purchase by a buyer in demographic cell g, and let $\bar{r}$ denote the average of r_g over the full pool of gun-naïve prospective handgun buyers. A buyer i in cell g then receives the normalized risk weight

$$w_i = \frac{r_g}{\bar{r}}.$$

The weights therefore average to one in the buyer pool. A value of $w_i = 2$, for example, means that a handgun purchase by buyer i is associated with twice the homicide risk of a purchase by the average buyer.

Under the local linear mortality approximation, the effect of heterogeneous risk on a given policy depends only on the average risk weight among the buyers it induces to switch. Let

$$\Phi(S) = E[w_i \mid i \text{ switches at subsidy } S].$$

If $\Phi(S) < 1$, the subsidy disproportionately diverts buyers whose handgun purchases carry below-average homicide risk; if $\Phi(S) > 1$, it disproportionately diverts buyers whose purchases carry above-average risk. Averted deaths under heterogeneous risk are equal to the homogeneous-risk estimate multiplied by $\Phi(S)$. Because the risk adjustment changes the

mortality benefit of a given switch set but not the payments or consumer-surplus costs required to induce that set to switch, net cost per averted death is the corresponding homogeneous-risk figure divided by $\Phi(S)$.

The same weights could also be incorporated when choosing the subsidy rather than applied only to a fixed policy. In that case, the planner would evaluate the mortality benefit of each potential switch set using its risk-weighted composition and choose the subsidy that maximizes the resulting welfare objective. Thus, heterogeneous homicide risk does not require a different policy framework; it requires data linking buyer characteristics to the marginal homicide risk created by a handgun purchase.

F Numerical Determination of the Optimal Uniform Policies

This appendix documents how we locate the optimal uniform subsidy in Section 5, and why the reported optima are robust to the numerical choices involved.

The criterion involves no smoothing. The optimal uniform subsidy maximizes the welfare objective $W_B(S)$ of Section 5 over a grid of candidate subsidy levels containing every distinct WTA value in the simulated distribution. Between two adjacent WTA thresholds, the set of switchers in unchanged, so cumulative averted deaths and the cumulative WTA of switchers are unchanged, while total subsidy expenditure weakly increases with the subsidy level. Welfare therefore cannot increase as the subsidy rises within such an interval, and an optimum can always be taken at zero or at one of the observed WTA thresholds. We accordingly evaluate $W_B(S)$ exactly at these points and select its grid maximizer. The same applies to the targeted policies: their objective $W(n)$ is evaluated directly at each feasible threshold in the ordered WTA distribution.

Why the marginal curves shown in figures require care. The marginal cost and benefit *curves* displayed in Figure 3 are a different matter. Under a uniform subsidy, enrolling the kth switcher requires raising the subsidy from S_{k-1} to S_k for all inframarginal switchers as well. The resulting increase in expenditure is

$$kS_k - (k-1)S_{k-1} = S_k + (k-1)(S_k - S_{k-1}).$$

The second term makes the raw marginal-cost series highly sensitive to the gaps between consecutive WTA order statistics: even a modest irregular gap can generate a large spike because the higher subsidy is paid to every inframarginal switcher. As a result, the raw series is extremely jagged, with many local crossings of the marginal-benefit schedule; its first crossing occurs at a subsidy of only a few cents. A first-crossing rule would therefore be inappropriate, which is why we determine the optimum from the cumulative welfare objective rather than from the raw marginal series. For display, we smooth the cumulative primitives and differentiate them. Specifically, we fit cubic smoothing splines to cumulative expenditure and cumulative deaths averted as functions of the number of switchers, using an evenly spaced subsample covering up to 80% switching, beyond which the extreme right tail of the WTA distribution dominates. The displayed marginal curves are obtained from the derivatives of these fitted cumulative functions. This approach preserves the connection between the marginal curves and the underlying cumulative quantities while filtering out high-frequency variation generated by adjacent WTA gaps. The resulting crossings closely track the optima obtained directly from the unsmoothed cumulative welfare objective.

Robustness of the optimum. Figure F.1 plots $W_B(S)$ computed from raw cumulative totals under both elasticity assumptions. The objective is single-peaked over the relevant range but flat near its maximum. In the optimistic case, subsidies between roughly \$316 and \$532 deliver at least 95% of the maximum welfare gain, with the grid optimum at \$412. In the pessimistic case, the corresponding range is roughly \$140 to \$210, with the grid optimum at

$178. The reported grid maximizers should therefore not be interpreted as knife-edge policy levels; none of the paper's conclusions depend on the precise location of the optimum within these bands.

The shape of the marginal benefit schedule. Because both policies enroll switchers in ascending order of WTA, the marginal benefit schedule in Figure 3 is shared between them and is close to flat. This flatness is the net of offsetting forces. Under the optimistic elasticities the only curvature comes from the constant-elasticity mortality function over a small change in ownership, and a linear fit to the marginal benefit schedule attains $R^2 = 0.998$; imposing it would not move the optimum at all. Under the pessimistic elasticities, two channels work in opposite directions: the realized composition of switchers shifts toward long guns along the WTA path (the cumulative long-gun share rises from 55% over the first twentieth of the path to 78% overall), which lowers marginal benefit, while the shrinking handgun stock and the diminishing marginal harm of the growing long-gun stock raise it. The resulting marginal-benefit schedule remains relatively flat, although a linear approximation does not capture the composition-driven variation particularly well ($R^2 \approx 0.25$). Economically, however, the approximation is innocuous: re-optimizing against the fitted line moves the targeted optimum by about one percentage point of buyers and reduces welfare by roughly $1 million relative to the $427 million welfare gain. We therefore treat approximate linearity as a description of the results rather than an assumption of the procedure. The targeted policies need none of this machinery: under perfect targeting, marginal government expenditure is the WTA of the marginal switcher, an order statistic and hence monotone.

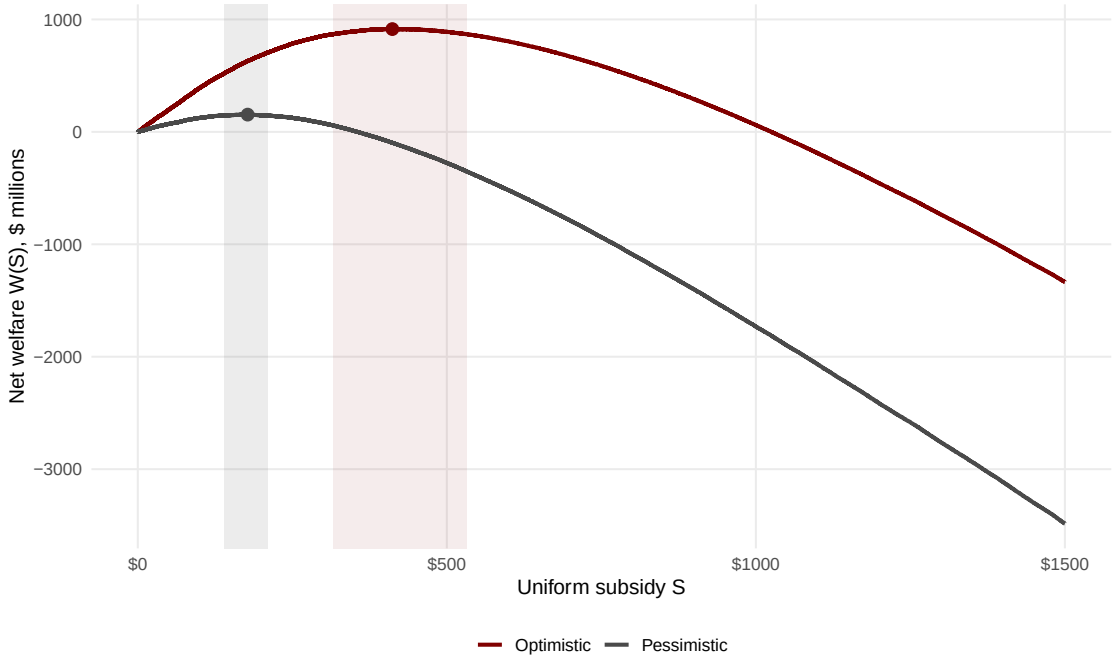


Figure F.1: The uniform-subsidy welfare objective $W_B(S)$ computed from raw cumulative totals (no smoothing), under the optimistic (maroon) and pessimistic (gray) elasticities. Dots mark the grid maximizers ($412 and $178); shaded bands mark the regions delivering at least 95% of the maximum welfare gain.

G Averted Deaths Curves for Perfect Targeting

Figures G.1 and G.2 display deaths averted and the share of handgun buyers switching as a function of the maximum subsidy under perfect targeting (Scenario A), for the optimistic and pessimistic elasticity assumptions respectively. Each panel marks the optimal policy from Table 4, where the marginal cost of the last switcher equals the value of the averted deaths they generate. Deaths averted rise steeply at low subsidy levels and flatten as the maximum subsidy climbs into the right tail of the WTA distribution.

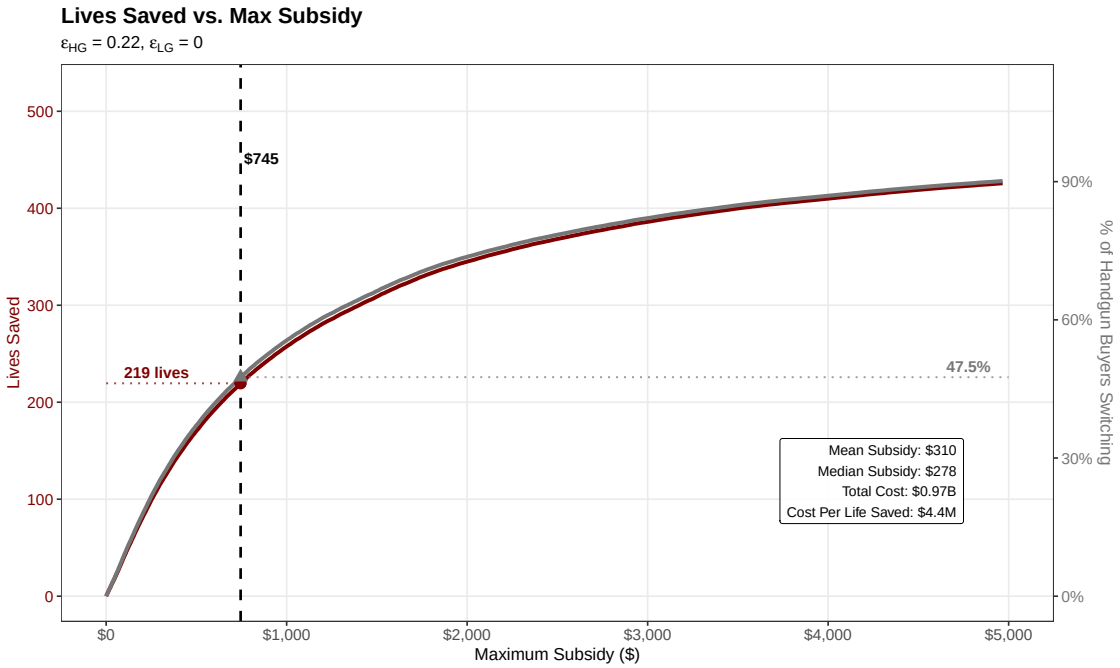


Figure G.1: Averted Deaths Curve (Optimistic Scenario)

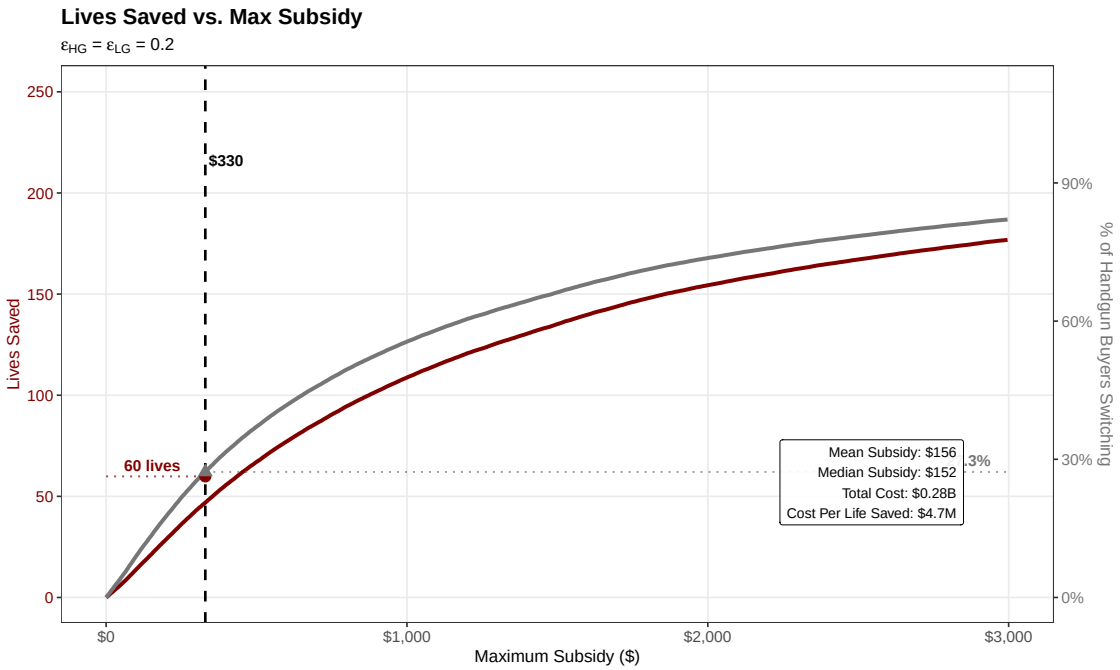


Figure G.2: Averted Deaths Curve (Pessimistic Scenario)