Online Appendix

Model-Based Evaluation of Cooling Off Policies

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A. Summary

In this Online Appendix we present several model extensions to assess the robustness of the main model's theoretical predictions, as well as the model based evaluation using aggregate data. The model presented in the main part of the paper makes several stringent assumptions. Notably, consumer motivations are uncorrelated over time, there are no return costs, all agents share the same degree of projection bias, α, and there is no differentiation in consumers' utility except for that driven by their current motivation state. Towards this, we consider four model variations.

First, we consider the case in which consumer motivations are correlated over time. Second, we allow for return to be costly, with either the firm or consumers directly bearing the return costs. Third, we allow for consumer heterogeneity by incorporating a fraction of unbiased consumers into the population. Fourth, we consider the case in which consumer tastes are horizontally differentiated.

We next present a general summary of the results, which is followed by the detailed descriptions and analyses of the different extensions.

Autocorrelated Motivations The main model specification assumes that motivation states are independent across periods. In practice, it is entirely possible that motivation states are somewhat persistent, that is, that a consumer who is motivated (unmotivated) today is more likely to be motivated (unmotivated) in the next period. We address this issue by considering a model variant in which consumer motivation is persistent with probability $\rho \in [0, 1)$ in Appendix B. We show that the theoretical predictions in the baseline setting and with a mandatory cooling off period are unchanged, and that the same combinations of targeting behavior pre and post policy adoption, as well as the associated price, quantity and consumer welfare movements obtain. This implies that the ex-post evaluation of whether consumer welfare increased or decreased due to the policy can be conducted under the same data requirements as in the main model specification: data on quantities alone, or data on prices and stepping back behavior suffices.

With a return policy, there are two changes relative to the main model specification. First, it is possible that the firm exclusively caters to twice motivated consumers following the adoption of a return policy even if the market was fully covered prior to the adoption. This is because the persistence in motivations makes the exclusive targeting strategy relatively more profitable than the intermediate targeting strategy and hence expands the range such that exclusive targeting is optimal. This combination of targeting strategies is associated with a negative effect on consumer welfare. Second, whenever the firm uses the intermediate targeting strategy post policy adoption while the market was fully covered pre policy, the policy is no longer neutral in terms of consumer welfare but also negatively affects it. This is because the price in the full market coverage adjusts downward as unmotivated consumers correctly predict that they are more likely to again be unmotivated in the second period: as this price is the basis of the targeting strategy, consumer surplus increases relative to the main model specification. Despite these changes, the data requirements to identify the sign of the effect of the policy on consumer welfare are unchanged. Quantity data, data on return behavior, and knowledge of market size together allow a determination of the efficacy of the policy. A given combination of targeting behaviors is always associated with a unique sign of the change in consumer welfare, and the newly arising case can be identified by noting that it is the only combination of targeting strategies where the initially purchased quantity falls below the one sold prior to the policy adoption.

Costly Return The main model specification presents the best possible case for a return policy by abstracting from any form of private or social return cost. However, return in practice is likely to be costly and comprise various dimensions such as shipping or hassle costs. We therefore analyze a model variant with costly return in Appendix C. There are three main takeaways.

First, the theoretical predictions largely carry over, with the exception of a novel case in which full targeting pre adoption of a return policy is followed by exclusive targeting post adoption. As with autocorrelated motivations, this is driven by the fact that return costs render the exclusive targeting strategy relatively more profitable for the firm than the intermediate targeting strategy in which more consumers return the good. If this combination of targeting strategies materializes as optimal, a return policy has a negative impact on consumer welfare.

Crucially, these predictions do not depend on whether consumers or the firm directly bear the return costs. As long as consumers correctly anticipate the cost, the fact that the firm fully extracts the (predicted) rents of the targeted consumer group implies that it ultimately is born by the firm so that the targeting strategies, quantities, and also consumer welfare pre and post policy are identical in the two settings. However, there is more ambiguity with respect to the potential direction of price movements if consumers bear return costs, as the price of the product needs to be lowered. This implies that a price decrease following the policy adoption could be driven either by a switch in targeting strategies, or by the need to be compensated for costly return, which potentially complicates the ex-post assessment.

We show that the data requirements to assess the efficacy of a return policy in terms of the impact on consumer welfare are unaffected by the presence of return costs or who bears them. This fact relies on two observations. On the one hand, the potential newly arising case of full market coverage being followed by exclusive targeting can always be identified using data on quantities and return behavior as it is the only combination of targeting strategies associated with a lower initially purchased quantity relative to the pre-policy period. On the other hand, price data is not necessary to assess the efficacy of the return policy for consumers as the identification requires data on quantities, return behavior, and market size. As such, the added ambiguity with respect to price movements due to the policy adoption is not an issue and the data requirements are unchanged relative to the main model specification.

Heterogeneity in Projection Bias: Unbiased Consumers In Appendix D, we consider a model variant that incorporates a fraction of unbiased consumers in the population. Their presence provides the firm with a new targeting strategy: both in the baseline and if a mandatory cooling off period is adopted, pricing may be based on the (correctly predicted) expected utility of unbiased consumers. In case of a return policy, unbiased consumers behave like motivated biased consumers because the predicted utility in the high state is identical and drives the initial purchase decision, while return decisions are based on actual consumption utilities so that potential biases do not matter.

The theoretical predictions of the model naturally adapt to the new targeting strategies, but overall largely carry over. The main difference is that a return policy may now lead to more exclusive targeting post policy adoption, so that it may negatively affect consumer welfare—while it avoids negative consumer welfare by aligning the final consumption decision with knowledge about the consumption utility, it may be the case that consumers are losing the rent they enjoyed because pre-policy pricing was based on unmotivated biased consumers who underpredict their expected consumption utility.

With respect to using aggregate data to identify the impact of the policy change, the data requirements to identify the sign of the change in consumer welfare increase but exhibit a similar flavor to the main model. In particular, the requirements to identify the sign change in consumer welfare due to the policy introduction are higher for a return policy than for a mandatory cooling off period. In both cases, aggregate data on prices, quantities and return/stepping back behavior need to be complemented with additional information about the fraction of motivated consumers or even market size to fully identify the sign of the change in Consumer Surplus. However, the aforementioned data is sufficient for partial identification, and always allows an identification of whether Consumer Surplus was negatively affected.

Heterogeneity in Valuation In Appendix E, we explicitly introduce consumer heterogeneity in terms of idiosyncratic tastes. We model this by considering the firm to be located at the end of a Hotelling line of sufficient length. Consumers are evenly distributed along the line. All consumers exhibit a projection bias, and their consumption utilities are as in the main model. However, they suffer a disutility equal to their distance from the firm.

In this setup, the firm's price is determined not by the identical willingness-to-pay of the consumer group (in terms of bias and motivation) which is targeted with a given pricing strategy, but instead via a first-order condition which trades off the within-targeting-group sensitivity of demand to changes in the price. This complicates both the theoretical analysis as well as the potential identification via aggregate data following a policy adoption. The reason is that not only may the policy induce a change in the targeting behavior (based on which consumer group is the price predominantly set), but it simultaneously affects the within-group responsiveness of demand to price changes. As such, aggregate changes in demand and price are no longer sufficient to back out the firm's targeting strategy, which in the previous analyses was sufficient to assess e.g. the directional change in consumer welfare. Moreover, even given a particular combination of pre- and post-adoption targeting the directional change in consumer welfare is not necessarily unambiguously determined.

Despite the increased ambiguity, our approach of using aggregate data to identify the combination of targeting strategies can still be used as a screening device. In the case of a mandatory cooling off period, the combination of targeting strategies can always be identified using a combination of price and quantity data. As consumer welfare can only be negatively affected by the policy whenever the firm uses the exclusive targeting strategy both pre and post policy intervention, an in depth investigation using additional individual level data is only necessary if the associated market level outcome of a decreased quantity at a relatively constant price level materializes. Similarly, consumer welfare can only be negatively affected by a return policy if the firm switches from exclusive to intermediate targeting and if the degree of the projection bias is sufficiently low. In this case, the model always predicts an increase in the quantity consumed, as well as a price increase. Thus, only in this case a policy maker would have to look for more detailed data for an in-depth investigation.

Exposition We next discuss the model variants in detail. All model variants have been solved analytically. Nonetheless, to economize on space and streamline the exposition we keep intermediate steps brief and in particular do not explicitly derive the behavior of aggregate outcomes (Δp, Δq, ΔCW) for each combination of possible equilibrium targeting combinations pre and post policy intervention. Instead, we summarize the results following the characterizations of the optimal firm behavior and provide a Mathematica file verifying them on our websites. Throughout, we keep the tie-breaking assumption that the firm prefers the larger market share in case of equal profits, and that consumers only purchase if they predict a strictly positive probability to actually consume the good. Moreover, we restrict attention to the limiting case where $\delta = 1$. This facilitates the exposition of the analysis of the adoption of a mandatory cooling off period, which carries over to the case with discounting provided that discounting is not too severe.

B. Autocorrelated motivations

To address the question of correlated motivation states, consider the following setup: each consumer i is motivated in the initial period with probability $\mu \in (0, 1)$ and unmotivated with probability $(1-\mu)$. In subsequent periods, the previous motivation state persists with probability $\rho \in [0, 1)$, while it is drawn anew (motivated w/ prob. μ, unmotivated with $(1 - \mu)$) with probability $(1 - \rho)$. We assume that consumers are aware of the persistence. Note that in any given period, there still is a fraction μ of motivated consumers. For simplicity, we provide the analysis below for the special case of $\delta = 1$; the predictions naturally carry over to the setting with $\delta < 1$.

Despite the persistence in motivations, motivated consumers still overpredict their future expected consumption utility due to the projection bias, while unmotivated consumers underpredict it. Moreover, motivated consumers – for partially persistent motivations, $\rho > 0$ – actually enjoy a higher actual expected consumption utility than unmotivated consumers because they are motivated with probability $\rho + (1-\rho)\mu = \mu + (1-\mu)\rho > \mu - \mu\rho = (1-\rho)\mu$, which is the probability that unmotivated consumers are motivated in the next period. Finally, this has a natural impact on the pricing of the firm.

Specifically, observe that the state-contingent predicted utilities carry over from the baseline, i.e. that $\tilde{u}(\bar{s}|\underline{s}), \tilde{u}(\bar{s}|\bar{s})$ and $\tilde{u}(\underline{s}|\underline{s}), \tilde{u}(\underline{s}|\bar{s})$ are unaffected. From this, we obtain for the predicted expected utility of a motivated consumer $\tilde{u}$ and unmotivated consumer $\utilde{u}$, respectively, that

$$\begin{aligned} \tilde{u}_a &= [\rho + (1-\rho)\mu]\, \tilde{u}(\bar{s}|\bar{s}) + (1-\rho)(1-\mu)\tilde{u}(\underline{s}|\bar{s}) \\ &= \underline{u} + \Delta\, [\mu + (1-\mu)(\rho + (1-\rho)\alpha)] \qquad \text{(WA.1)} \\ \utilde{u}_a &= [\rho + (1-\rho)(1-\mu)]\, \tilde{u}(\underline{s}|\underline{s}) + (1-\rho)\mu\tilde{u}(\bar{s}|\underline{s}) \\ &= \underline{u} + (1-\rho)(1-\alpha)\mu\Delta. \qquad \text{(WA.2)} \end{aligned}$$

B.1. Baseline

Demand absent a policy intervention is therefore given by

$$D_a(p) = \begin{cases} 1 & \text{if} \quad p \leq \utilde{u}_a \\ \mu & \text{if} \quad \utilde{u}_a < p < \tilde{u}_a \\ 0 & \text{otherwise} \end{cases} \qquad \text{(WA.3)}$$

It follows that the baseline candidate prices change relative to the main model specification as the firm may either choose to target all consumers by charging $\utilde{u}_a \leq \tilde{u}$, or exclusively target the mass μ of motivated consumers by charging $\tilde{u}_a \geq \tilde{u}$. Candidate profits for the two strategies are therefore given by $\tilde{\pi}_a = \mu(\tilde{u}_a - c)$ and $\utilde{\pi}_a = \utilde{u}_a - c$. Comparing the candidate profits allows us to derive the cost threshold c_a such that the firm prefers to target motivated consumers exclusively iff $c > c_a$.

Proposition WA.1 *There exists a cost threshold c_a which determines the firm's pricing decision absent a policy intervention.*

(i) If $c \leq c_a$, the firm targets all consumers by charging $p = \utilde{u}_a$, which induces demand $q = 1$, firm profits $\utilde{\pi}_a$, and consumer welfare $\utilde{CW}_a = \mu\Delta(\alpha + (1-\alpha)\rho)$.

(ii) If $c_a < c \leq \tilde{u}_a$, the firm targets only motivated consumers by charging $p = \tilde{u}_a$, which induces demand $q = \mu$, firm profits $\tilde{\pi}_a$, and consumer welfare $\widetilde{CW}_a = -\mu\alpha\Delta(1-\mu)(1-\rho)$.

(iii) If $c > \tilde{u}_a$, the firm does not sell the good by charging any price $p > \tilde{u}_a$.

Proof. $c_a = \underline{u} + \frac{1-\mu-\alpha(2-\mu)(1-\rho)-(2-\mu)\rho}{1-\mu}\mu\Delta$ is obtained by equating $\widetilde{\pi}_a$ and $\underset{\sim}{\pi}_a$ and solving for c. Comparing the price with the expected utilities of the respective consumer groups (where we need to account for the persistence in motivations) directly yields CW for each equilibrium pricing strategy. ∎

B.2. Mandatory cooling off period

As in the main model specification, the adoption of a mandatory cooling off period affects demand. Specifically, while the cutoff prices are unaffected and remain at the predicted expected utility of motivated ($\tilde{u}_a$) and unmotivated ($\underset{\sim}{u}_a$) consumers, respectively, demand now reflects that unmotivated consumers may potentially step back because they are unmotivated in the second period. This occurs with probability $(1-\rho)(1-\mu)$ and we hence obtain

$$D_{a,c}(p) = \begin{cases} 1 & \text{if} \quad p \leq \underset{\sim}{u}_a \\ \mu\left[\rho + (1-\rho)\mu\right] & \text{if} \quad \underset{\sim}{u}_a < p < \tilde{u}_a \\ 0 & \text{otherwise} \end{cases} \tag{WA.4}$$

The candidate prices are therefore unaffected at $p = \underset{\sim}{u}_a$ and $p = \tilde{u}_a$, as is the candidate profit when targeting all consumers, $\underset{\sim}{p}_{a,c} = \underset{\sim}{p}_a$, while the candidate profit when targeting exclusively twice motivated consumers reflects the change in demand: $\widetilde{\pi}_{a,c} = \left[\rho + (1-\rho)\mu\right]\widetilde{\pi}_a$. As in the baseline, comparing the candidate profits allows us to derive the cost threshold $c_{a,c}$ such that the firm prefers to target motivated consumers exclusively iff $c > c_{a,c}$.

Proposition WA.2 *There exists a cost threshold $c_{a,c} \geq c_a$ which determines the firm's pricing decision under a mandatory cooling off period.*

(i) If $c \leq c_{a,c}$, the firm targets all consumers by charging $p = \underset{\sim}{u}_a$, which induces demand $q = 1$, firm profits $\underset{\sim}{\pi}_{a,c}$, and consumer welfare $\underset{\sim}{CW}_{a,c} = \mu\Delta(\alpha + (1-\alpha)\rho)$.

(ii) If $c_{a,c} < c \leq \tilde{u}_a$, the firm targets only motivated consumers by charging $p = \tilde{u}_a$, which induces demand $q = \mu \cdot (\rho + (1-\rho)\mu)$, firm profits $\widetilde{\pi}_{a,c}$, and consumer welfare $\widetilde{CW}_{a,c} = -\mu\alpha\Delta(1-\mu)(1-\rho)(\rho + (1-\rho)\mu)$.

(iii) If $c > \tilde{u}_a$, the firm does not sell the good by charging any price $p > \tilde{u}_a$.

Proof. $c_{a,c} = \underline{u} + \frac{1-\rho-\alpha(1-\rho)(1+(1-\mu)\mu+(1-\mu)^2\rho)-(\mu+\rho(1-\mu))^2}{(1-\mu)(1+\mu(1-\rho))}\mu\Delta$ is obtained by equating $\widetilde{\pi}_{a,c}$ and $\underset{\sim}{\pi}_{a,c}$ and solving for c, where $c_{a,c} \geq c_a$ immediately follows from $\widetilde{\pi}_{a,c} < \widetilde{\pi}_a$ and $\underset{\sim}{\pi}_{a,c} = \underset{\sim}{\pi}_a$. Comparing the price with the expected utilities of the respective consumer groups (where we need to account for the persistence in motivations) directly yields CW for each equilibrium pricing strategy. ∎

Impact of a cooling off period & ex-post evaluation Given $c_{a,c} \geq c_a$, it is clear that there are three potential combinations of equilibrium targeting strategies when comparing the outcomes before and after the adoption of a mandatory cooling off period. The associated impact on prices, quantities, and consumer welfare directly follow from Proposition WA.1 and Proposition WA.2. We illustrate the possible combinations in Figure WA.1. Notably, both the possible cases and the predictions in terms of Δp, Δq and ΔCW are identical to those in the main model specification.

Baseline \ with Cooling Off Period	Full Targeting	Exclusive Targeting
Exclusive Targeting	$\Delta q > 0$ $\Delta p < 0$ $\Delta CW > 0$ no stepping back	$\Delta q < 0$ $\Delta p = 0$ $\Delta CW > 0$ observe stepping back
Full Targeting	$\Delta q = 0$ $\Delta p = 0$ $\Delta CW = 0$ no stepping back	

Figure WA.1: Impact of a mandatory cooling off period with autocorrelated motivations

It follows that the requirements to evaluate the policy in terms of the impact on consumer welfare also carry over from the main model specification, as we illustrate in Figure WA.2. Quantity data alone allow to distinguish between the possible combinations of equilibrium targeting strategies and thus allow for an ex post assessment. The same can be achieved by a combination of price data and confirmation rates.

	final quantity decreases $\Delta q < 0$	final quantity constant $\Delta q = 0$	final quantity increases $\Delta q > 0$
price increases $\Delta p > 0$			
price constant $\Delta p = 0$	(A) observe stepping back Excl $\rightarrow$ Excl: $\Delta CW > 0$	(B) no stepping back Full $\rightarrow$ Full: $\Delta CW = 0$	
price decreases $\Delta p < 0$			(C) no stepping back Excl $\rightarrow$ Full: $\Delta CW > 0$

Figure WA.2: Evaluation of a mandatory cooling off period when motivation is autocorrelated

Proposition WA.3 *Data on quantities or data on both prices and confirmation rates are sufficient to assess the directional change in consumer welfare and the relevant cost range following the adoption of a mandatory cooling off period.*

Proof. Follows from the preceding discussion. ■

B.3. Return policy

Compared to the main model specification, the adoption of a return policy has a similar impact. It provides the firm with three potential pricing strategies by allowing it to either cater to twice motivated consumers only, to cater to all consumers who are motivated in the second period even if they were initially unmotivated, or to cater to all consumers. This is reflected in the demand which incorporates the changed likelihoods (relative to the main model specification) of consumers' motivation state combinations.

$$D_{c,r}(p) = \begin{cases} 1 & \text{if} \quad p \leq \underline{u} \\ \mu & \text{if} \quad \underline{u} < p \leq \tilde{u}(\bar{s}|\underline{s}) \\ \mu(\rho + (1-\rho)\mu) & \text{if} \quad \tilde{u}(\bar{s}|\underline{s}) < p \leq \bar{u} \\ 0 & \text{otherwise} \end{cases} \tag{WA.5}$$

From this, we obtain the candidate profits for the three possible targeting strategies. The firm may charge $\bar{u}$ to reap profits $\overline{\pi}_{a,r} = \mu(\rho + (1-\rho)\mu)(\underline{u} + \Delta - c)$, charge $\tilde{u}(\bar{s}|\underline{s})$ to reap profits $\utilde{\pi}_{r,a} = \mu(\underline{u} + (1-\alpha)\Delta - c)$, or charge $\underline{u}$ to reap profits $\underline{\pi}_{a,r} = \underline{u} - c$. Pairwise comparison of the profits allows to establish the cost thresholds $\utilde{c}_{a,r}$ and $\tilde{c}_{a,r}$ which determine the firm's equilibrium strategy.

Proposition WA.4 (Firm's pricing given return policy) *There exist thresholds $\utilde{c}_{a,r}$ and $\tilde{c}_{a,r}$ which determine the firm's pricing decision in presence of a return policy.*

(i) If $c \leq \utilde{c}_{a,r}$, the firm initially targets all consumers and all consumers keep the good. The firm charges $p = \underline{u}$ to reap profits $\underline{\pi}_{a,r}$, while consumer surplus is $\underline{CW}_{a,r} = \mu\Delta$.

(ii) If $c \in (\utilde{c}_{a,r}, \tilde{c}_{a,r}]$, the firm initially targets all consumers, who return the good unless they are motivated in the second period. The firm charges $p = \underline{u} + (1-\alpha)\Delta$ to reap profits $\utilde{\pi}_{a,r}$, while consumer surplus is $\utilde{CW}_{a,r} = \alpha\mu\Delta$.

(iii) If $c \in (\tilde{c}_{a,r}, \bar{u}]$, the firm initially targets only motivated consumers, who return the good unless they remain motivated in the second period. The firm charges $p = \underline{u} + \Delta$ to reap profits $\overline{\pi}_{a,r}$, while consumer surplus is $\overline{CW}_r = 0$.

$(\utilde{c}_{a,r}, \tilde{c}_{a,r}]$ is nonempty if and only if $\alpha < \frac{1-\rho}{1+(1-\mu)\rho}$.

Proof. Pairwise comparison of candidate profits yields the thresholds

- $c_1 \equiv \underline{u} - \frac{(1-\alpha)\mu}{1-\mu}\Delta$ so that $\underline{\pi}_{a,r} < \utilde{\pi}_{a,r} \iff c > c_1$
- $c_2 \equiv \underline{u} + \frac{(1-\mu)(1-\rho)-\alpha}{(1-\mu)(1-\rho)}\Delta$ so that $\utilde{\pi}_{a,r} < \overline{\pi}_{a,r} \iff c > c_2$
- $c_3 \equiv \underline{u} - \frac{\mu^2(1-\rho)+\mu\rho}{(1-\mu)(1+(1-\rho)\mu)}\Delta$ so that $\underline{\pi}_{a,r} < \overline{\pi}_{a,r} \iff c > c_3$

We obtain thresholds c_1, c_2, c_3 from the pairwise comparison of profits so that $\underline{\pi}_{a,r} < \underset{\sim}{\pi}_{a,r}$ (for $c > c_1$), $\underset{\sim}{\pi}_{a,r} < \bar{\pi}_{a,r}$ ($c > c_2$) and $\underline{\pi}_{a,r} < \bar{\pi}_{a,r}$ (for $c > c_3$), respectively. As in the baseline, the order of these thresholds depends on α; specifically, $c_1 \geq c_3 \geq c_2$ if $\alpha \geq \frac{1-\rho}{1+(1-\rho)\mu}$, and $c_1 < c_3 < c_2$ otherwise. Note that $\frac{1-\rho}{1+(1-\rho)\mu} \overset{\rho=0}{=} \frac{1}{1+\mu}$, i.e. that this coincides with the main model specification for $\rho = 0$. Defining $\underset{\sim}{c}_{a,r} = \min\{c_1, c_3\}$ and $\tilde{c}_{a,r} = \max\{c_2, c_3\}$ we obtain the equilibrium targeting behaviors, and can compute consumer welfare by comparing the price with the respective utilities of consumption. ■

Impact of a return policy & ex-post evaluation By comparing the possible equilibrium targeting strategies and associated outcomes as given by Proposition WA.1 and Proposition WA.4, we can characterize the impact of the adoption of a return policy. We illustrate this in Figure WA.3

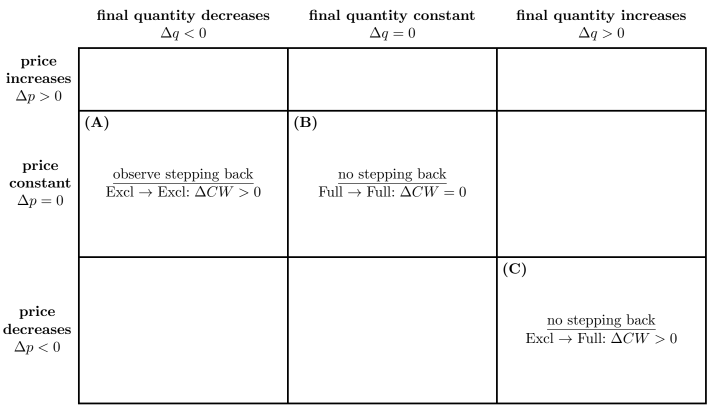

Figure WA.3: Impact of a return policy with autocorrelated motivations

Importantly, a novel case arises compared to the main model specification. For sufficiently persistent motivations (large ρ), it is in addition possible that full market coverage pre intervention is followed by exclusive targeting post intervention, which is associated with $\Delta p > 0, \Delta q < 0$ and $\Delta CW < 0$. This is because persistence in motivation makes exclusive targeting in case of a return policy relatively more attractive as initially motivated consumers are more likely to remain motivated and hence keep the good; formally, it is possible that $\underset{\sim}{c}_{a,r} < \tilde{c}_a$. Otherwise, the same combinations of pre and post intervention targeting behavior materialize, with identical predictions in terms of Δp, Δq and ΔCW as the model in the main part — the one exception being the case where a return policy leads to a change from full market coverage to catering to the full market, but inducing return by second-period unmotivated consumers; in this case, $\Delta CW < 0$ instead of $\Delta CW = 0$ in the original model.

Naturally, this warrants a discussion of whether the data requirements to identify the sign of ΔCW are affected. It turns out that this is not the case, see Figure WA.4, despite the now three potential combinations of targeting pre and post policy adoption which rationalize a price increase and quantity decrease (see Cell(A)). To distinguish between the combinations of exclusive targeting pre and post policy adoption, and full targeting pre adoption with intermediate targeting post adoption, we require knowledge of the total market size as in the main model

	final quantity decreases $\Delta q < 0$	**final quantity constant** $\Delta q = 0$	**final quantity increases** $\Delta q > 0$
price increases $\Delta p > 0$	**(A)** observe return Excl $\rightarrow$ Excl: $\Delta CW > 0$ Full $\rightarrow$ Int: $\Delta CW < 0$ Full $\rightarrow$ Excl: $\Delta CW < 0$	**(B)** observe return Excl $\rightarrow$ Int: $\Delta CW > 0$	
price constant $\Delta p = 0$		**(C)** observe return Excl $\rightarrow$ Int: $\Delta CW > 0$	
price decreases $\Delta p < 0$		**(D)** observe return Excl $\rightarrow$ Int: $\Delta CW > 0$ observe no return Full $\rightarrow$ Full: $\Delta CW > 0$	**(E)** observe no return Excl $\rightarrow$ Full: $\Delta CW > 0$

Figure WA.4: Evaluation of a return policy when motivation is autocorrelated

specification. The newly arising combination of full targeting followed by exlcusive targeting in turn can always be identified even without this additional information as it is the only case in which the initially purchased quantity (as opposed to the quantity consumed) falls below that pre intervention. Importantly, we do not require knowledge of the degree to which motivations are persistent to evaluate these policies.

Proposition WA.5 *Data on quantities, return frequencies and market size are sufficient to assess the directional change in consumer welfare and the relevant cost range following the adoption of a return policy.*

Proof. Follows from the preceding discussion.■

B.4. Summary

In summary, allowing for motivation states to be autocorrelated over time leaves the main qualitative predictions of the model unchanged, but makes it possible for a return policy to be detrimental to consumer welfare. Importantly, the data requirements to assess the sign of the impact of the policy adoptions on consumer welfare are unchanged compared to the main model specification.

C. Costly Return

The main model specification considered the case of costless return. However, this is unlikely to hold in reality: There are shipping costs of physically returning the good, as well as potential hassle costs of dealing with the associated paperwork and the opportunity costs of devoting time to the return process on the consumers' side. Moreover, the firm has to produce the good and ship it to the consumer, even though consumption does not take place as the good is returned. It is therefore important to assess whether the inclusion of return costs—which may be born by either consumers or the firm—affects the model's qualitative predictions and the data requirements to evaluate the return policy ex post.

To address this issue, we proceed as follows. We first analyze a model variant where the firm internalizes a fraction η of the production cost in case the product is returned and not consumed. We show that the qualitative predictions are largely unchanged, and that in particular a cooling off period may still be better for consumer welfare than a return policy. Despite the fact that positive return costs prima facie make a return policy less attractive, this is not immediately obvious as positive return costs may in principle incentivize the firm to avoid inducing return, which benefits consumer welfare as this is only facilitated by charging a sufficiently low price such that all consumers purchase and keep the good. While a new combination of targeting strategies is theoretically possible, we show that the data requirements to evaluate the policy ex-post do not differ from the main model specification: data on quantities, return behavior, and market size is sufficient to assess whether consumers benefited from the policy adoption.

We then show that the same holds true when it is consumers who bear the return costs. This is because the firm's profits for a given targeting strategy are unaffected relative to the case where the firm bears the costs—consumers correctly anticipate their return behavior despite the projection bias and the price as such adjusts to exactly compensate consumers for the return cost. For an ex-post assessment of the policy, price data is less informative whenever consumers bear the return costs. This is because it is not possible to determine whether a price decrease is due to a shift in targeting strategy or due to the fact that consumers are compensated for sometimes returning the good. The overall data requirements are nonetheless unaffected because price data was not necessary to evaluate the policy—quantities, return behavior, and market size are all unaffected by who bears the cost, and as such remain sufficient to determine whether consumers benefited from the policy.

C.1. Firm bears return cost

Let $\eta \in [0, 1]$ be the fraction of the production cost c which the firm incurs whenever a product is returned. $\eta > 0$ for example captures the fact that the firm has been returned a good which was shipped out but not used and which can hence be sold later. Whenever a consumer returns the good, the firm incurs a cost ηc proportional to the initial production cost. Relative to the main model specification, this return cost does not affect the baseline model or the adoption of a mandatory cooling off period, and only impacts the adoption of a return policy.

With a return policy in place, consumers' decisions remain as in the baseline model because they do not directly bear the return cost. As such, demand is unaffected and given by $\hat{D}_r(p)$.

$$\hat{D}_r(p) = \begin{cases} 1 & \text{if} \quad p \leq \underline{u} \\ \mu & \text{if} \quad p \in (\underline{u}, \tilde{u}(\bar{s}|\underline{s})] = (\underline{u}, \alpha\underline{u} + (1-\alpha)\bar{u}] \\ \mu^2 & \text{if} \quad p \in (\tilde{u}(\bar{s}|\underline{s}), \bar{u}] = (\alpha\underline{u} + (1-\alpha)\bar{u}, \bar{u}] \\ 0 & \text{if} \quad p > \bar{u} \end{cases} \tag{WA.6}$$

This implies the same three potential targeting strategies. However, firm profits are lowered whenever the pricing by the firm induces return for some consumers. The firm can exclusively target motivated consumers who return the good unless they are again motivated in the second period. It charges $p = \bar{u}$ to earn profits

$$\hat{\bar{\pi}}_r = \mu\left(\mu(\bar{u} - c) - (1-\mu)\eta c\right) = \mu(\mu(\underline{u} + \Delta) - (\mu + (1-\mu)\eta)c) \tag{WA.7}$$

Alternatively, it may target all consumers, but have second period unmotivated consumers return the good. This is facilitated by charging $p = \underline{u} + (1-\alpha)\Delta$ and yields profits

$$\hat{\underset{\sim}{\pi}}_r = \mu(\underline{u} + (1-\alpha)\Delta - c) - (1-\mu)\eta c = \mu(\underline{u} + (1-\alpha)\Delta) - (\mu + (1-\mu)\eta)c \tag{WA.8}$$

Finally, the firm may target all consumers and avoid return by charging $p = \underline{u}$ which yields profits $\hat{\underline{\pi}}_r = \underline{u} - c$.

As in the main model specification, comparing the potential profits yields the firm's equilibrium pricing strategy as a function of its marginal cost of production.

Proposition WA.6 *There exist thresholds $\underset{\wedge}{c}_r$ and $\hat{c}_r$ which determine the firm's pricing decision in presence of a return policy.*

(i) If $c \leq \underset{\wedge}{c}_r$, the firm initially targets all consumers and all consumers keep the good. The firm charges $\underline{p}_r = \underline{u}$ to reap profits $\underline{u} - c$, while consumer surplus is $CW = \mu\Delta$.

(ii) If $c \in (\underset{\wedge}{c}_r, \hat{c}_r]$, the firm initially targets all consumers, who return the good unless they are motivated in the second period. The firm charges $\underset{\sim}{p}_r$ to reap profits $\hat{\underset{\sim}{\pi}}_r = \mu(\underline{u} + (1-\alpha)\Delta) - (\mu + (1-\mu)\eta)c$, while consumer surplus is $\underset{\sim}{CW}_r = \mu\alpha\Delta$.

(iii) If $c \in \left(\hat{c}_r, \frac{\mu}{\mu+(1-\mu)\eta}\bar{u}\right]$, the firm initially targets only motivated consumers, who return the good unless they remain motivated in the second period. The firm charges $\bar{p}_r$ to reap profits $\hat{\bar{\pi}}_r = \mu(\mu(\underline{u} + \Delta) - (\mu + (1-\mu)\eta)c)$, while consumer surplus is $\overline{CW}_r = 0$.

$(\underset{\wedge}{c}_r, \hat{c}_r]$ is nonempty if and only if $(1-\mu)\eta\underline{u} < \mu(1 - \alpha(1 + (1-\eta)\mu))\Delta$.

Proof. Pairwise comparison of candidate profits yields the thresholds

- $\hat{c}_r^1 \equiv \frac{1-\mu}{1-(\mu+(1-\mu)\eta)}\underline{u} - \Delta\frac{\mu(1-\alpha)}{1-(\mu+(1-\mu)\eta)}$ so that $\hat{\underset{\sim}{\pi}}_r > \hat{\underline{\pi}}_r \iff c > \hat{c}_r^1$.
- $\hat{c}_r^2 \equiv \frac{\mu}{\mu+(1-\mu)\eta}\underline{u} + \Delta\frac{\mu(1-\mu-\alpha)}{\mu(1-\mu)+(1-\mu)^2\eta}$ so that $\hat{\bar{\pi}}_r > \hat{\underset{\sim}{\pi}}_r \iff c > \hat{c}_r^2$.
- $\hat{c}_r^3 \equiv \frac{1-\mu^2}{1-\mu^2-\mu(1-\mu)\eta}\underline{u} - \Delta\frac{\mu^2}{1-\mu^2-\mu(1-\mu)\eta}$ so that $\hat{\bar{\pi}}_r > \hat{\underline{\pi}}_r \iff c > \hat{c}_r^3$.

Next, we can establish that $\hat{c}_r^1 \leq \hat{c}_r^3 \leq \hat{c}_r^2$ if $(1-\mu)\eta\underline{u} < \mu(1-\alpha(1+(1-\eta)\mu))\Delta$, and $\hat{c}_r^1 > \hat{c}_r^3 > \hat{c}_r^2$ otherwise. Note that

$$(1-\mu)\eta\underline{u} < \mu(1 - \alpha(1 + (1-\eta)\mu))\Delta \overset{\eta=0}{\iff} \alpha < \frac{1}{1+\mu}, \tag{WA.9}$$

i.e. that this coincides with the main model specification for $\eta = 0$. Defining $\check{c}_r = \min\{\hat{c}_r^1, \hat{c}_r^3\}$ and $\hat{c}_r = \max\{\hat{c}_r^2, \hat{c}_r^3\}$ we obtain the equilibrium targeting behaviors, and can compute consumer welfare by comparing the price with the respective utilities of consumption. ■

Overall, the targeting behavior is hence similar to that without return costs; however, the profitability of strategies which induce on-path return is lowered, which increases the range of marginal cost such that the full market is covered. Moreover, it is now possible that the firm exclusively targets twice motivated consumers with a return policy in place even though it catered to all consumers prior to the policy intervention, i.e., that $\hat{c}_r < \tilde{c}$. This is because the internalization of return costs also affects the relative profitability between the intermediate and exclusive targeting strategies and may therefore push $\hat{c}_r$ downward. We summarize the combinations of targeting behavior and the implications for prices, quantities, consumer welfare, and return behavior in Figure WA.5, which we obtain by comparing the equilibrium outcomes given by Proposition WA.6 with those for the baseline case from the main model specification.

with Return Policy

Baseline	Full Targeting	Intermediate Targeting	Exclusive Targeting
Exclusive Targeting	$\Delta q > 0$ $\Delta p < 0$ $\Delta CW > 0$ no return	$\Delta q = 0$ Δp ambiguous $\Delta CW > 0$ observe return	$\Delta q < 0$ $\Delta p > 0$ $\Delta CW > 0$ observe return
Full Targeting	$\Delta q = 0$ $\Delta p < 0$ $\Delta CW > 0$ no return	$\Delta q < 0$ $\Delta p > 0$ $\Delta CW = 0$ observe return	$\Delta q < 0$ $\Delta p > 0$ $\Delta CW < 0$ observe return

Figure WA.5: Impact of a Return Policy when the firm bears the return cost

Ex-post evaluation The price, quantity and return patterns given a targeting strategy combination are hence unchanged relative to the main model specification, except for the newly arising case Full $\rightarrow$ Excl, as depicted in Figure WA.6. This new combination in principle has the potential to confound identification, as it is associated with $\Delta q < 0$, $\Delta p > 0$ and $\Delta CW < 0$—it shares the Δp-Δq-combination and on-path return with the combinations Full $\rightarrow$ Int ($\Delta CW = 0$) and Excl $\rightarrow$ Excl ($\Delta CW > 0$). However, we can separate this potential new case from the other two, as it is the only one where the set of originally purchasing consumers (μ) is smaller than that of those purchasing before the policy adoption (1). In the other two combinations, the set of originally purchasing consumers is identical to those who purchased before the intervention (full market for Full$\rightarrow$Int, only initially motivated consumers for Excl$\rightarrow$Excl).

	final quantity decreases $\Delta q < 0$	final quantity constant $\Delta q = 0$	final quantity increases $\Delta q > 0$
price increases $\Delta p > 0$	**(A)** observe return Excl → Excl: $\Delta CW < 0$ Full → Int: $\Delta CW = 0$ Full → Excl: $\Delta CW < 0$	**(B)** observe return Excl → Int: $\Delta CW > 0$	
price constant $\Delta p = 0$		**(C)** observe return Excl → Int: $\Delta CW > 0$	
price decreases $\Delta p < 0$		**(D)** observe return Excl → Int: $\Delta CW > 0$ observe no return Full → Full: $\Delta CW > 0$	**(E)** observe no return Excl → Full: $\Delta CW > 0$

Figure WA.6: Evaluation of a Return Policy when the firm bears the return cost

For the remaining cases, the data requirements to identify the relevant cost range and therefore directional change in consumer welfare are obtained using the same arguments as in the main model specification. If quantities increase, it must be the case that only motivated consumers were targeted pre intervention while the market is fully covered after the adoption of the return policy. When the final quantity remains constant, return data allows to distinguish between a change from exclusively targeting motivated consumers pre intervention and the market being fully covered both pre and post adoption of the return policy. Finally, data on market size is necessary to distinguish between the cases where the firm uses the most exclusive targeting strategy both pre and post intervention, and where it switches from targeting all consumers to initially catering to all consumers, but inducing return unless they are motivated in the consumption period—the market is fully covered pre intervention only in the latter scenario. Thus, we can overall conclude that the data requirements are unchanged relative to the main model specification with costless return.

Proposition WA.7 *When return is costly and the firm internalizes a fraction η of the production cost for returned goods, data on quantities, return frequencies, and market size are sufficient to assess the directional change in consumer welfare following the adoption of a return policy.*

Proof. Follows from the preceding discussion.■

C.2. Consumers bear return cost

Suppose that instead of the firm, it is consumers who bear the return cost. Denote the cost by $r_c > 0$ and suppose that consumers correctly anticipate it. As consumers always correctly predict the probability of return (specifically, that they return whenever they are unmotivated in the second period in the two relevant targeting strategies), the price needs to adjust to compensate them for it. However, the firm's profits are unchanged. To exemplify this, consider the exclusive targeting strategy. Only motivated consumers initially purchase and the price the firm can

with Return Policy

Baseline	Full Targeting	Intermediate Targeting	Exclusive Targeting
Exclusive Targeting	$\Delta q > 0$ $\Delta p < 0$ $\Delta CW > 0$ no return	$\Delta q = 0$ Δp ambiguous $\Delta CW > 0$ observe return	$\Delta q < 0$ Δp ambiguous $\Delta CW > 0$ observe return
Full Targeting	$\Delta q = 0$ $\Delta p < 0$ $\Delta CW > 0$ no return	$\Delta q < 0$ Δp ambiguous $\Delta CW = 0$ observe return	$\Delta q < 0$ Δp ambiguous $\Delta CW < 0$ observe return

Figure WA.7: Impact of a Return Policy when consumers bear the return cost

charge becomes $\bar{p} = \bar{u} - \frac{1-\mu}{\mu} r_c$ so that the motivated consumer's predicted utility is equal to $\mu \cdot (\bar{u} - \bar{p}) + (1-\mu) \cdot r_c = 0$. The firm's profit in turn becomes $\hat{\hat{\bar{\pi}}}_r = \mu^2 \cdot (\bar{u} - \frac{1-\mu}{\mu} r_c - c)$, which is identical to the profits of a firm using the exclusive targeting strategy which internalizes a fraction $\eta = \frac{r_c}{c}$ of the production cost.

The same holds for the intermediate targeting strategy; consumers' predicted expected utility becomes $\mu \cdot \tilde{u}(\bar{s}|\underline{s}) + (1-\mu) \cdot (-r_c)$ which implies that the firm can charge at most $p = \tilde{u}(\bar{s}|\underline{s}) - \frac{1-\mu}{\mu} r_c = \underline{u} + (1-\alpha)\Delta - \frac{1-\mu}{\mu} r_c$ to reap profits $\underset{\sim}{\hat{\hat{\pi}}}_r = \mu(\underline{u} + (1-\alpha)\Delta - \frac{1-\mu}{\mu} r_c - c) \overset{\eta = \frac{r_c}{c}}{=} \underset{\sim}{\hat{\pi}}_r$.

Overall, the cost thresholds which determine the firm's targeting are hence identical to those in Proposition WA.6 with $\eta = \frac{r_c}{c}$, with only the prices charged by the firm changing to reflect that consumers now need to be compensated for the return costs they directly bear.

Proposition WA.8 *There exist thresholds $\underset{\wedge}{c}_r$ and $\hat{c}_r$ which determine the firm's pricing decision in presence of a return policy, when consumers directly bear the return cost $r_c = \eta \cdot c$.*

(i) If $c \leq \underset{\wedge}{c}_r$, the firm initially targets all consumers and all consumers keep the good. The firm charges $\underline{p}_r = \underline{u}$ to reap profits $\underline{u} - c$, while consumer surplus is $CW = \mu\Delta$.

(ii) If $c \in (\underset{\wedge}{c}_r, \hat{c}_r]$, the firm initially targets all consumers, who return the good unless they are motivated in the second period. The firm charges $\underline{u} + (1-\alpha)\Delta - \frac{1-\mu}{\mu}\eta c$ to reap profits $\underset{\sim}{\hat{\pi}}_r = \mu(\underline{u} + (1-\alpha)\Delta) - (\mu + (1-\mu)\eta)c$, while consumer surplus is $\underset{\sim}{CW}_r = \mu\alpha\Delta$.

(iii) If $c \in \left(\hat{c}_r, \frac{\mu}{\mu+(1-\mu)\eta}\bar{u}\right]$, the firm initially targets only motivated consumers, who return the good unless they remain motivated in the second period. The firm charges $\bar{u} - -\frac{1-\mu}{\mu}\eta c$ to reap profits $\hat{\bar{\pi}}_r = \mu(\mu(\underline{u} + \Delta) - (\mu + (1-\mu)\eta)c)$, while consumer surplus is $\overline{CW}_r = 0$.

$(\underaccent{\check}{c}_r, \hat{c}_r]$ *is nonempty if and only if* $(1-\mu)\eta\underline{u} < \mu(1-\alpha(1+(1-\eta)\mu))\Delta$.

Proof. Follows immediately from Proposition WA.6 as only the prices but not the relative profitabilities of the respective strategies are affected. ■

This also implies that the predictions on quantities, return, and consumer welfare are unaffected. However, the impact on price is no longer generically signable as there is downward pressure on prices when return is induced on the equilibrium path, which introduces more ambiguity in terms of the price movement, see Figure WA.7. However, this additional ambiguity does not affect the data requirements for evaluating the impact of the policy intervention on consumer welfare. This is because the assessment only uses data on quantities, return behavior, and market size, all of which do not depend (conditional on targeting strategy combinations) on whether the firm or consumers bear the return cost.

	final quantity decreases $\Delta q < 0$	**final quantity constant** $\Delta q = 0$	**final quantity increases** $\Delta q > 0$
price increases $\Delta p > 0$	**(A)** observe return Excl → Excl: $\Delta CW < 0$ Full → Int: $\Delta CW = 0$ Full → Excl: $\Delta CW < 0$	**(B)** observe return Excl → Int: $\Delta CW > 0$	
price constant $\Delta p = 0$	**(A')** observe return Excl → Excl: $\Delta CW < 0$ Full → Int: $\Delta CW = 0$ Full → Excl: $\Delta CW < 0$	**(C)** observe return Excl → Int: $\Delta CW > 0$	
price decreases $\Delta p < 0$	**(A")** observe return Excl → Excl: $\Delta CW < 0$ Full → Int: $\Delta CW = 0$ Full → Excl: $\Delta CW < 0$	**(D)** observe return Excl → Int: $\Delta CW > 0$ observe no return Full → Full: $\Delta CW > 0$	**(E)** observe no return Excl → Full: $\Delta CW > 0$

Figure WA.8: Evaluation of a Return Policy when consumers bear the return cost

Specifically, we can depict all possible combinations of observed price and quantity behavior due to the policy adoption in Figure WA.8. Compared to Figure WA.6, there is additional ambiguity in terms of potential price movements whenever the quantity consumed decreases (Cells (A') and (A")). But as the three possible targeting strategy combinations which lead to these observations can be identified using data on return and market size, the overall data requirements are not affected.

Proposition WA.9 *When return is costly and consumers suffer costs* r_c *when returning the good, data on quantities, return frequencies, and market size are sufficient to assess the directional change in consumer welfare following the adoption of a return policy.*

Proof. Follows from the preceding discussion.■

C.3. Comparison of Policies with Costly Return

As in the main model specification, a mandatory cooling off period may be better for consumer welfare than a return policy. For this, reconsider the model variant where the firm internalizes a fraction η of the cost of returned goods and note that we can rewrite

$$\begin{aligned} \hat{c}_r^2 &= \frac{\mu}{\mu(1-\mu)+(1-\mu)^2\eta}\left((1-\mu)(\underline{u}+\Delta)-\alpha\Delta\right) \\ \hat{c}_r^3 &= \frac{1}{1-\mu^2-\mu(1-\mu)\eta}\left(\underline{u}-\mu^2(\underline{u}+\Delta)\right) \end{aligned} \tag{WA.10}$$

Note that if $(1-\mu)\eta\underline{u} < \mu(1-\alpha(1+(1-\eta)\mu))\Delta$, $\hat{c}_r^2$ is the relevant cutoff above which the firm uses exclusive targeting in the presence of a return policy. But this cutoff is positive iff $(1-\mu)(\underline{u}+\Delta)-\alpha\Delta > 0$, in which case it decreases in η. So whenever $\hat{c}_r^2 = \hat{c}_r > 0$, the fact that $\hat{c}_r|_{\eta=0} < \tilde{c}_c$ suffices to conclude that cooling off is preferred to a return policy for a positive mass of marginal cost. Moreover, if it is negative the point is moot as exclusive targeting always prevails – while the cutoff is decreasing in η in this case, it always remains negative. For $(1-\mu)\eta\underline{u} < \mu(1-\alpha(1+(1-\eta)\mu))\Delta$, the property that a mandatory cooling off period may be the preferred policy intervention carries over to the setting in which return is costly.

In the converse case, $\hat{c}_r^3 = \hat{c}_r$ is the relevant cutoff below which the firm exclusively targets twice motivated consumers, which for $\underline{u}-\mu^2(\underline{u}+\Delta) > 0$ is positive and increasing in η. So it may be the case that we have $\hat{c}_r^3 > \tilde{c}_c$ for some values of η (recall that for $\eta = 0$, $\hat{c}_r^3|_{\eta=0} < \tilde{c}_c$). We can summarize that a return policy may do worse than a cooling off period with regards to consumer welfare even if return costs are internalized. However, for large η, i.e. if the internalized fraction of the production cost is sizeable, there may not exist a cost range such that this is the case. The reasoning behind this is simple: As the internalization occurs only in the scenario where a return policy is in place, it may make exclusive targeting sufficiently unattractive for the firm such that it always prefers less exclusive targeting behavior to avoid the internalization of return costs. Aside from the total welfare loss which is associated with a return policy in the presence of return costs, i.e. $\eta \cdot c > 0$ for each returned good, the result that a cooling off period may be better for consumer welfare than a return policy, despite the fact that the latter avoids negative expected consumer utility, carries over.

D. Heterogeneity in Bias

To incorporate heterogeneity in consumers' degree to which they exhibit a projection bias, we analyze the model in the presence of a second consumer type. Let a fraction $(1-\rho)$ of consumers experience a projection bias as in the baseline, while the remaining proportion $\rho \in (0,1)$ of consumers is unbiased. These unbiased consumers correctly predict their state-dependent and expected consumption utilities. The rest of the model remains unchanged. The firm is fully aware of consumers' preferences and proportions and chooses its price to maximize its profit.

D.1. Baseline

Absent a policy intervention, the firm now has three instead of two targeting strategies. As before, it can base its pricing on the predicted expected utility of unmotivated consumers, $\utilde{p} = \utilde{u}$, or on that of motivated consumers, $\widetilde{p} = \tilde{u}$. In addition, it can charge the actual expected utility $\bar{p} = E[u]$, which attracts both unbiased consumers and motivated biased consumers. This intermediate targeting behavior is only optimal provided that the fraction of unbiased consumers is sufficiently large; otherwise, it is strictly better for the firm to either increase the quantity sold by catering to the full market, or to increase the price by focusing exclusively on motivated consumers.

Specifically, the fraction ρ of unbiased consumers purchases iff $p \leq E[u] = \underline{u} + \mu\Delta$, the fraction $(1-\rho)\mu$ of motivated consumers purchases iff $p \leq \tilde{u} = \underline{u} + (\mu + (1-\mu)\alpha)\Delta$, and the fraction $(1-\rho)(1-\mu)$ of unmotivated consumers purchases iff $p \leq \utilde{u} = \underline{u} + (1-\alpha)\mu\Delta$. This implies that demand is given by

$$D(p) = \begin{cases} 1 & \text{if} \quad p \leq \utilde{u} \\ \rho + (1-\rho)\mu & \text{if} \quad \utilde{u} < p \leq E[u] \\ (1-\rho)\mu & \text{if} \quad E[u] < p \leq \tilde{u} \\ 0 & \quad \text{otherwise} \end{cases} \tag{WA.11}$$

The candidate prices and profits are thus given by (i) $\utilde{p} = \utilde{u}$ yielding $\utilde{\pi} = \underline{u} + (1-\alpha)\mu\Delta - c$, (ii) $\bar{p} = E[u]$ yielding $\bar{\pi} = (\rho + (1-\rho)\mu)(\underline{u} + \mu\Delta - c)$, and (iii) $\widetilde{p} = \tilde{u}$ yielding $\widetilde{\pi} = (1-\rho)\mu\,[\underline{u} + (\mu + (1-\mu)\alpha)\Delta - c]$. Pairwise comparison of these candidate profits allows us to determine the firm's equilibrium behavior and the associated market outcomes.

Proposition WA.10 *There exist thresholds $\utilde{c}$, $\tilde{c}$ and $\tilde{\rho} \in (0,1)$ which determine the firm's pricing decision absent a policy intervention.*

(i) If $c \leq \utilde{c}$, the firm targets all consumers and charges $\utilde{p} = \utilde{u}$. This gives $\utilde{q} = 1$ and $\utilde{CW} = \alpha\mu\Delta$.

(ii) If $c \in (\utilde{c}, \tilde{c}]$, the firm targets all but initially unmotivated biased consumers by charging $\bar{p} = E[u]$. This gives $\bar{q} = \rho + (1-\rho)\mu$ and $\overline{CW} = 0$.

(iii) Otherwise, the firm targets only initially motivated biased consumers by charging $\widetilde{p} = \tilde{u}$. This gives $\widetilde{q} = (1-\rho)\mu$ and $\widetilde{CW} = -\mu(1-\mu)\alpha(1-\rho)\Delta$. $(\utilde{c}, \tilde{c}]$ is nonempty if and only if $\rho > \tilde{\rho}$. Otherwise, $\utilde{c} = \tilde{c}$.

Proof. Pairwise comparison of the candidate profits yields cost thresholds c_1, c_2, c_3 such that

- $\utilde{\pi} < \bar{\pi}$ iff $c > c_1 = \underline{u} + \mu\frac{(1-\mu)(1-\rho)-\alpha}{(1-\mu)(1-\rho)}\Delta$
- $\bar{\pi} < \widetilde{\pi}$ iff $c > c_2 = \underline{u} + \mu\frac{\rho-(1-\mu)(1-\rho)\alpha}{\rho}\Delta$
- $\utilde{\pi} < \widetilde{\pi}$ iff $c > c_3 = \underline{u} + \left(\mu + (1-\mu)\alpha - \frac{\alpha}{1-(1-\rho)\mu}\right)\Delta.$

It follows that $c_1 < c_3 < c_2$ if $\rho > \tilde{\rho} = \frac{3-(4-2\mu)\mu-\sqrt{5-4(2-\mu)\mu}}{2(1-\mu)^2} \in (0,1)$ and $c_1 \geq c_3 \geq c_2$ otherwise. Defining $\underset{\sim}{c} = \min\{c_1, c_3\}$ and $\tilde{c} = \max\{c_2, c_3\}$ we obtain the equilibrium targeting behaviors, and can compute consumer welfare by comparing the price with the respective expected utilities of consumption of each targeted consumer group. ■

D.2. Mandatory cooling off period

The analysis in case the mandatory cooling off period is in place follows that of the baseline. Given that we restrict attention to $\delta = 1$, the candidate prices are the same, $\underset{\sim}{p}_c = \underset{\sim}{u}, \bar{p}_c = E[u]$ and $\widetilde{p}_c = \tilde{u}$, while the quantities in the intermediate and exclusive targeting case decrease as initially motivated biased consumers who are unmotivated in the second period step back. This is reflected in the changed demand and candidate profits

$$D_c(p) = \begin{cases} 1 & \text{if} \quad p \leq \underset{\sim}{u} \\ \rho + (1-\rho)\mu^2 & \text{if} \quad \underset{\sim}{u} < p \leq E[u] \\ (1-\rho)\mu^2 & \text{if} \quad E[u] < p \leq \tilde{u} \\ 0 & \text{otherwise} \end{cases} \tag{WA.12}$$

$$\underset{\sim}{\pi}_c = \underset{\sim}{u} + (1-\alpha)\mu\Delta - c \tag{WA.13}$$

$$\bar{\pi}_c = (\rho + (1-\rho)\mu^2)(\underset{\sim}{u} + \mu\Delta - c) \tag{WA.14}$$

$$\widetilde{\pi}_c = (1-\rho)\mu^2 \left[\underset{\sim}{u} + (\mu + (1-\mu)\alpha)\Delta - c\right]. \tag{WA.15}$$

Pairwise comparison of these candidate profits allows us to determine the firm's equilibrium behavior and the associated market outcomes.

Proposition WA.11 *There exist thresholds $\underset{\sim}{c}_c \geq \underset{\sim}{c}$, $\tilde{c}_c \geq \tilde{c}$ and $\tilde{\rho}_c \in (0,1)$ which determine the firm's pricing decision absent a policy intervention.*

(i) If $c \leq \underset{\sim}{c}_c$, the firm targets all consumers and charges $\underset{\sim}{p}_c = \underset{\sim}{u}$. This gives $\underset{\sim}{q}_c = 1$ and $\underset{\sim}{CW}_c = \alpha\mu\Delta$.

(ii) If $c \in (\underset{\sim}{c}_c, \tilde{c}_c]$, the firm targets all but initially unmotivated biased consumers by charging $\bar{p}_c = E[u]$. This gives $\bar{q}_c = \rho + (1-\rho)\mu^2$ and $\overline{CW}_c = 0$.

(iii) Otherwise, the firm targets only initially motivated biased consumers by charging $\widetilde{p}_c = \tilde{u}$. This gives $\widetilde{q}_c = (1-\rho)\mu^2$ and $\widetilde{CW}_c = -\mu^2(1-\mu)\alpha(1-\rho)\Delta$.

$(\underset{\sim}{c}_c, \tilde{c}_c]$ is nonempty if and only if $\rho > \tilde{\rho}_c$. Otherwise, $\underset{\sim}{c}_c = \tilde{c}_c$.

Proof. Pairwise comparison of the candidate profits yields cost thresholds $c_{1,c}, c_{2,c}, c_{3,c}$ such that

- $\underset{\sim}{\pi}_c < \bar{\pi}_c$ iff $c > c_{1,c} = \underset{\sim}{u} + \mu\frac{(1-\mu^2)(1-\rho)-\alpha}{(1-\mu^2)(1-\rho)}\Delta$
- $\bar{\pi}_c < \widetilde{\pi}_c$ iff $c > c_{2,c} = \underset{\sim}{u} + \mu\frac{\rho-\alpha\mu(1-\mu)(1-\rho)}{\rho}\Delta$

- $\underset{\sim}{\pi}_c < \widetilde{\pi}_c$ iff $c > c_{3,c} = \underline{u} + \left(\alpha + (1-\alpha)\mu - \frac{\alpha}{1-(1-\rho)\mu^2}\right)\Delta$.

It follows that $c_{1,c} < c_{3,c} < c_{2,c}$ if

$$\rho > \tilde{\rho}_c = 1 - \frac{\sqrt{1 + 4\mu(1-\mu)^2(1+\mu)} - 1}{2\mu(1-\mu)^2(1+\mu)} \in (0,1) \tag{WA.16}$$

and $c_{1,c} \geq c_{3,c} \geq c_{2,c}$ otherwise. Defining $\underset{\sim}{c}_c = \min\{c_{1,c}, c_{3,c}\}$ and $\tilde{c}_c = \max\{c_{2,c}, c_{3,c}\}$ we obtain the equilibrium targeting behaviors, and can compute consumer welfare by comparing the price with the respective expected utilities of consumption of each targeted consumer group.

Note that $\tilde{\rho} > \tilde{\rho}_c \iff \mu < \frac{\sqrt{5}-1}{2}$. Moreover, we have

$$c_{1,c} - c_1 = \frac{\alpha\mu^2}{(1-\mu^2)(1-\rho)}\Delta > 0 \tag{WA.17}$$

$$c_{2,c} - c_2 = \frac{1-\rho}{\rho}(1-\mu)^2\alpha\mu\Delta > 0 \tag{WA.18}$$

$$c_{3,c} - c_3 = \alpha\mu\frac{(1-\mu)(1-\rho)}{(1-(1-\rho)\mu)(1-(1-\rho)\mu^2)}\Delta > 0 \tag{WA.19}$$

and thus $\underset{\sim}{c}_c \geq \underset{\sim}{c}$ and $\tilde{c}_c \geq \tilde{c}$. ■

The intuition behind the different targeting strategies is as in the baseline. There are two important observations. First, $\underset{\sim}{c}_c \geq \underset{\sim}{c}$ and $\tilde{c}_c \geq \tilde{c}$ ensures that the adoption of a mandatory cooling off period always pushes the firm towards a weakly more inclusive targeting behavior. Second, no generic comparison can be made between $\tilde{\rho}$ and $\tilde{\rho}_c$. Intermediate targeting is more likely to materialize absent the policy intervention, $\tilde{\rho} < \tilde{\rho}_c$, whenever the fraction of motivated consumers is sufficiently high.

Impact of a cooling off period All combinations of pre- and post policy adoption strategies which feature weakly more inclusive targeting post intervention can materialize. The resulting combinations, together with the implications for the signs of the changes in price, Δp, quantity, Δq, and consumer welfare, ΔCW, are obtained by comparing the pre and post policy intervention outcomes as characterized by Proposition WA.10 and Proposition WA.11. We depict this in Figure WA.9. Importantly, the directional change in quantity Δq is ambiguous when the mandatory cooling off period leads to a change from exclusive targeting to intermediate targeting. This is because $\Delta q = \rho - (1-\mu)\mu(1-\rho)$ reflects both that unbiased consumers purchase following the policy adoption, while initially motivated biased consumers who are unmotivated in the second period step back.

In all other cases, Δq, Δp and ΔCW can generically be signed. Whenever the targeting behavior is unaffected, there is no change in the price (due to $\delta = 1$), quantity is reduced unless the market is fully covered post policy (as motivated consumers step back when they are unmotivated in the second period) and consumer welfare increases only in the case of exclusive targeting pre and post policy (as the exploitation of biased motivated consumers' overprediction of the expected consumption utility only affects twice motivated consumers).

with Cooling Off Period

Baseline	Full Targeting	Intermediate Targeting	Exclusive Targeting
Exclusive Targeting	$\Delta q > 0$ $\Delta p < 0$ $\Delta CW > 0$	Δq ambiguous $\Delta p < 0$ $\Delta CW > 0$	$\Delta q < 0$ $\Delta p = 0$ $\Delta CW > 0$
Intermediate Targeting	$\Delta q > 0$ $\Delta p < 0$ $\Delta CW > 0$	$\Delta q < 0$ $\Delta p = 0$ $\Delta CW = 0$	
Full Targeting	$\Delta q = 0$ $\Delta p = 0$ $\Delta CW = 0$		

Figure WA.9: Impact of a mandatory cooling off period in the presence of unbiased consumers

By considering the resulting Δp-Δq-combinations together with whether stepping back from initial purchases is observed, which we depict in Figure WA.10, we can speak to the data requirements to assess the directional change in consumer welfare. Most importantly, the directional change in consumer welfare is no longer identified using data on quantities, prices, and stepping back behavior as we cannot clearly identify the targeting behaviors when prices stay constant and quantity decreases, see Cell (A).

	final quantity decreases $\Delta q < 0$	**final quantity constant** $\Delta q = 0$	**final quantity increases** $\Delta q > 0$
price increases $\Delta p > 0$			
price constant $\Delta p = 0$	**(A)** observe stepping back Excl → Excl: $\Delta CW > 0$ Med → Med: $\Delta CW = 0$	**(B)** no stepping back Full → Full: $\Delta CW = 0$	
price decreases $\Delta p < 0$	**(C)** observe stepping back Excl → Med: $\Delta CW > 0$	**(D)** observe stepping back Excl → Med: $\Delta CW > 0$	**(E)** observe stepping back Excl → Med: $\Delta CW > 0$ no stepping back Excl → Full: $\Delta CW > 0$

Figure WA.10: Evaluation of a mandatory cooling off period in the presence of unbiased consumers

Proposition WA.12 *Data on quantities, prices, and stepping back behavior are not sufficient to always assess the directional change in consumer welfare.*

Proof. When $\Delta q < 0$ and $\Delta p = 0$, this can be rationalized both by exclusive or intermediate targeting, respectively, pre and post intervention, see Cell (A) in Figure WA.10. However, consumer welfare is positively affected in case or exclusive targeting, and unaffected (for $\delta = 1$) in case of intermediate targeting. ■

Aside from Cell (A), the combination of market level price and quantity data alone is sufficient to identify the directional change in consumer welfare; in particular, the combination of pre and post policy adoption targeting is always given unless quantity increases while prices fall (Cell (E)). In the latter case, however, all combinations of targeting policies which are consistent with this price-quantity-behavior are unambiguously beneficial for consumers, and could even be identified via the use of data on stepping back behavior.

The case of exclusive targeting pre and post policy intervention, and intermediate targeting pre and post intervention are at first glance indistinguishable for researchers (Cell (A)). They both lead to a reduction in quantity together with no (in case of discounting little) change in prices. Moreover, stepping back from initial purchases materializes in both cases for motivated biased consumers who are no longer motivated at the confirmation stage. However, the fraction of consumers who step back from the initial purchase differs across the two cases and may prove helpful in distinguishing them.

Suppose that researchers have access to survey data which allows an estimation of the fraction μ of consumers who are motivated in a given period. When exclusive targeting materializes pre and post policy adoption, a mass $\mu \cdot (1-\rho)$ of consumers initially indicate that they wish to purchase, while a fraction $\mu^2(1-\rho)$ confirms. A fraction $(1-\mu)$ of initially purchasing consumers hence steps back. In contrast, intermediate targeting pre and post policy adoption features $\rho + \mu(1-\rho)$ consumers initially indicating their wish to purchase, while $\rho + \mu^2(1-\rho)$ confirm. As such, $\frac{(1-\mu)\mu(1-\rho)}{\rho+\mu(1-\rho)} < (1-\mu)$ of initially purchasing consumers step back; provided that μ is known and $\rho > 0$, observing the relative frequency of stepping back decisions distinguishes between these cases.[1] This directly leads to the following Corollary.

Corollary WA.1 *If the fraction of motivated consumers in each period μ is known, the directional change in consumer welfare can be assessed.*

Proof. Follows from the preceding discussion. ■

Discounting The above results on the identification carry over to the scenario in which consumers discount the future, $\delta < 1$, as long as the evaluator is able to distinguish between cases where price strictly decreases due to changes in the targeting strategy (Cells (C) & (D)) and those where price only decreases slightly due to discounting (Cells (A) & (B)). This seems a reasonable assumption for $\delta \approx 1$. Nonetheless, with discounting consumer welfare is naturally negatively affected by leading to a delay in consumption for the case where the firm catered to all consumers both pre and post policy intervention. This case can always be identified with aggregate data on prices and quantities as it is the only combination of targeting strategies which features a constant quantity and close to no movement in price.

[1] Note that for $\rho \to 0$, there would be no difference in stepping back behavior; however, intermediate targeting does not materialize for ρ sufficiently low.

Corollary WA.2 *Suppose that consumers discount the future, $\delta < 1$, but that evaluators can distinguish small price adjustments due to discounting from larger ones due to shifts in the firm's targeting strategy due to the adoption of a cooling off period. Then the case where consumer welfare is negatively affected can always be identified using aggregate data on prices and quantities.*

Proof. Follows from the preceding discussion. ∎

D.3. Return Policy

As unbiased consumers correctly predict their future consumption utility in the motivated state to be equal to $\bar{u}$, they behave identical to motivated biased consumers. Both types initially purchase provided that $p \leq \bar{u}$ and confirm the purchase provided that $p \leq \bar{u}$ if they are motivated, and provided that $p \leq \underline{u}$ if they are unmotivated. Unmotivated biased consumers in contrast initially purchase whenever $p \leq \tilde{u}(\bar{s}|\underline{s}) = \underline{u} + (1-\alpha)\Delta$. Overall, demand is given by

$$D_r(p) = \begin{cases} 1 & \text{if} \quad p \leq \underline{u} \\ \mu & \text{if} \quad \underline{u} < p \leq \tilde{u}(\bar{s}|\underline{s}) \\ \mu(\rho + (1-\rho)\mu) & \text{if} \quad \tilde{u}(\bar{s}|\underline{s}) < p \leq \bar{u} \\ 0 & \text{otherwise} \end{cases} \tag{WA.20}$$

The candidate prices for the firm are thus as in the main model specification. The firm may choose to cater to second-period unmotivated consumers by charging a price of $\underline{p}_r = \underline{u}$; it may choose to attract biased initially unmotivated consumers but have them return the good unless they are motivated in the second period by charging $\underaccent{\tilde}{p}_r = \tilde{u}(\bar{s}|\underline{s})$; it may choose to extract the full actual consumption utility of motivated consumers, $\bar{p} = \bar{u}$, which implies that biased initially unmotivated consumers do not purchase. Notably, the presence of unbiased consumers only affects the most exclusive targeting strategy and increases both the quantity and profitablity (relative to the main model specification). We obtain for the candidate profits

$$\begin{aligned} \underline{\pi}_r &= \underline{u} - c \\ \underaccent{\tilde}{\pi}_r &= \mu \cdot (\underline{u} + (1-\alpha)\Delta - c) \\ \bar{\pi}_r &= \mu(\rho + (1-\rho)\mu)(\underline{u} + \Delta - c). \end{aligned} \tag{WA.21}$$

Pairwise comparison of these candidate profits allows us to determine the firm's equilibrium behavior and the associated market outcomes.

Proposition WA.13 *There exist thresholds $\underaccent{\tilde}{c}_r$, $\tilde{c}_r$ and $\tilde{\rho}_r$ which determine the firm's pricing decision absent a policy intervention.*

(i) If $c \leq \underaccent{\tilde}{c}_r$, the firm charges $\underline{p}_r = \underline{u}$ to earn $\underline{\pi}_r$. This gives $\underline{q}_r = 1$ and $\underline{CW}_r = \mu\Delta$. No consumer returns the product.

(ii) *If* $c \in (\underset{\sim}{c}_r, \tilde{c}_r]$, *the firm charges* $\underset{\sim}{p}_r = \tilde{u}(\bar{s}|\underline{s})$ *to earn* $\underset{\sim}{\pi}_r$. *All consumers initially purchase the good, but only motivated consumers keep it so that* $\underset{\sim}{q}_r = \mu$ *and* $\underset{\sim}{CW}_r = \mu\alpha\Delta$.

(iii) *Otherwise, the firm charges* $\bar{p}_r = \bar{u}$ *to earn* $\bar{\pi}_r$. *Unbiased and biased motivated consumers initially purchase, and confirm the purchase if they are motivated in the second period,* $\bar{q}_r = \mu(\mu + \rho - \mu\rho)$ *and* $\overline{CW}_r = 0$.

$(\underset{\sim}{c}_r, \tilde{c}_r]$ *is nonempty if and only if* $\rho < \tilde{\rho}_r$. *Otherwise,* $\underset{\sim}{c}_r = \tilde{c}_r$. *It is possible that* $\tilde{\rho}_r < 0$, *in which case* $(\underset{\sim}{c}_r, \tilde{c}_r]$ *is empty irrespective of* ρ.

Proof. Pairwise comparison of the candidate profits yields cost thresholds $c_{1,r}, c_{2,r}, c_{3,r}$ such that

- $\underline{\pi}_r < \underset{\sim}{\pi}_r \iff c > c_{1,r} = \underline{u} - \mu\frac{1-\alpha}{1-\mu}\Delta$
- $\underset{\sim}{\pi}_r < \bar{\pi}_r \iff c > c_{2,r} = \underline{u} + \frac{(1-\mu)(1-\rho)-\alpha}{(1-\mu)(1-\rho)}\Delta$
- $\underline{\pi}_r < \bar{\pi}_r \iff c > c_{3,r} = \underline{u} + \left(1 - \frac{1}{(1-\mu)(1+(1-\rho)\mu)}\right)\Delta$

It follows that $c_{1,r} < c_{3,r} < c_{2,r}$ if $\rho < \tilde{\rho}_r = \frac{1-\alpha-\alpha\mu}{1-\alpha\mu}$, and $c_{1,c} \geq c_{3,c} \geq c_{2,c}$ otherwise. Defining $\underset{\sim}{c}_r = \min\{c_{1,r}, c_{3,r}\}$ and $\tilde{c}_r = \max\{c_{2,r}, c_{3,r}\}$ we obtain the equilibrium targeting behaviors, and can compute consumer welfare by comparing the price with the respective expected utilities of consumption of each targeted consumer group. Note that $\tilde{\rho}_r$ and $\tilde{\rho}$ cannot be generically ordered. We have

$$\tilde{\rho} > \tilde{\rho}_r \iff \alpha > \frac{\sqrt{5 - 8\mu + 4\mu^2} - 1}{2(1 + \mu^2) - \mu(5 - \sqrt{5 - 8\mu + 4\mu^2})} \equiv \tilde{\alpha} \in (0, 1) \tag{WA.22}$$

■

Impact of a return policy It can be established that all potential combinations of pre and post policy targeting can materialize. Towards this, we can consider the different cases regarding the ordering of $\tilde{\rho}$ and $\tilde{\rho}_r$ (which depend on α), and then consider all the possible targeting combinations implied by the ordering of the cost thresholds. From this, we can use Proposition WA.10 and Proposition WA.13 to obtain the possible market outcome combinations, which we depict in Figure WA.11.

Note that a return policy can negatively impact consumer welfare. Specifically, this occurs when the adoption of a return policy leads to a shift from full market coverage (pre policy) to exclusive targeting (post policy). This in turn is possible as the presence of unbiased consumers increases the relative profitabilities both of full market coverage pre policy relative to exclusive targeting, and of the exclusive targeting strategy in the presence of a return policy. Moreover, while ΔCW can always generically be signed given a combination of targeting behavior, this does not hold true for Δq and Δp.

In particular, Δp is ambiguous when the firm uses intermediate or exclusive targeting pre-intervention, and uses the intermediate targeting strategy post-intervention. For a low probability of being motivated, the inclusion of the unmotivated state in the predicted expected utilities

Baseline \ with Return Policy	Full Targeting	Intermediate Targeting	Exclusive Targeting
Exclusive Targeting	$\Delta q > 0$ $\Delta p < 0$ $\Delta CW > 0$	$\Delta q > 0$ Δp ambiguous $\Delta CW > 0$	Δq ambiguous $\Delta p > 0$ $\Delta CW > 0$
Intermediate Targeting	$\Delta q > 0$ $\Delta p < 0$ $\Delta CW > 0$	$\Delta q < 0$ Δp ambiguous $\Delta CW > 0$	$\Delta q < 0$ $\Delta p > 0$ $\Delta CW = 0$
Full Targeting	$\Delta q = 0$ $\Delta p < 0$ $\Delta CW > 0$	$\Delta q < 0$ $\Delta p > 0$ $\Delta CW = 0$	$\Delta q < 0$ $\Delta p > 0$ $\Delta CW < 0$

Figure WA.11: Impact of a return policy in the presence of unbiased consumers

pre-intervention implies a price increase when pricing is based on the predicted consumption utility that unmotivated biased consumers assign to the motivated state. Conversely, price decreases when the projection bias α is sufficiently strong as this both leads to weakly higher prices in the respective pre-policy targeting strategies, but a lower price post policy adoption. Moreover, there is ambiguity regarding Δq when the firm uses the most exclusive targeting strategies both pre and post policy intervention. This is because of the opposing effects of including (second-period motivated) unbiased consumers post policy intervention at the expense of only catering to twice-motivated biased consumers.

By considering the resulting Δp-Δq-combinations together with whether return is observed, which we depict in Figure WA.12, we can speak to the data requirements to assess the directional change in consumer welfare. Consumer welfare is positively affected by the adoption of a return policy unless prices are observed to increase, while the final quantity decreases (Cell (A)). However, there are multiple combinations of targeting strategies consistent with this combination of Δp and Δq which all feature return by some consumers and exhibit differential implications for the sign change in consumer welfare.

Proposition WA.14 *Data on quantities, prices, and return behavior are not sufficient to always assess the directional change in consumer welfare.*

Proof. When $\Delta q < 0$ and $\Delta p > 0$ (Cell (A)), there are multiple combinations of pre and post policy targeting behavior which rationalize this. All feature return of the product, and consumer welfare may have been positively or negatively affected, or have been left unchanged. ■

To further investigate, we summarize behavior of quantities in Table 1, where we also distinguish between the initial purchase post policy adoption, and the final quantity. This allows us to show that the above mentioned data is in fact sufficient to identify the case where consumer welfare is negatively affected. $\Delta CW < 0$ is only possible when the firm catered to the full market pre intervention, but uses the most exclusive targeting strategy following the adoption of a return

	final quantity decreases $\Delta q < 0$	final quantity constant $\Delta q = 0$	final quantity increases $\Delta q > 0$
price increases $\Delta p > 0$	**(A)** observe return Excl $\rightarrow$ Excl: $\Delta CW > 0$ Int $\rightarrow$ Int: $\Delta CW > 0$ Int $\rightarrow$ Excl: $\Delta CW = 0$ Full $\rightarrow$ Int: $\Delta CW = 0$ Full $\rightarrow$ Excl: $\Delta CW < 0$	**(B)** observe return Excl $\rightarrow$ Excl: $\Delta CW > 0$	**(C)** observe return Excl $\rightarrow$ Int: $\Delta CW > 0$ Excl $\rightarrow$ Excl: $\Delta CW > 0$
price constant $\Delta p = 0$	**(D)** observe return Int $\rightarrow$ Int: $\Delta CW > 0$		**(E)** observe return Excl $\rightarrow$ Int: $\Delta CW > 0$
price decreases $\Delta p < 0$	**(F)** observe return Int $\rightarrow$ Int: $\Delta CW > 0$	**(G)** observe no return Full $\rightarrow$ Full: $\Delta CW > 0$	**(H)** observe return Excl $\rightarrow$ Int: $\Delta CW > 0$ observe no return Excl $\rightarrow$ Full: $\Delta CW > 0$ Int $\rightarrow$ Full: $\Delta CW > 0$

Figure WA.12: Evaluation of a return policy in the presence of unbiased consumers

policy. Crucially, this is the only targeting strategy combination in which the initial quantity purchased post policy adoption lies below the quantity purchased pre intervention.

Corollary WA.3 *The case in which consumer welfare decreases due to the adoption of a return policy can be identified using data on quantities, prices, and return behavior.*

Proof. Follows from the preceding discussion ■

#	Strategy Combination	Quantity Pre	Initial Purchase Post	Final Quantity Post	ΔCW
1	Excl $\rightarrow$ Excl	μ	$\rho + (1-\rho)\mu$	$\mu(\rho + (1-\rho)\mu)$	+
2	Int $\rightarrow$ Int	$\rho + (1-\rho)\mu$	1	μ	+
3	Int $\rightarrow$ Excl	$\rho + (1-\rho)\mu$	$\rho + (1-\rho)\mu$	$\mu(\rho + (1-\rho)\mu)$	=
4	Full $\rightarrow$ Int	1	1	μ	=
5	Full $\rightarrow$ Excl	1	$\rho + (1-\rho)\mu$	$\mu(\rho + (1-\rho)\mu)$	−

Table 1: Market Coverage Pre- and Post Policy Intervention

To distinguish the remaining cases, and hence separate the targeting strategy combinations which imply that CW increased due to the policy from those where CW was unaffected, more data is necessary. Notably, knowledge of the fraction of motivated consumers each period, μ, is insufficient to overcome the problem of identifying the targeting strategy combinations in this case. This is because second-period unmotivated consumers return the product, which implies that the fraction of initially purchasing consumers who return (provided that return materializes) is always $(1-\mu)$. Identifying the sign of the change in consumer welfare hence requires additional information such as knowledge of the market size.

Corollary WA.4 *If the fraction of motivated consumers in each period μ is known together with the overall market size, the directional change in consumer welfare can be assessed.*

Proof. See Table 1, in which we need to use information on μ and market size to distinguish combinations 1 through 4. Excl $\to$ Excl is the only combination of targeting strategies which features pre-policy quantity exactly equal to the fraction of motivated consumers times market size. Int $\to$ Int and Full $\to$ Int both feature purchase by all market participants post policy adoption, but only Full $\to$ Int featured full market coverage pre policy. ■

D.4. Summary

Introducing unbiased consumers impacts both the model predictions and the data requirements to identify the sign change in consumer welfare due to the policy introduction. While the main qualitative model predictions carry over from the main model specification, additional targeting strategies materialize which increase the data requirements to assess the policies ex post.

The adoption of a mandatory cooling off period leads to very similar model predictions—post policy the firm always uses a weakly more inclusive targeting strategy, and consumer welfare is negatively affected only by delaying consumption when the market was already fully covered pre policy adoption. Nonetheless, the presence of an additional targeting strategy by basing pricing on unbiased consumers alters the data requirements to assess the sign of the change in consumer welfare. Specifically, this can only be facilitated by using data on the fraction of motivated consumers in addition to aggregate data on prices and quantities, as well as stepping back behavior.

With a return policy, incorporating unbiased consumers makes it possible that consumer welfare is negatively affected by the policy intervention. This is because their presence differentially affects the profitability of the targeting strategies pre and post intervention, and in particular simultaneously increases the relative profitability of catering to the full market pre intervention, and exclusively to motivated consumers post intervention. As such, it is possible that the firm switches from catering to the full market to the most exclusive targetiung behavior post adoption, which lowers consumer welfare. To fully identify the sign of the change in consumer welfare, the evaluator requires additional knowledge of both the fraction of motivated consumers and the size of the market.

Notably, the singular cases which lead to a negative impact of the policy adoption on consumer welfare can be identified using data on prices, quantities, as well as return/stepping back behavior. Even if the data requirements for a full assessment are not met, reasonably available aggregate data is hence sufficient to screen out cases where the policy introduction harmed consumers.

E. Heterogeneity in Valuations

Suppose that the seller is located at the beginning of a line of length $L > \bar{u}$. There is a total mass L of consumers which are uniformly distributed along that line. A consumer at location x incurs a disutility of x when consuming the good, which is independent of the motivation state. $L > \bar{u}$ ensures that some consumers are sufficiently far away from the seller so that they do not purchase at positive prices even if they are certain to consume the good in the motivated state and correctly predict the consumption utility in that state. The total mass of consumers is equal to the length of the line which ensures that there is a mass l on any line segment of length l of consumers, which simplifies the expressions.

Otherwise, the model is as in the baseline. Each individual consumer is either motivated (probability μ) or unmotivated (probability $1-\mu$) in any given period. The consumption utilities are as before, and each consumer exhibits a projection bias parametrized by α. Individual consumer decisions are made as in the baseline model, but take into account the individual disutility due to the distance from the firm for each consumer.

This model formulation leads to demand, as well as the quantity initially purchased and consumed functions, respectively, which are continuous and piecewise-linear. This implies that the firm still has different potential targeting strategies which determine whether some consumer groups are fully excluded, but that the price charged conditional on a given targeting strategy is determined by a standard first order condition.

E.1. Baseline

There are two groups of consumers: a fraction μ of motivated consumers and a fraction $(1-\mu)$ of unmotivated consumers. Motivated consumers purchase if their predicted expected consumption utility $\tilde{u}$ exceeds the total cost of the product, which reflects the purchase price and disutility due to the distance from the firm. The same holds true for unmotivated consumers whose predicted expected utility is given by $\utilde{u}$. Denoting by x_m and x_u the cutoff distance such that motivated (x_m) and unmotivated (x_u) consumers purchase, respectively, we obtain

$$x_m = \tilde{u} - p = \underline{u} + \mu\Delta + (1-\mu)\alpha\Delta - p\,,\;\; x_u = \utilde{u} - p = \underline{u} + \mu\Delta - \alpha\mu\Delta - p \qquad \text{(WA.23)}$$

It is straightforward that (some) unmotivated consumers purchase iff $p < \utilde{u}$. For $p \leq \utilde{u}$, demand is hence given by $\mu x_m + (1-\mu)x_u$, while it is given by μx_m for $\utilde{u} < p \leq \tilde{u}$. This results in demand $D(p)$ given by

$$D(p) = \begin{cases} \underline{u} + \mu\Delta - p & \text{if} \quad p \leq \utilde{u} \\ \mu(\tilde{u} - p) & \text{if} \quad \utilde{u} < p \leq \tilde{u} \\ 0 & \quad\text{otherwise} \end{cases} \qquad \text{(WA.24)}$$

The firm therefore has two targeting strategies. It can price such that unmotivated consumers do not purchase, $\tilde{u} \geq p > \utilde{u}$. In this case, demand is $\mu(\tilde{u}-p)$ (see (WA.24)), and the firm solves

$$\max_{p \in (\utilde{u}, \tilde{u}]} (p-c) \cdot \mu\,(\tilde{u} - p) \qquad \text{(WA.25)}$$

which admits the first order condition

$$\mu\,[\tilde{u} + c - 2\widetilde{p}] = 0 \iff \widetilde{p} = \frac{1}{2}\,(\tilde{u} + c) = \frac{1}{2}\,(c + \underline{u} + [\mu + (1-\mu)\alpha]\Delta)\,. \qquad \text{(WA.26)}$$

Note that $\widetilde{p}$ is the solution to the maximization problem provided that it is interior, i.e. satisfies $p \in (\utilde{u}, \tilde{u}]$. Throughout our analysis, we always verify after deriving the firm's optimal targeting strategy that this is indeed the case conditional on the targeting strategy being optimal. With the optimal price conditional on the exclusive targeting strategy we also obtain the realized total demand $\widetilde{q}$

$$\widetilde{q} = x_m|_{p=\widetilde{p}} = \frac{1}{2}\mu\left(\utilde{u} + [\mu + (1-\mu)\alpha]\Delta - c\right), \tag{WA.27}$$

the firm's profit $\widetilde{\pi}$

$$\widetilde{\pi} = \frac{1}{4}\mu\left(\utilde{u} + [\mu + (1-\mu)\alpha]\Delta - c\right)^2, \tag{WA.28}$$

and the consumer surplus which we can decompose into the actual expected consumption utilities of all purchasing consumers $E[u]$, total disutilities from distance, and total price paid:

$$\widetilde{CW} = \widetilde{q}\cdot(E[u] - \widetilde{p}) - \frac{1}{2}\cdot\mu\cdot x_m^2\big|_{p=\widetilde{p}} = \frac{1}{8}\mu\left(\utilde{u} + [\mu + (1-\mu)\alpha]\Delta - c\right)\left(\utilde{u} + \mu\Delta - 3\alpha(1-\mu)\Delta - c\right). \tag{WA.29}$$

If the firm instead caters to at least some unmotivated consumers by pricing below $\utilde{u}$, demand is $\utilde{u} + \mu\Delta - p$ (see (WA.24)) and the firm solves

$$\max_{p \le \utilde{u}} (p - c)\cdot(\utilde{u} + \mu\Delta - p) \tag{WA.30}$$

which admits the first order condition

$$\utilde{u} + \mu\Delta - c - 2\utilde{p} = 0 \iff \utilde{p} = \frac{1}{2}\left(\utilde{u} + \mu\Delta - c\right). \tag{WA.31}$$

With the optimal price conditional on the full targeting strategy we also obtain the realized total demand $\utilde{q}$

$$\utilde{q} = (x_m + x_u)|_{p=\utilde{p}} = \frac{1}{2}\left(u + \mu\Delta - c\right), \tag{WA.32}$$

the firm's profit $\utilde{\pi}$

$$\utilde{\pi} = \frac{1}{4}\left(\utilde{u} + \mu\Delta - c\right)^2, \tag{WA.33}$$

and the consumer welfare

$$\utilde{CW} = \frac{1}{8}\left[(\utilde{u} - c)(\utilde{u} + 2\mu\Delta - c) + \mu(\mu - 4(1-\mu)\alpha^2)\Delta^2\right]. \tag{WA.34}$$

By comparing the candidate profits $\widetilde{\pi}$ and $\utilde{\pi}$, we can solve for the cost threshold $\tilde{c}$ such that the firm prefers exclusive targeting iff $c > \tilde{c}$. We can then also verify that the solutions are indeed interior, that is, $\widetilde{p} > \utilde{u}$ for $c > \tilde{c}$ and $\utilde{p} \le \utilde{u}$ for $c \le \tilde{c}$. Combining these results, we obtain the following proposition.

Proposition WA.15 *There exists a cost threshold $\tilde{c}$ which determines the firm's pricing decision absent a policy intervention.*

(i) If $c \le \utilde{c}$, the firm targets some unmotivated consumers by charging $\utilde{p} < \utilde{u}$, which induces demand $\utilde{q}$, firm profits $\utilde{\pi}$, and consumer welfare $\utilde{CW}$.

(ii) If $\underset{\sim}{c} < c \leq \tilde{u}$, the firm targets only motivated consumers by charging $\widetilde{p} > \underset{\sim}{u}$, which induces demand $\widetilde{q}$, firm profits $\widetilde{\pi}$, and consumer welfare $\widetilde{CW}$.

(iii) If $c > \tilde{u}$, the firm does not sell the good by charging any price $p > \tilde{u}$.

Proof. Follows from the preceding discussion. We obtain $\tilde{c} = \underset{\sim}{u} + \Delta\left((1-\alpha)\mu - \sqrt{\mu}\right)$. ■

An important observation is that consumer welfare in case of exclusive targeting is no longer necessarily negative. While consumers close to the marginal consumer necessarily experience a negative surplus (in expectation) due to their overprediction of the expected consumption utility, the consumers close to the firm benefit as the firm does not fully extract their predicted expected consumption utility. To see this, we can evaluate $\widetilde{CW}$ at the cost threshold $\tilde{c}$ and obtain

$$\widetilde{CW}\Big|_{c=\tilde{c}} > 0 \iff \mu > \frac{9}{16}, \tag{WA.35}$$

which establishes that a positive consumer welfare is possible at least for some parameter constellations. The restriction that μ is sufficiently large is intuitive—when consumers are sufficiently likely to be motivated, the overprediction of the consumption utility in the unmotivated state is less detrimental for consumers. This is important as that implies that the adoption of a mandatory cooling off period may not be beneficial for consumer welfare even if the firm uses the exclusive targeting strategy pre policy intervention. Note, moreover, that the above condition on μ is sufficient but not necessary. As $\widetilde{CW}$ is potentially nonmonotone in c, $\widetilde{CW} > 0$ is feasible even if this does not materialize at the threshold $\tilde{c}$. This for example materializes for a low degree of the projection bias α, which similar to a high likelihood of being motivated lowers the degree to which motivated consumers overpredict their expected consumption utility.

E.2. Mandatory Cooling Off Period

In case of a mandatory cooling off period, the "actual demand", i.e. quantity consumed, is determined as follows. For $\delta = 1$, the same cutoffs as in the baseline, x_m and x_u, are relevant. However, only a fraction μ^2 of consumers is twice motivated and hence bases both the initial purchase and the confirmation decision on the predicted expected utility $\tilde{u}$ of motivated consumers. In contrast, both initially unmotivated consumers $(1-\mu)$ and initially motivated consumers who are unmotivated in the second period $(\mu(1-\mu))$ only purchase if they are closer than x_u as at least one of the two decisions (purchase, stepping back) is based on the predicted expected utility $\underset{\sim}{u}$ of unmotivated consumers. As such, final demand $D_c(p)$ is given by $\mu^2 x_m$ in case the firm caters only to motivated consumers, and $\mu^2 x_m + (1-\mu)(1+\mu)x_u$ in case the firm caters to at least some unmotivated consumers. We obtain

$$D_c(p) = \begin{cases} \underset{\sim}{u} + \mu(1-(1-\mu)\alpha)\Delta - p & \text{if} \quad p \leq \underset{\sim}{u} \\ \mu^2(\tilde{u} - p) & \text{if} \quad \underset{\sim}{u} < p \leq \tilde{u} \\ 0 & \text{otherwise} \end{cases} \tag{WA.36}$$

Inspecting (WA.36) already yields two insights. In case of exclusive targeting, the optimal price *conditional on exclusive targeting* will not change. While total demand is lower compared to the baseline as initially motivated consumers who are unmotivated in the second period step back, the relative tradeoff the firm faces between exploiting the overprediction of the expected consumption utility by consumers close to it and also catering to consumers further away is unaffected. This is in contrast to the case of full targeting. The price conditional on full targeting changes relative to that in the baseline because demand now disproportionally is driven by consumers who are unmotivated. This lowers the intercept, and induces the firm to lower the price compared to the baseline.

We can see this by inspecting the first order conditions which we obtain by solving the maximization problems conditional on the respective targeting strategies. We get for the optimal prices $\utilde{p}_c$ and $\widetilde{p}_c$ that

$$\utilde{p}_c = \frac{1}{2}\left(\underline{u} + \mu\left[1-(1-\mu)\alpha\right]\Delta + c\right) < \frac{1}{2}\left(\underline{u} + \mu\Delta + c\right) = \utilde{p}, \tag{WA.37}$$

and

$$\widetilde{p}_c = \frac{1}{2}\left(\underline{u} + \left[\mu + (1-\mu)\alpha\right]\Delta + c\right) = \widetilde{p}. \tag{WA.38}$$

We obtain for the induced qualities $\utilde{q}_c$ and $\widetilde{q}_c$

$$\utilde{q}_c = \frac{1}{2}\left(\underline{u} + \mu\left[1-(1-\mu)\alpha\right]\Delta - c\right), \; \widetilde{q}_c = \mu^2\left(\underline{u} + [\mu + (1-\mu)\alpha]\Delta - c\right), \tag{WA.39}$$

for the profits $\utilde{\pi}_c$ and $\widetilde{\pi}_c$

$$\utilde{\pi}_c = \frac{1}{4}\left(\underline{u} + \mu\left[1-(1-\mu)\alpha\right]\Delta - c\right)^2, \; \widetilde{\pi}_c = \frac{1}{4}\mu^2\left(\underline{u} + [\mu + (1-\mu)\alpha]\Delta - c\right)^2, \tag{WA.40}$$

and for consumer welfare

$$\utilde{CW}_c = \frac{1}{8}\left([\underline{u} - c]\left[\underline{u} + 2(1+(1-\mu)\alpha)\mu\Delta - c\right] + \left[1 + (1-\mu)\alpha\left(2 - (7+\mu)\alpha\right)\right]\mu^2\Delta^2\right) \tag{WA.41}$$

$$\widetilde{CW}_c = \frac{1}{8}\mu^2\left(\underline{u} + [\mu + (1-\mu)\alpha]\Delta - c\right)\left(\underline{u} + \mu\Delta - 3\alpha(1-\mu)\Delta - c\right). \tag{WA.42}$$

The firm's optimal targeting strategy is again determined by a cutoff cost $\tilde{c}_c$ such that exclusive targeting is preferred iff $c > \tilde{c}_c$. Notably, $\tilde{c}_c > \tilde{c}$ still holds so that a mandatory cooling off period pushes the firm to a weakly more inclusive targeting strategy.

Proposition WA.16 *There exists a cost threshold $\tilde{c}_c > \tilde{c}$ which determines the firm's pricing decision with a mandatory cooling off period in place.*

(i) If $c \leq \utilde{c}_c$, the firm targets some unmotivated consumers by charging $\utilde{p}_c < \underline{u}$, which induces demand $\utilde{q}_c$, firm profits $\utilde{\pi}_c$, and consumer welfare $\utilde{CW}_c$.

(ii) If $\utilde{c}_c < c \leq \tilde{u}$, the firm targets only motivated consumers by charging $\widetilde{p}_c > \underline{u}$, which induces demand $\widetilde{q}_c$, firm profits $\widetilde{\pi}_c$, and consumer welfare $\widetilde{CW}_c$.

(iii) If $c > \tilde{u}$, the firm does not sell the good by charging any price $p > \tilde{u}$.

Proof. Follows from the preceding discussion. We obtain $\tilde{c}_c = \underline{u} + (1-2\alpha)\mu\Delta$ which implies

$$\tilde{c}_c - \tilde{c} = \alpha\Delta\left(\sqrt{\mu} - \mu\right) > 0. \qquad \text{(WA.43)}$$

■

Impact of a Mandatory Cooling Off Period As in the main specification, there are three combinations of targeting behavior pre and post policy intervention. We summarize the implications for the change in final quantity Δq, price Δp, and consumer welfare ΔCW in Figure WA.13, which we obtain by pairwise comparison of the outcomes given the possible targeting behavior combinations as characterized in Proposition WA.15 and Proposition WA.16.

		with Cooling Off Period	
		Full Targeting	**Exclusive Targeting**
Baseline	**Exclusive Targeting**	$\Delta q > 0$ $\Delta p < 0$ $\Delta CW > 0$	$\Delta q < 0$ $\Delta p = 0$ ΔCW ambiguous
	Full Targeting	$\Delta q < 0$ $\Delta p < 0$ $\Delta CW > 0$	

Figure WA.13: Impact of a mandatory cooling off period when consumers have heterogeneous valuations

When full targeting materializes post intervention, the price always decreases. However, this is accompanied by a decrease in quantity when the firm already catered to some unmotivated consumers pre intervention. This is because relatively more consumers are unmotivated in at least one period, such that they do not purchase and confirm the purchase if they are sufficiently far away. The decrease in price only partially offsets this. If the firm shifted from exclusive targeting pre intervention to full targeting post intervention, the inclusion of some unmotivated consumers always leads to an increase in the overall quantity. Both scenarios with full targeting post intervention also increase consumer welfare; in case of full targeting pre and post intervention this is because the adoption of the policy prevents some distant consumers who are initially motivated to step back if they turn out to be unmotivated in the second period—as these consumers only purchased because of their overprediction in expected consumption utility, this increases consumer welfare.[2]

When the firm uses exclusive targeting both pre and post intervention, the price remains unchanged (slightly drops if $\delta < 1$), while the quantity consumed decreases due to second-period

[2]Note that a sufficiently large cost of delaying consumption, $\delta << 1$, would be sufficient to overturn this.

unmotivated consumers no longer purchasing. In contrast to the main specification without horizontal consumer differentiation, the effect on consumer welfare is ambiguous. This is because for a sufficiently high likelihood of consumers being motivated μ, even exclusive targeting leads to positive consumer welfare, so that the reduction in sold quantity is detrimental for consumers. A mandatory cooling off period is hence no longer necessarily detrimental if it fails to prevent exclusive targeting post intervention.

Comparison to Main Model Specification Overall, the predictions on price and quantity movements are qualitatively similar to the main model specification, with the only difference being that quantity and price decrease under full targeting both pre and post policy instead of remaining constant (except for a slight price decrease due to discounting)—this is because the policy induces consumers who are initially motivated, unmotivated in the second period, and sufficiently far away from the firm, to step back from the purchase. The firm reacts to this by lowering the price, which limits this reduction in quantity. Precisely because these consumers would have only purchased due to their overprediction of the expected consumption utility, consumer welfare is now positively affected in the case of full targeting pre and post policy. A cooling off period can still be detrimental for consumer welfare, however, wenn the firm exclusively targets motivated and twice motivated consumers, respectively, before and after the policy adoption. This is because exclusive targeting can—but need not— be associated with positive consumer welfare if the firm's incentive to include distant consumers outweighs the incentive to extract rent using the motivated consumers' overprediction of their expected consumption utility.

Ex-post assessment The ambiguity also has implications for the identification of the sign of the change in consumer welfare due to the policy adoption, which we illustrate in Figure WA.14. While the combination of targeting strategies can always be identified using the combination of aggregate price and quantity data, the change in consumer welfare cannot be generically signed if a combination of exclusive targeting pre and post intervention is identified. However, the use of aggregate data is still viable and recommended, as it can either verify that the policy benefitted consumers, or serve as a screening device that the market and intervention need to be scrutinized provided that the case with ambiguous effects is identified.

Proposition WA.17 *Aggregate data on prices and quantities is sufficient to identify the combination of targeting strategies pre and post adoption of a mandatory cooling off period. The sign of the change in consumer welfare is only partially identified using these data.*

Proof. Follows from the preceding discussion.■

As in the case of the model variation with rational consumers, additional information about the fraction of motivated consumers in the market μ may be helpful in assessing whether consumers benefitted from the policy adoption or not. This is because a positive consumer welfare with exclusive targeting requires a large probability of being motivated; specifically we can show that for any $\mu < \frac{3}{5}$ exclusive targeting leads to negative consumer welfare, in which case the policy

	final quantity decreases $\Delta q < 0$	**final quantity constant** $\Delta q = 0$	**final quantity increases** $\Delta q > 0$
price increases $\Delta p > 0$			
price constant $\Delta p = 0$	**(A)** observe stepping back Excl $\rightarrow$ Excl: ΔCW ambiguous		
price decreases $\Delta p < 0$	**(B)** observe stepping back Full $\rightarrow$ Full: $\Delta CW > 0$		**(C)** observe stepping back Excl $\rightarrow$ Full: $\Delta CW > 0$

Figure WA.14: Evaluation of a mandatory cooling off period when consumers have heterogeneous valuations

intervention benefits them. In this case, it needs to be noted that a mandatory cooling off period *always* improves consumer welfare.

E.3. Return Policy

With a return policy in place, the final quantity that the firm sells (and which hence forms the basis for its pricing decision) is composed of up to three types of consumers: consumers who are motivated in both periods, consumers who are initially unmotivated but motivated in the second period, and consumers who are unmotivated in the second period. This is analogous to the three pricing strategies (exclusive, intermediate, full) which feature in the main model specification with a return policy in place.

Recall that consumers initially purchase the good if they foresee keeping it in at least one motivation state. They hence initially purchase iff the predicted consumption utility in the high motivation state ($\tilde{u}(\bar{s}|\bar{s}) = \bar{u}$ or $\tilde{u}(\bar{s}|\underline{s}) < \bar{u}$ depending on the motivation state) exceeds the price net of the disutility due to distance, and keep the good if the actual consumption utility ($\bar{u}$ or $\underline{u}$ depending on the motivation state) satisfies the same criterion.

Twice motivated consumers hence purchase and consume the good provided that they are at most x_{tm} away from the firm, where x_{tm} solves

$$\bar{u} - p - x_{tm} = 0 \iff x_{tm} = \bar{u} - p. \tag{WA.44}$$

For initially unmotivated consumers who are motivated in the second period, their actual consumption utility $\bar{u}$ which determines whether they keep the good exceeds their initial predicted consumption utility for the high state in the first period $\tilde{u}(\bar{s}|\underline{s})$ which determines whether they initially purchase. They hence purchase and consume the good provided that they are at most

x_{um} away from the firm, where x_{um} solves

$$\tilde{u}(\bar{s}|\underline{s}) - p - x_{um} = 0 \iff x_{um} = \tilde{u}(\bar{s}|\underline{s}) - p = \underline{u} + (1-\alpha)\Delta - p. \tag{WA.45}$$

Finally, consider consumers who are unmotivated in the second period. Their actual consumption utility $\underline{u}$ which determines the return decision is strictly lower than their initial predicted consumption utility for the high state which determines the initial purchase decision. As such, they purchase and consume the good provided that they are at most x_{su} away from the firm, where x_{su} solves

$$\underline{u} - p - x_{su} = 0 \iff x_{su} = \underline{u} - p. \tag{WA.46}$$

Given the characterizations of x_{tm}, x_{um} and x_{su}, we can derive demand. The firm has three targeting strategies. It can cater exclusively to twice motivated consumers by charging a price above $\tilde{u}(\bar{s}|\underline{s})$, which induces a demand of $\mu^2 x_{tm}$. It can also include some consumers who are initially unmotivated by charging a price above $\underline{u}$ but below $\tilde{u}(\bar{s}|\underline{s})$, which leads to a demand of $\mu^2 x_{tm} + (1-\mu)\mu x_{um}$. Finally, it can cater to at least some second-period unmotivated consumers by charging a price below $\underline{u}$, which induces a demand of $\mu^2 x_{tm} + (1-\mu)\mu x_{um} + (1-\mu)x_{su}$. Plugging in and simplifying gives that the final quantity sold and consumed $D_r(p)$ is given by

$$D_r(p) = \begin{cases} \underline{u} + \mu\left(1 - (1-\mu)\alpha\right)\Delta - p & \text{if} \quad p \leq \underline{u} \\ \mu\left(\underline{u} + (1 - (1-\mu)\alpha)\Delta - p\right) & \text{if} \quad \underline{u} < p \leq \tilde{u}(\bar{s}|\underline{s}) \\ \mu^2(\underline{u} + \Delta - p) & \text{if} \quad \tilde{u}(\bar{s}|\underline{s}) < p \leq \underline{u} + \Delta \\ 0 & \text{otherwise.} \end{cases} \tag{WA.47}$$

As in the baseline and with a mandatory cooling off period, we can derive the first-order conditions which determine the firm's pricing *conditional on a given targeting strategy.* We obtain for the optimal prices $\underline{p}_r, \widetilde{p}_r$ and $\bar{p}_r$ that

$$\begin{aligned} \underline{p}_r &= \frac{1}{2}\left(\underline{u} + \mu\left(1 - (1-\mu)\alpha\right)\Delta + c\right) \\ \widetilde{p}_r &= \frac{1}{2}\left(\underline{u} + \left(1 - (1-\mu)\alpha\right)\Delta + c\right) \\ \bar{p}_r &= \frac{1}{2}\left(\underline{u} + \Delta + c\right), \end{aligned} \tag{WA.48}$$

which induces consumed quantities

$$\begin{aligned} \underline{q}_r &= \frac{1}{2}\left(\underline{u} + \mu\left(1 - (1-\mu)\alpha\right)\Delta - c\right) \\ \widetilde{q}_r &= \frac{1}{2}\mu\left(\underline{u} + \left(1 - (1-\mu)\alpha\right)\Delta - c\right) \\ \bar{q}_r &= \frac{1}{2}\mu^2\left(\underline{u} + \Delta - c\right), \end{aligned} \tag{WA.49}$$

and profits

$$\begin{aligned}\underline{\pi}_r &= \frac{1}{4}\left(\underline{u}+\mu\left(1-(1-\mu)\alpha\right)\Delta-c\right)^2\\ \widetilde{\pi}_r &= \frac{1}{4}\mu\left(\underline{u}+\left(1-(1-\mu)\alpha\right)\Delta-c\right)^2\\ \overline{\pi}_r &= \frac{1}{4}\mu^2\left(\underline{u}+\Delta-c\right)^2. \end{aligned} \tag{WA.50}$$

For consumer welfare, we again need to take into account the total disutilities from distance by each consumer group and obtain

$$\begin{aligned}\underline{CW}_r &= \frac{1}{8}\left([\underline{u}-c][\underline{u}+2(1+(1-\mu)\alpha)\Delta-c]+\mu[4-3\mu+\alpha(1-\mu)(2\mu-(4-(1-\mu)\mu)\alpha)]\Delta^2\right)^2\\ \widetilde{CW}_r &= \frac{\mu}{8}\left([\underline{u}-c][\underline{u}+2(1+(1-\alpha)\mu)\Delta-c]+\alpha[1+(1-\mu)(2-(3+\mu)\alpha)]\Delta^2\right)\\ \overline{CW}_r &= \frac{\mu^2}{8}\left(\underline{u}+\Delta-c\right)^2. \end{aligned} \tag{WA.51}$$

By pairwise comparison of the resulting profits, we can derive the cost thresholds $\tilde{c}_{r,1}$, $\tilde{c}_{r,2}$ and $\tilde{c}_{r,3}$ such that intermediate targeting is preferred over full targeting ($\tilde{c}_{r,1}$), exclusive targeting preferred over intermediate targeting ($\tilde{c}_{r,3}$), and exclusive targeting is preferred over full targeting ($\tilde{c}_{r,3}$), respectively. The order between these thresholds in turn is determined by the relation of the degree of the projection bias α to the threshold $\tilde{\alpha}_r = \frac{1}{1+\sqrt{\mu}-\mu} \in (0,1)$.

If the bias is sufficiently large, $\alpha \geq \tilde{\alpha}_r$, we can establish that $\tilde{c}_{r,1} \geq \tilde{c}_{r,3} \geq \tilde{c}_{r,2}$ and intermediate targeting is never optimal. This is intuitive as the penalty (in terms of a decreased price) to include initially unmotivated consumers is larger the higher α. In this case, full targeting materializes for $c \leq \tilde{c}_{r,3}$ while exclusive targeting materializes for $c > \tilde{c}_{r,3}$.

If the bias is sufficiently low, $\alpha < \tilde{\alpha}_r$, we have $\tilde{c}_{r,1} < \tilde{c}_{r,3}$ and intermediate targeting is optimal for a range of costs c. Specifically, full targeting materializes for $c \leq \tilde{c}_{r,1}$, intermediate targeting for $c \in (\tilde{c}_{r,1}, \tilde{c}_{r,2}]$, and exclusive targeting for $c > \tilde{c}_{r,2}$. Defining $\underset{\sim}{c}_r = \min\{\tilde{c}_{r,1}, \tilde{c}_{r,3}\}$ and $\tilde{c}_r = \max\{\tilde{c}_{r,2}, \tilde{c}_{r,3}\}$ and collecting these observations yields the following proposition regarding the optimal firm behavior.

Proposition WA.18 *There exist thresholds $\underset{\sim}{c}_r$ and $\tilde{c}_r \geq \tilde{c}$ which determine the firm's pricing decision absent a policy intervention.*

(i) If $c \leq \underset{\sim}{c}_r$, the firm charges $\underline{p}_r$, which induces demand $\underline{q}_r$, firm profits $\underline{\pi}_r$, and consumer welfare $\underline{CW}_r$.

(ii) If $c \in (\underset{\sim}{c}_r, \tilde{c}_r]$, the firm charges $\widetilde{p}_r$, which induces demand $\widetilde{q}_r$, firm profits $\widetilde{\pi}_r$, and consumer welfare $\widetilde{CW}_r$.

(iii) Otherwise, the firm charges $\bar{p}_r = \bar{u}$, which induces demand $\bar{q}_r$, firm profits $\bar{\pi}_r$, and consumer welfare $\overline{CW}_r$.

There exists $\tilde{\alpha}_r \in (0,1)$ such that $(\underset{\sim}{c}_r, \tilde{c}_r]$ is nonempty if and only if $\alpha < \tilde{\alpha}_r$. Otherwise, $\underset{\sim}{c}_r = \tilde{c}_r$.

Proof. Follows from the preceding discussion. Specifically, we obtain

$$\begin{aligned} \tilde{c}_{r,1} &= \underline{u} - (1 - (1-\mu)\alpha)\sqrt{\mu}\Delta \\ \tilde{c}_{r,2} &= \underline{u} + (1 - (1+\sqrt{\mu})\alpha)\,\Delta, \\ \tilde{c}_{r,3} &= \underline{u} - \alpha\mu\Delta. \end{aligned} \tag{WA.52}$$

and hence

$$\tilde{c}_{r,2} - \tilde{c} = (1-\alpha)(1-\mu)\Delta > 0 \implies \tilde{c}_r \geq \tilde{c}_{r,2} > \tilde{c}. \tag{WA.53}$$

■

Importantly, it holds that $\tilde{c}_r \geq \tilde{c}$ so that exclusive targeting post policy intervention is not possible if the firm catered to some unmotivated consumers pre intervention.

Impact of a Return Policy It can be established that all the remaining potential combinations of pre and post policy targeting can materialize. The implications for the signs of the changes in price, Δp, quantity, Δq, and consumer welfare, ΔCW, are depicted in Figure WA.15, where the entries are obtained from the pairwise comparison of the outcomes of the respective targeting behavior combinations in Proposition WA.15 and Proposition WA.18.

Baseline \ with Return Policy	Full Targeting	Intermediate Targeting	Exclusive Targeting
Exclusive Targeting	$\Delta q > 0$ $\Delta p < 0$ $\Delta CW > 0$	$\alpha > \frac{1}{2}$: $\Delta q < 0$, $\Delta p < 0$, $\Delta CW > 0$ $\alpha < \frac{1}{2}$: $\Delta q > 0$, $\Delta p > 0$, ΔCW ambiguous	Δq ambiguous $\Delta p > 0$ $\Delta CW > 0$
Full Targeting	$\Delta q < 0$ $\Delta p < 0$ $\Delta CW > 0$	Δq ambiguous $\Delta p > 0$ $\Delta CW > 0$	

Figure WA.15: Impact of a return policy when consumers have heterogeneous valuations

This yields several observations. First, there is potential for the introduction of a return policy to harm consumer welfare even in the absence of return costs, which is in contrast to the main model specification. Specifically, this can materialize when the firm switches from exclusive to intermediate targeting due to the adoption of the return policy, and when the degree of the projection bias is sufficiently low. The reasoning is as follows. With the projection bias sufficiently low, consumer welfare can be positive even with exclusive targeting pre policy as the overprediction of the expected consumption utility by motivated consumers is limited. In turn, a low bias also implies that the utility unmotivated consumers predict for the motivated state, $\tilde{u}(\bar{s}|\underline{s})$, is close to the actual consumption utility $\bar{u}$ in that state, which in turn allows the firm to charge a higher price and still cater to initially unmotivated consumers in the presence of a return policy. Overall, this can result in a higher price which despite an increase in final quantity consumed leads to a decrease in consumer welfare. Notably, this decrease in consumer welfare obtains not because the firm exploits a severe bias, but because the return policy allows the firm to align its pricing with the actual consumption utility and extract the rent of motivated consumers.

In all other cases, consumer welfare increases following the policy adoption. The direction of the price movement can be signed—in case of a shift from exclusive to intermediate targeting conditional on the degree of the projection bias—but there is newly arising ambiguity in the direction of the change in quantity. This is because of the tension between extracting rent from consumers close to the firm and including consumers further away, which for a given set of model parameters differentially impacts the pre policy and post policy targeting strategies.

Comparison to Main Model Specification Comparing the results to those from the main model specification, we can see that the direction of the price change conditional on the respective targeting strategies is preserved. However, there now is ambiguity in the direction of the change in quantity because of the ambiguous outcome of the tension between surplus extraction from consumers located close to the firm, and increasing the quantity by also catering to consumers further away. This naturally has implications for the identification of the sign of the change in consumer welfare due to the policy adoption, which we illustrate in Figure WA.16.

	final quantity decreases $\Delta q < 0$	**final quantity constant** $\Delta q = 0$	**final quantity increases** $\Delta q > 0$
price increases $\Delta p > 0$	**(A)** observe return Excl $\rightarrow$ Excl: $\Delta CW > 0$ Full $\rightarrow$ Int: $\Delta CW > 0$	**(B)** observe return Excl $\rightarrow$ Excl: $\Delta CW > 0$ Full $\rightarrow$ Int: $\Delta CW > 0$	**(C)** observe return Excl $\rightarrow$ Excl: $\Delta CW > 0$ Full $\rightarrow$ Int: $\Delta CW > 0$ Excl $\rightarrow$ Int: ΔCW amb
price constant $\Delta p = 0$		**(D)** observe return Excl $\rightarrow$ Int: $\Delta CW > 0$	
price decreases $\Delta p < 0$	**(E)** observe return Full $\rightarrow$ Full: $\Delta CW > 0$ Excl $\rightarrow$ Int: $\Delta CW > 0$		**(F)** observe return Excl $\rightarrow$ Full: $\Delta CW > 0$

Figure WA.16: Evaluation of a return policy when consumers have heterogeneous valuations

It is apparent that the combination of aggregate data on prices and quantities alone is insufficient to identify the combination of pre and post policy targeting strategies. Whenever the price increases (Cells (A)-(C)), there are always at least two combinations (exclusive targeting to exclusive targeting and targeting all consumers to intermediate targeting) consistent with this observation. Moreover, when the quantity consumed also increases (Cell (C)), it may in addition be the case that the firm exclusively targeted motivated consumers pre policy, but caters to some initially unmotivated consumers post intervention. Finally, there also is multiplicity regarding the potential targeting strategies whenever prices and quantities both decrease (Cell (E)). Naturally, this also implies that the sign of the change in consumer welfare is not always identified using only aggregate data on prices and quantities.

Proposition WA.19 *Aggregate data on prices and quantities is not sufficient to identify the combination of targeting strategies pre and post adoption of a mandatory cooling off period. The sign of the change in consumer welfare is only partially identified using these data.*

Proof. Follows from the preceding discussion.■

Nonetheless, our relatively simple approach is helpful in identifying situations which warrant further investigation. Specifically, consumer welfare can only be negatively affected by the policy if the firm switches from exclusive to intermediate targeting and if the degree of the projection bias is sufficiently low. In this case, the model always predicts an increase in the quantity consumed, as well as a price increase. Therefore, a potentially detrimental impact on consumers only needs to be considered whenever aggregate data reveals that this materialized.

There also is additional information which may help conduct the ex-post assessment. An appropriate definition of the total market size, while complex both theoretically and empirically, may help to distinguish between the exclusive and full targeting strategies pre policy. This allows a further refinement of the screening as to whether consumer welfare may have been detrimentally affected.