Good and Bad Consistency in Regulatory Decisions[*]

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Good and Bad Consistency in Regulatory Decisions[1]

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Abstract

We examine sources of consistent regulatory decisions in a model where regulators respond to mixed incentives, including career concerns. In the reference case, regulators act as "public servants" who strive to make the socially optimal decision, given limited information and the opportunity to observe the prior decision of another regulator. Adding career concerns, such as a desire to avoid controversy or to implement a future employer's preferred policy, tends to reduce the degree of differentiation in sequentially taken decisions, hence increasing consistency. Thus, it is possible to observe that the self-interested career concerns of regulators give rise to consistency in regulatory decision-making. This type of consistency might lead to substantial deviations from optimal regulatory policies.

1 Introduction

Consistency is often cited as a good principle of regulation, both in regulatory circles where consistency is a buzz word, and by regulated businesses. What consistency means is not entirely clear, but informally stakeholders expect similar regulatory outcomes from similar circumstances. Examples of where consistency is expected include similar regulatory decisions across industries (e.g., gas versus electricity), across jurisdictions (e.g., gas regulation across states)[1], and across countries (e.g., competition law across European Union member states).

There are some sound reasons behind this desire for consistency. Consistent regulation minimises compliance costs (duplication for firms that operate across jurisdictions) and eliminates arbitrage (investment driven by differences in how regulators behave). Consistent regulation over time increases the regulator's reputation capital and minimises regulatory risk.[2] However, it is questionable whether consistency should be an objective in itself: clearly it would be better to have some good and bad regulation across jurisdictions or industries than to let it be consistently bad.

This paper argues that consistent regulatory decisions might arise, not from sound economic responses to industry fundamentals, but rather from career concerns of regulators. In particular, we model a situation where two regulators have to make a decision under incomplete information, and they do so sequentially. Each regulator receives an imperfect signal about the true value of the regulatory parameters and might be able to observe the decision of the previous regulator. We investigate the extent to which the regulators' career concerns can lead us to observe consistent, but bad decisions (that is, decisions that are similar, but which diverge substantially from the social optimum). Such bad consistency might result, for example, when a regulator is concerned about the effects of making a decision that is contrary to the previous regulator's decision, even when his information calls for a change, for fear that it might adversely affect his career prospects.

While our theoretical treatment of the interaction between a regulator's decision and his career concerns is novel, there is a largely empirical literature that makes a connection between regulatory decisions and the characteristics

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[1]See Breunig, Hornby, Menezes and Stacey [[2]] for an empirical assessment of price regulation across state jurisdictions, industries and over time in Australia.

[2]For a comparison of time consistency of utility price regulation and monetary policy see Levine, Stern and Trillas [[9]].

of the regulator's job. For example, Leaver [7] suggests that regulators take actions designed to avoid criticism and placate special interests, especially when their tenures are brief (hence career incentives arguably are more important). He finds in a panel of US state public utility commissions that regulators with shorter terms in office review rates less often in periods of falling costs.

Fields et al. [3] showed that when California insurance regulators were no longer appointed but elected by popular vote, the value of the regulated firms fell. Hence it is plausible that there was a public expectation that career concerns (reelection by consumers) would change regulation.[3] Scope for self-serving behaviour arises because a wide range of policies, including those a regulator might consider favourable to his career prospects, could be justified to the public as objective exercises of judgment. Koray and Saglam [6] make this point in their analysis of the Baron-Myerson mechanism for regulating a monopolist, which relies on the regulator's unverifiable prior beliefs about the monopolist's costs.

According to Klein and Sweeney [4], regulation of natural gas distribution in Tennessee seems to favour large customer groups and firms: they observe smaller elasticity-weighted price-cost margins in larger markets and for smaller firms. This observation is consistent with the possibility that regulators might try to avoid conflict, perhaps in order to promote their future career prospects. In the US electricity and natural gas markets, Knittel [5] observes evidence for anticompetitive regulatory policies that suit the interests of the industry . This is an example of the frequently mentioned revolving-door logic, where the regulator may wish to please potential future employers.

Conflict avoidance and preferred-policy targeting – which were identified in the empirical literature reviewed above – are the two kinds of career incentives we study. We show that these incentives can lead to even greater

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[3]In this vein, Lehman and Weisman [[8]] find that prices of telecommunication leases are higher in U.S. states with elected public utility commissioners. For retail telecommunications and electricity, prices in states with elected commissioners are found to be either lower (Besley and Coate [[1]]) or not satistically significantly different (Primeaux and Mann [[10]]) from prices in states with appointed commissioners. Using a richer database of regulatory decisions over time, Quast [[11]] shows that the political affiliation of elected commissioners may be correlated with the lease (wholesale) prices that they set. Moreover, he shows that retail prices may vary with the political affiliation of appointed regulators.

consistency than optimal decision making with sequential learning. But these policies are suboptimal, even if they are consistent. They do not make enough use of the available information or are subject to bias.

2   Regulators' Career Concerns and Incentives

We consider the case where two regulators make a decision on the same type of issue in a predetermined order. We denote the leader's decision by $\delta_1 \in [0,1]$ and the follower's decision by $\delta_2 \in [0,1]$. The latter knows δ_1 when choosing δ_2. The socially optimal decision $\delta \in [0,1]$ is unobserved. Each regulator instead observes a signal $s_1 \in [0,1]$, respectively $s_2 \in [0,1]$, that is drawn independently from a distribution known to be increasing in proximity to δ. That is, if the support of the signal distribution is $S \subseteq [0,1]$, then $\Pr(s_1|\delta) > \Pr(s_1'|\delta)$ for $s_1, s_1' \in S$ if $|s_1 - \delta| < |s_1' - \delta|$.

We consider three models of regulator incentives and later combine them in a weighted utility function. These are as follows.

I - The Public Servant

This is the benchmark case where regulators attempt to get as close as possible to the socially optimal decision δ. Publicly minded regulators want to make the best decision in the interest of society. Hence they experience a regret $R^I(|\delta_i - \delta|)$ that increases in the shortfall $|\delta_i - \delta|$ of regulator i's decision from the optimum. The associated (dis-)utilities in this case are given by:

$$u_1^I(\delta_1) = \int_0^1 R^I(|\delta_1 - \delta|) \Pr(\delta|s_1) \, d\delta$$

$$u_2^I(\delta_2) = \int_0^1 R^I(|\delta_2 - \delta|) \Pr(\delta|s_1, s_2) \, d\delta.$$

If these regrets were the sole consideration, regulator 1 could do no better than to set $\delta_1 = s_1$, since s_1 is his best estimate of δ. Regulator 2 would also set δ_2 to the best estimate of δ. However, he observes δ_1 in addition to s_2. Knowing that $\delta_1 = s_1$ is a dominant strategy for 1, regulator 2's best estimate depends jointly on signals s_1 and s_2. For example, if δ is distributed continuously and symmetrically around a single peak, then 2's policy is $d_2 =$

$(s_1 + s_2)/2$, leading to a decision difference $|\delta_1 - \delta_2| = |(s_2 - s_1)/2|$. The important point is that public servant regulators do not typically make the same decision, since the follower has more information than the leader and updates his estimate of the optimal policy accordingly.

II - The Copycat

This type of regulator is interested in deviating as little as possible from the other regulator's decision. The copycat regulator anticipates a penalty $R^{II}(|\delta_1 - \delta_2|)$ that increases in the disagreement $|\delta_1 - \delta_2|$ between decisions. This is meant to reflect the government's displeasure at regulatory action that exposes it to arbitrage, claims of favouritism, and legal appeals. The greater the discrepancy in decisions, the greater the probability of controversy. The associated (dis-)utilities are

$$
\begin{aligned}
u_1^{II}(\delta_1, \delta_2) &= \int_0^1 R^{II}(|\delta_1 - \delta_2(\delta_1, s_2)|) \Pr(s_2|s_1)\, ds_2 \\
u_2^{II}(\delta_1, \delta_2) &= R^{II}(|\delta_1 - \delta_2|).
\end{aligned}
$$

If these were the only incentives, then regulator 2 would simply replicate 1's decision, whatever it may be, and maximal consistency ($|\delta_1 - \delta_2| = 0$) would be achieved. If the regulators also want to act as public servants and implement a good policy, it makes sense for regulator 1 to set $\delta_1 = s_1$. From 1's point of view, 2 is most likely to observe a signal close to s_1, and therefore should be willing to emulate δ_1. Upon observing δ_1 and s_2, regulator 2 has an updated and improved estimate of δ. He weighs the incentive to copy δ_1, in order to minimise expected regret $R^{II}(|\delta_1 - \delta_2|)$, against the incentive to implement the best estimate of δ. In the symmetric and single-peaked distribution case, a decision difference less than $(s_1 + s_2)/2$ results.

III - The Yes Man

Finally, we consider a regulator, who wants to implement a target decision that is favoured by government or interested lobbies. Revolving-door motivations, where regulators compete for future jobs at regulated firms by being soft, fall into this category. The yes man regulator knows that a particular decision $\bar{\delta}$ is desired by the regulated firms (whom he regards as future

employers) or the government (who awards promotions and may have a policy bias). When the decision taken by the leader differs from $\bar{\delta}$ by $\left|\delta_1 - \bar{\delta}\right|$, and that of the follower differs by $\left|\delta_2 - \bar{\delta}\right|$, they suffer losses

$$
\begin{aligned}
u_1^{III}\left(\delta_1, \delta_2\right) &= R^{III}\left(\left|\delta_1 - \bar{\delta}\right|\right) \\
u_2^{III}\left(\delta_1, \delta_2\right) &= R^{III}\left(\left|\delta_2 - \bar{\delta}\right|\right)
\end{aligned}
$$

to their career prospects, increasing in the differences from $\bar{\delta}$.

If these regrets are the only incentives, both regulators will implement the target policy and thereby achieve maximum consistency ($\left|\delta_1 - \delta_2\right| = 0$). If "yes-men" experience disutility from implementing a suboptimal policy (e.g. because they may be exposed and penalised), they face a trade-off between doing what is best for the public and what is best for their personal careers. Both decisions are biased toward $\bar{\delta}$ and likely to be more consistent than if only public service mattered to the regulators. An intuitive reason is that, whereas the regulators have different information about the socially optimal policy δ (due to the sequential timing of the decisions), they have identical information about the target policy $\bar{\delta}$.

Mixed Incentives

It is our premise that career incentives are mitigated by a threat of penalty when a regulator's decision is too far from the socially optimal policy. The impact of a decision may be revealed at some time after it was made, with punishment available in the form of a reputation loss, a career handicap, or simply personal remorse. Hence regulators balance career objectives with a preference for the socially optimal policy, whether from idealistic or other motives.

We consider therefore a disutility function that weights all three incentives as follows:

$$
\begin{aligned}
u_1\left(\delta_1\right) &= (1 - \alpha - \beta)\, u_1^I\left(\delta_1\right) + \alpha u_1^{II}\left(\delta_1, \delta_2\right) + \beta u_1^{III}\left(\delta_1, \delta_2\right) \\
&= (1 - \alpha - \beta) \int_0^1 R^I\left(\left|\delta_1 - \delta\right|\right) \Pr\left(\delta | s_1\right) d\delta \\
&\quad + \alpha \int_0^1 R^{II}\left(\left|\delta_1 - \delta_2\left(\delta_1, s_2\right)\right|\right) \Pr\left(s_2 | s_1\right) ds_2 + \beta R^{III}\left(\left|\delta_1 - \bar{\delta}\right|, \left|\delta_2 - \bar{\delta}\right|\right),
\end{aligned}
$$

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respectively

$$
\begin{aligned}
u_2\left(\delta_2\right) &= (1-\alpha-\beta)\, u_2^I\left(\delta_2\right) + \alpha u_2^{II}\left(\delta_1,\delta_2\right) + \beta u_2^{III}\left(\delta_1,\delta_2\right) \\
&= (1-\alpha-\beta)\int_0^1 R^I\left(\left|\delta_2-\delta\right|\right)\Pr\left(\delta|\delta_1,s_2\right)d\delta \\
&\quad + \alpha R^{II}\left(\left|\delta_1-\delta_2\right|\right) + \beta R^{III}\left(\left|\delta_2-\bar{\delta}\right|,\left|\delta_1-\bar{\delta}\right|\right).
\end{aligned}
$$

In the next section we set up a formal model, including a stochastic process that generates the value of the optimal policy, and solve for the equilibrium policy choices of regulators 1 and 2. We show that in equilibrium disagreements in the policies adopted by the regulators diminish when the idealistic "public servant" preference is mixed with career incentives.

3   Regulators' Equilibrium Behaviour

We assume now specifically that the optimal policy δ is uniformly distributed between 0 and 1. We suppose that the regulators obtain signals $s_1, s_2 \in \{0,1\}$, where
$$
\Pr\left(s_i = 1|\delta\right) = \delta,\ \ \Pr\left(s_i = 0|\delta\right) = 1-\delta
$$
for $i = 1,2$. Hence the signals are crude indications. For example, a signal might indicate whether a regulated monopolist is truthful or insincere about its claimed costs. Under this interpretation, a signal that is equal to 1 suggests that the regulated firm might be reporting its costs truthfully.

The following lemma, which is proved in the appendix, characterises the conditional expectations of the socially optimal policy for regulators 1 and 2.

Lemma 1 *The implied expectation of δ, after regulator* 1 *observes a signal of either* 1 *or* 0, *is:*

$$
\begin{aligned}
E\left(\delta|s_1 = 1\right) &= \frac{2}{3} \\
E\left(\delta|s_1 = 0\right) &= \frac{1}{3}.
\end{aligned}
$$

Regulator 2's expectation of δ, upon observing 1's action and deducing the signal s_1, and then observing the additional signal s_2, is:

$$E\left(\delta\mid\{s_1,s_2\}=\{1,1\}\right) = \frac{3}{4}$$
$$E\left(\delta\mid\{s_1,s_2\}=\{1,0\}\right) = \frac{1}{2}$$
$$= E\left(\delta\mid\{s_1,s_2\}=\{0,1\}\right)$$
$$E\left(\delta\mid\{s_1,s_2\}=\{0,0\}\right) = \frac{1}{4}.$$

We further impose that the regrets are quadratic functions of the difference between a regulator's decision and the target under the incentive model. Thus:

$$R^I\left(|\delta_i-\delta|\right) = \left(\delta_i-\delta\right)^2$$

for the public servant;

$$R^{II}\left(|\delta_i-\delta_j|\right) = \left(\delta_i-\delta_j\right)^2$$

for the copycat;

$$R^{III}\left(\left|\delta_i-\bar{\delta}\right|\right) = \left(\delta_i-\bar{\delta}\right)^2$$

for the yes-man.

Therefore, each regulator chooses a decision in order to minimise the associated disutility functions:

$$u_1\left(\delta_1,\delta_2\right) = (1-\alpha-\beta)\int_0^1 \left(\delta_1-\delta\right)^2\Pr\left(\delta|s_1\right)d\delta+\alpha\sum_{s_2\in\{0,1\}}\left(\delta_1-\delta_2\right)^2\Pr\left(s_2|s_1\right)+\beta\left(\delta_1-\bar{\delta}\right)^2$$

respectively

$$u_2\left(\delta_1,\delta_2\right) = (1-\alpha-\beta)\int_0^1 \left(\delta_2-\delta\right)^2\Pr\left(\delta|\delta_1,s_2\right)d\delta+\alpha\left(\delta_1-\delta_2\right)^2+\beta\left(\delta_2-\bar{\delta}\right)^2.$$

The equilibrium strategies, as a function of signals and observed behaviour, are characterised in the following proposition. The proof is in the appendix.

Proposition 2 *The following is the unique perfect equilibrium in pure strategies, for $\alpha < 1$:*

$$\delta_1^*(s_1) = \begin{cases} \frac{1}{1-\alpha}\left(\frac{2}{3}(1-\alpha-\beta)+\beta\bar{\delta}\right) & \text{if } s_1 = 1 \\ \frac{1}{1-\alpha}\left(\frac{1}{3}(1-\alpha-\beta)+\beta\bar{\delta}\right) & \text{if } s_2 = 0 \end{cases}.$$

and

$$\delta_2^*(\delta_1, s_2) = \begin{cases} \frac{1}{12}(1-\alpha-\beta)+\frac{1}{1-\alpha}\left(\frac{2}{3}(1-\alpha-\beta)+\beta\bar{\delta}\right) & \text{if } s_1=1,\ s_2=1 \\ -\frac{1}{6}(1-\alpha-\beta)+\frac{1}{1-\alpha}\left(\frac{2}{3}(1-\alpha-\beta)+\beta\bar{\delta}\right) & \text{if } s_1=1,\ s_2=0 \\ \frac{1}{6}(1-\alpha-\beta)+\frac{1}{1-\alpha}\left(\frac{1}{3}(1-\alpha-\beta)+\beta\bar{\delta}\right) & \text{if } s_1=0,\ s_2=1 \\ -\frac{1}{12}(1-\alpha-\beta)+\frac{1}{1-\alpha}\left(\frac{1}{3}(1-\alpha-\beta)+\beta\bar{\delta}\right) & \text{if } s_1=0,\ s_2=0 \end{cases}.$$

The equilibrium identified above allows us to understand how the introduction of career concerns can affect observed consistency. Note that the probability that the signals agree is $2/3$, and the decisions differ in this case by $(1-\alpha-\beta)/12$ (and by $(1-\alpha-\beta)/6$ otherwise). Therefore, the expected difference is equal to

$$E\left(|\delta_1^* - \delta_2^*|\right) = \frac{1}{9}\left(1-\alpha-\beta\right).$$

We have just established the following result:

Corollary 3 *In the model above, the expected difference between the decisions of the two regulators decreases in α and β, the weights of the career incentives.*

That is, we expect to see a greater degree of consistency across regulatory decisions for no other reason than that career concerns become more prevalent. Next we illustrate the extent to which career concerns can cause deviations from the optimal regulatory choices. The benchmark case is given by (i) $\alpha = \beta = 0$, and depicted below in Figure 1. In this case, both regulators are just public servants and, therefore, set their decisions to the expectation of δ, given their signals. Note that, for any α and β, regulator 2 can deduce 1's signal from 1's decision, so in equilibrium 2 acts as if he
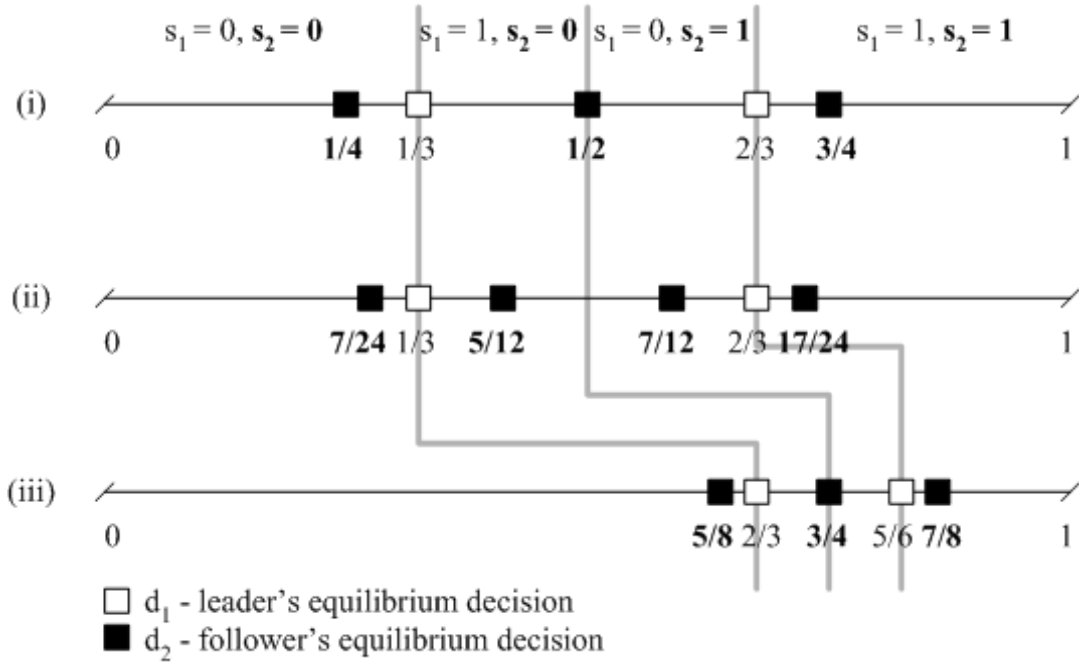
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Figure 1: Optimal decisions in cases (i)-(iii)

observes both signals. Therefore, the expectations of δ differ - the follower has more information. Thus, we have:

$$\delta_1^* = \begin{cases} \frac{2}{3} & \text{if } s_1 = 1 \\ \frac{1}{3} & \text{if } s_2 = 0 \end{cases}$$

and

$$\delta_2^* = \begin{cases} \frac{3}{4} & \text{if } s_1 = 1,\ s_2 = 1 \\ \frac{1}{2} & \begin{array}{l} \text{if } s_1 = 1,\ s_2 = 0 \\ \text{or } s_1 = 0,\ s_2 = 1 \end{array} \\ \frac{1}{4} & \text{if } s_1 = 0,\ s_2 = 0 \end{cases} .$$

Decisions differ by $1/12$ when signals agree, and by $1/6$ when they do not, so the expected decision difference is $1/9$.

If $\alpha = 1$, there are many solutions, in all of which regulator 2 exactly replicates 1's decision. One possibility is that regulator 1 acts like a public servant, basing his decision on the expectation of δ. By copying 1's decision, 2 ignores the additional information he obtains from his own signal, which is

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inefficient. If $\beta = 1$, both set their decisions to the target policy $\bar{\delta}$, irrespective of their signals.

When (ii) $\alpha = 1/2$ and $\beta = 0$, i.e. regulators are partly idealistic and partly conflict-averse (copycats), regulator 1 still sets his decision to the expectation of δ. His best guess is that regulator 2 will see a similar signal to his own, so that the wish to emulate 1's decision will not interfere with the wish to be close to the socially optimal policy. However, 2's signal shifts the expectation of δ either toward 0 or toward 1. Thus 2 deviates a little from 1's decision, reflecting the idealistic motive, especially if the signals disagree. We have:

$$\delta_2^* = \begin{cases} \frac{3}{4}\alpha + (1-\alpha)\,\delta_1 & \text{if } s_1 = 1,\ s_2 = 1 \\ \frac{1}{2}\alpha + (1-\alpha)\,\delta_1 & \begin{array}{l}\text{if } s_1 = 1,\ s_2 = 0 \\ \text{or } s_1 = 0,\ s_2 = 1\end{array} \\ \frac{1}{4}\alpha + (1-\alpha)\,\delta_1 & \text{if } s_1 = 0,\ s_2 = 0 \end{cases}$$

$$= \quad \cdot \begin{cases} \frac{17}{24} & \text{if } s_1 = 1,\ s_2 = 1 \\ \frac{14}{24} & \text{if } s_1 = 1,\ s_2 = 0 \\ \frac{10}{24} & \text{if } s_1 = 0,\ s_2 = 1 \\ \frac{7}{24} & \text{if } s_1 = 0,\ s_2 = 0 \end{cases} \quad .$$

This strategy is just a mixture of 2's equilibrium strategies when (i) $\alpha = \beta = 0$ and (ii) $\alpha = 1$ and $\beta = 0$. The decisions differ by $\alpha/12 = 1/24$ when signals agree and by $\alpha/6 = 1/12$ when they do not, so the expected decision difference is $\alpha/9 = 1/18$; half of what it was in the public servant case.

When (iii) $\alpha = 0$ and $\beta = 1/2$, and the policy desired by the regulated firm is $\bar{\delta} = 1$, both bias their decisions toward 1:

$$\hat{\delta}_1 = \begin{cases} \frac{2}{3}\beta + (1-\beta)\,\bar{\delta} & \text{if } s_1 = 1 \\ \frac{1}{3}\beta + (1-\beta)\,\bar{\delta} & \text{if } s_1 = 0 \end{cases}$$

$$= \quad \cdot \begin{cases} \frac{5}{6} & \text{if } s_1 = 1 \\ \frac{4}{6} & \text{if } s_1 = 0 \end{cases}$$

and

$$\hat{\delta}_2 \;=\; \begin{cases} \frac{3}{4}\beta + (1-\beta)\,\bar{\delta} & \text{if } s_1 = 1,\ s_2 = 1 \\[4pt] \frac{1}{2}\beta + (1-\beta)\,\bar{\delta} & \begin{array}{l}\text{if } s_1 = 1,\ s_2 = 0 \\ \text{or } s_1 = 0,\ s_2 = 1\end{array} \\[4pt] \frac{1}{4}\beta + (1-\beta)\,\bar{\delta} & \text{if } s_1 = 0,\ s_2 = 0 \end{cases}$$

$$\;=\; \begin{cases} \frac{7}{8} & \text{if } s_1 = 1,\ s_2 = 1 \\[4pt] \frac{6}{8} & \begin{array}{l}\text{if } s_1 = 1,\ s_2 = 0 \\ \text{or } s_1 = 0,\ s_2 = 1\end{array} \\[4pt] \frac{5}{8} & \text{if } s_1 = 0,\ s_2 = 0 \end{cases}.$$

These strategies are again mixtures of the equilibrium strategies when (i) $\alpha = \beta = 0$ and (ii) $\alpha = 0$ and $\beta = 1$. The decisions differ, analogously, by $\beta/12 = 1/24$ when signals agree and by $\beta/6 = 1/12$ when they do not, so the expected decision difference is $\beta/9 = 1/18$.

Figure 2 depicts the distributions of decision differences and their expectations, with case (i) in the upper panel and cases (ii) and (iii) in the lower panel. The height of each solid spike, labeled with the magnitude of the decision difference, indicates the ex ante probability of observing this difference, which reflects the joint likelihood of signal pairs and associated equilibrium decisions,. The expected difference is given by the dotted lines; it is greater in the top panel (where there are no career concerns).

4   Implications

While we have assumed specific regrets and signal distributions to show that consistency in regulatory policies increases in career concerns, the underlying reasons are intuitive and valid more broadly. Since career concerns by themselves, i.e. without any regard for the optimal social policy, lead to identical decisions, they bias the decision difference in any mixed model, where regulators balance career concerns with the desire to implement the optimal policy, toward smaller values.

If career concerns are sufficiently important, i.e. $\alpha + \beta$ is large enough, and regrets are convex (as in the example), the following general argument for more consistency exists. For any weighted sum of convex component (dis-)utility functions, the minimiser of the overall function is a convex combination of the smallest and largest minimiser of the component functions. The reason is that, below the smallest minimiser, all component functions
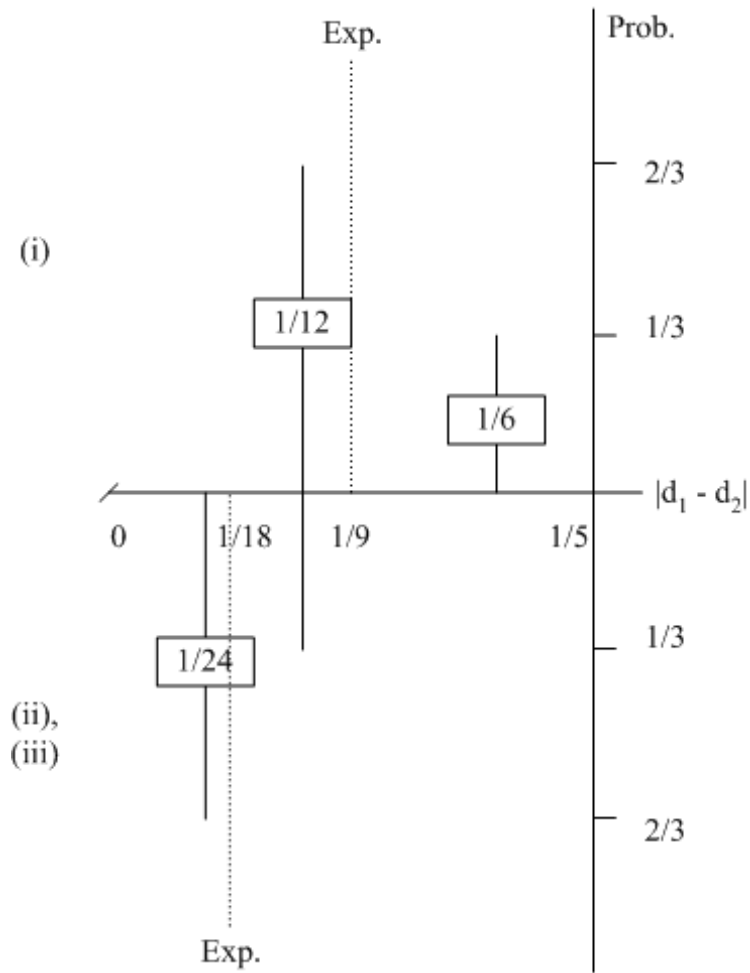
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Figure 2: Decision differences: (i) top and (ii),(iii) bottom

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are decreasing, hence their sum is decreasing, whereas above the largest minimiser all component functions are increasing, hence their sum is increasing. The minimiser of the summation must be in between. If we transform the problem for regulator 2 into one where the decision difference is treated as a decision variable, then smaller differences minimise the copycat and yesman component than the public-servant component. This implies that the decision regulator 2 takes in order to minimise his total disutility is closer to regulator 1's decision when career concerns are active.

To elaborate, suppose regulator 1 has already made decision δ_1. Observing δ_1, regulator 2 will minimise his disutility u_2, which is a weighted sum of three components, u_2^I (public-servant incentive), u_2^{II} (copycat incentive) and u_2^{III} (yes-man incentive). If regulator 2 were to consider minimising separately with respect to each component, he would match δ_1 in the second case and match the target policy $\bar{\bar{\delta}}$ in the third case. In the first case, regulator 2's decision would normally differ from regulator 1's because 2 observes an additional signal that either confirms the direction of 1's decision (hence revises toward the extremes) or casts doubt on it (hence revises toward the middle).

Translating 2's action δ_2 into the space of decision differences $|\delta_1 - \delta_2|$, 2 faces individual minimisers 0, $\left|\delta_1 - \bar{\delta}\right|$ and $x > 0$ for u_2^{II}, u_2^{III} and u_2^I respectively. (The components are correspondences, rather than functions, in $|\delta_1 - \delta_2|$, but we need only consider minima of the lower envelope functions.) If all component functions have unique minima (e.g. are convex), and provided $\left|\delta_1 - \bar{\delta}\right| < x$, then the minimiser of the weighted sum u_1 has to fall between 0 and x, since all components increase monotonically beyond x. (Giving general conditions for the convexity of the integrals u_1^I, u_2^I, and u_1^{II} is not straightforward, which motivates our informal discussion.)

It is conceivable that $\left|\delta_1 - \bar{\delta}\right|$ is large, if regulator 1's signal indicates an optimal policy far from $\bar{\delta}$ and the regulators care strongly about implementing it. However, if career incentives are dominant, δ_1 will be close to $\bar{\delta}$, since regulator 1 knows that 2 wants to implement $\bar{\delta}$, and is therefore most likely to match δ_1 in this case. Thus 1 can meet both career objectives best by gravitating to $\bar{\delta}$, and if career incentives are important enough, $\left|\delta_1 - \bar{\delta}\right|$ will be smaller than x. Then the minimiser of the public-servant component is largest, and must exceed the minimiser of regulator 2's total disutility (with active career incentives) in decision-difference space.

The argument is illustrated in Figure 3 for $\delta_1 = 4/5$ and signals $s_1 = 1$ and $s_2 = 1$, with quadratic disutilities as in the text and $\bar{\delta} = 1$. The left panel
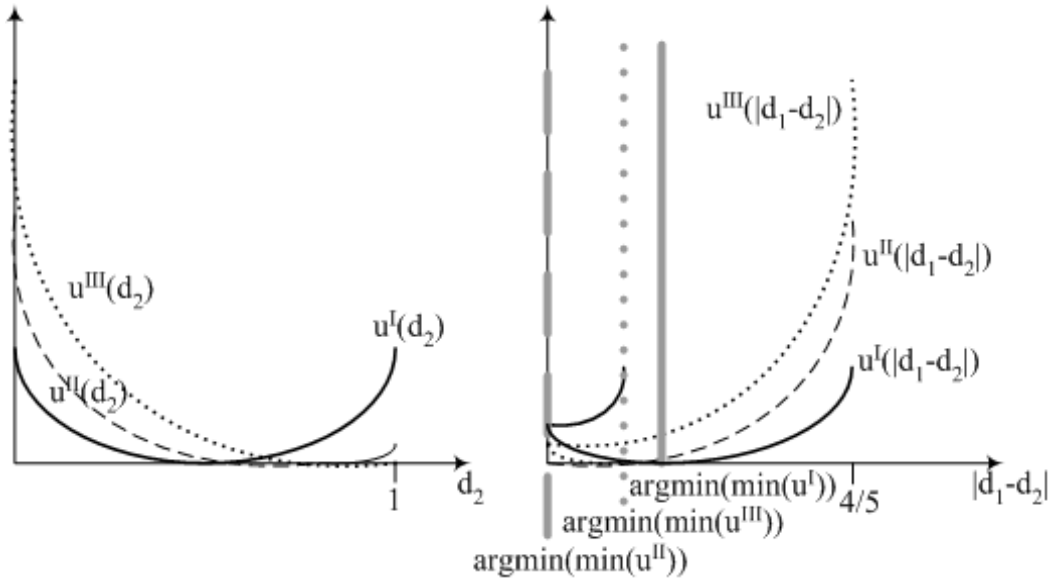
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Figure 3: Component functions of δ_2, left, transformed into functions of $|\delta_1 - \delta_2|$, right

depicts the component disutilities for different values of δ_2. The right panel shows the component disutilities for different values of $|\delta_1 - \delta_2| = |4/5 - \delta_1|$. The minimisers of u_2^I, u_2^{II}, and u_2^{III} in the right panel are respectively $3/10$ (since $\delta_2 = 4/5 - 3/10 = 1/2$), 0, and $1/5$ (since $\delta_2 = 4/5 + 1/5 = 1$). The largest of these is $3/10$, the minimiser of the public servant disutility u_2^I. Beyond this point, all component disutilities increase, so the total utility u_2, which is a weighted average of the components, must also increase. Its minimiser must therefore be smaller than $3/10$, which demonstrates - for this particular value of δ_1 - that the mixing of u_2^I with u_2^{II} and u_2^{III} reduces $|\delta_1 - \delta_2|$ if regulator 2 responds optimally. A similar argument applies to other values of δ_1 (provided the weight on u_2^{II} and u_2^{III} is large enough), hence in particular for the decision regulator 1 takes in equilibrium.

It is important to mention that there are other factors besides career incentives that could increase consistency. While "bad" consistency (the copycat and yes-man scenarios) tends to produce systematically smaller decision differences than "good consistency" (the public-servant case), there are confounding factors. In a single decision problem, highly consistent deci-

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sions may arise from information aggregation purely from the fact that both decision makers have very good information. Then their strongly correlated signals imply that regulator 2 has little new information, and therefore - in the pure public servant case - little reason to deviate from the leader's decision.

Very bad information (i.e. reason to mistrust one's own signal) would also reduce decision differences as both regulators have little basis for deviating from the unconditional expected value of the optimal policy, which is half. The same behavior is exhibited by very risk-averse agents. They would gravitate towards an intermediate decision (i.e. half), so as to avoid being on occasion very wrong with a decision at an extreme.

5   Conclusion

When regulators try to make socially optimal decisions (public servants), the arrival of new information is likely to change the optimal decision, and the follower is expected to deviate slightly from the leader. When we add an inherent preference for consistency (copycats) or a specific policy (yes men), the follower has an incentive to ignore new information and match the leader's decision, causing greater consistency.

Hence one cannot be unguardedly optimistic about the observed trend toward consistency, since it is likely to be influenced by career concerns. Such incentives lead to suboptimal decision making that doesn't make enough use of the available information and / or is subject to bias. One would like to be able to detect these influences empirically, but identification is not a straightforward task. Information quality (very good or very bad) and risk aversion also lead to greater consistency, and their effects could be mistaken for those of career concerns.

6   Appendix

Proof of Lemma 1:.   Each signal is unconditionally equally likely:

$$
\begin{aligned}
\Pr\left(s_i = 1\right) &= \int_0^1 \Pr\left(s_i = 1|\delta\right) d\delta = \frac{1}{2} \\
&= \int_0^1 \Pr\left(s_i = 0|\delta\right) d\delta = \Pr\left(s_i = 0\right).
\end{aligned}
$$

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Hence the conditional probability of δ, given a signal $s_1 \in \{0, 1\}$, is:

$$\Pr(\delta|s_1 = 1) = \frac{\Pr(s_1 = 1|\delta)}{\Pr(s_1 = 1)} = 2\delta$$

$$\Pr(\delta|s_1 = 0) = \frac{\Pr(s_1 = 0|\delta)}{\Pr(s_1 = 0)} = 2(1 - \delta).$$

The conditional distributions are:

$$\Pr(\delta \leq x|s_1 = 1) = \int_0^x \Pr(\delta|s_1 = 1)\, d\delta = x^2$$

$$\Pr(\delta \leq x|s_1 = 0) = \int_0^x \Pr(\delta|s_1 = 0)\, d\delta = 1 - (1 - x)^2.$$

The expectation of δ, conditional on one signal, is:

$$E(\delta|s_1 = 1) = \int_0^1 \delta \Pr(\delta|s_1 = 1)\, d\delta = \frac{2}{3}$$

$$E(\delta|s_1 = 0) = \int_0^1 \delta \Pr(\delta|s_1 = 0)\, d\delta = \frac{1}{3}.$$

The probability of s_2 after observing s_1 is:

$$\Pr(s_2 = 1|s_1 = 1) = \int_0^1 \Pr(s_2 = 1|\delta)\Pr(\delta|s_1 = 1)\, d\delta = \frac{2}{3}$$

$$\Pr(s_2 = 0|s_1 = 1) = \int_0^1 \Pr(s_2 = 0|\delta)\Pr(\delta|s_1 = 1)\, d\delta = \frac{1}{3}$$

$$\Pr(s_2 = 1|s_1 = 0) = \int_0^1 \Pr(s_2 = 1|\delta)\Pr(\delta|s_1 = 0)\, d\delta = \frac{1}{3}$$

$$\Pr(s_2 = 0|s_1 = 0) = \int_0^1 \Pr(s_2 = 0|\delta)\Pr(\delta|s_1 = 0)\, d\delta = \frac{2}{3}.$$

The unconditional joint density is:

$$\Pr(s_1 = 1, s_2 = 1) = \int_0^1 \Pr(s_1 = 1|\delta)\Pr(s_2 = 1|\delta)\, d\delta = \frac{1}{3}$$

$$= \int_0^1 \Pr(s_1 = 0|\delta)\Pr(s_2 = 0|\delta)\, d\delta = \Pr(s_1 = 0, s_2 = 0)$$

$$\Pr(s_1 = 1, s_2 = 0) = \int_0^1 \Pr(s_1 = 1|\delta)\Pr(s_2 = 0|\delta)\, d\delta = \frac{1}{6}$$

$$= \int_0^1 \Pr(s_1 = 0|\delta)\Pr(s_2 = 1|\delta)\, d\delta = \Pr(s_1 = 0, s_2 = 1).$$

Then the conditional probability of δ, given both signals, is:

$$\Pr(\delta|s_1 = 1, s_2 = 1) = \frac{\Pr(s_1 = 1|\delta)\Pr(s_2 = 1|\delta)}{\Pr(s_1 = 1, s_2 = 1)} = 3\delta^2$$

$$\Pr(\delta|s_1 = 1, s_2 = 0) = \frac{\Pr(s_1 = 1|\delta)\Pr(s_2 = 0|\delta)}{\Pr(s_1 = 1, s_2 = 0)} = 6\delta(1-\delta)$$

$$= \frac{\Pr(s_1 = 0|\delta)\Pr(s_2 = 1|\delta)}{\Pr(s_1 = 0, s_2 = 1)} = \Pr(\delta|s_1 = 0, s_2 = 1)$$

$$\Pr(\delta|s_1 = 0, s_2 = 0) = \frac{\Pr(s_1 = 0|\delta)\Pr(s_2 = 0|\delta)}{\Pr(s_1 = 0, s_2 = 0)} = 3(1-\delta)^2.$$

The associated conditional distribution of δ is:

$$\Pr(\delta \le x|s_1 = 1, s_2 = 1) = \int_0^x \Pr(\delta|s_1 = 1, s_2 = 1)\, d\delta = x^3$$

$$\Pr(\delta \le x|s_1 = 1, s_2 = 0) = \int_0^x \Pr(\delta|s_1 = 1, s_2 = 0)\, d\delta = 3x^2 - 2x^3$$

$$= \int_0^x \Pr(\delta|s_1 = 0, s_2 = 1)\, d\delta = \Pr(\delta \le x|s_1 = 0, s_2 = 1)$$

$$\Pr(\delta \le x|s_1 = 0, s_2 = 0) = \int_0^x \Pr(\delta|s_1 = 0, s_2 = 0)\, d\delta = 1 - (1-x)^3.$$

The expectation of δ, conditional on both signals, is:

$$E(\delta|\{s_1, s_2\} = \{1, 1\}) = \int_0^1 \delta \Pr(\delta|s_1 = 1, s_2 = 1)\, d\delta = \frac{3}{4}$$

$$E(\delta|\{s_1, s_2\} = \{1, 0\}) = \int_0^1 \delta \Pr(\delta|s_1 = 0, s_2 = 1)\, d\delta = \frac{1}{2}$$

$$E(\delta|\{s_1, s_2\} = \{0, 0\}) = \int_0^1 \delta \Pr(\delta|s_1 = 0, s_2 = 0)\, d\delta = \frac{1}{4}.$$

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Proof of Proposition 2. With the quadratic regrets, the integrals can be evaluated to give the following component utilities. In the public servant case,

$$u_1^I(\delta_1) = \int_0^1 R^I(|\delta_1 - \delta|)\Pr(\delta|s_1)\, d\delta = \begin{cases} \delta_1^2 - \frac{4}{3}\delta_1 + \frac{1}{2} & \text{if } s_1 = 1 \\ (1-\delta_1)^2 - \frac{4}{3}(1-\delta_1) + \frac{1}{2} & \text{if } s_1 = 0 \end{cases}$$

and

$$u_2^I(\delta_2) = \int_0^1 R^I(|\delta_2 - \delta|)\Pr(\delta|s_1, s_2)\,d\delta = \begin{cases} \delta_2^2 - \frac{3}{2}\delta_2 + \frac{3}{5} & \text{if } s_1 = 1,\, s_2 = 1 \\ \delta_2^2 - \delta_2 + \frac{3}{10} & \begin{array}{l}\text{if } s_1 = 1,\, s_2 = 0 \\ \text{or } s_1 = 0,\, s_2 = 1\end{array} \\ (1 - \delta_2)^2 - \frac{3}{2}(1 - \delta_2) + \frac{3}{5} & \text{if } s_1 = 0,\, s_2 = 0 \end{cases}.$$

In the copycat case,

$$u_1^{II}(\delta_1, \delta_2) = \sum_{s_2 \in \{0,1\}} (\delta_1 - \delta_2(s_1, s_2))^2 \Pr(s_2|s_1) = \begin{cases} \begin{array}{l}\frac{2}{3}(\delta_1 - \delta_2(s_1 = 1, s_2 = 1))^2 \\ +\frac{1}{3}(\delta_1 - \delta_2(s_1 = 1, s_2 = 0))^2\end{array} & \text{if } s_1 = 1 \\ \begin{array}{l}\frac{1}{3}(\delta_1 - \delta_2(s_1 = 0, s_2 = 1))^2 \\ +\frac{2}{3}(\delta_1 - \delta_2(s_1 = 0, s_2 = 0))^2\end{array} & \text{if } s_1 = 0 \end{cases}.$$

and

$$u_2^{II}(\delta_1, \delta_2) = (\delta_1 - \delta_2)^2.$$

In the yes-man case,

$$u_1^{III}(\delta_1, \delta_2) = (\delta_1 - \bar{\delta})^2$$

and

$$u_2^{III}(\delta_1, \delta_2) = (\delta_2 - \bar{\delta})^2.$$

Hence

$$u_1^I(\delta_1, \delta_2) = \begin{cases} \begin{array}{c}(1 - \alpha - \beta)\left(\delta_1^2 - \frac{4}{3}\delta_1 + \frac{1}{2}\right) \\ +\alpha\left(\frac{2}{3}(\delta_1 - \delta_2(s_1 = 1, s_2 = 1))^2 + \frac{1}{3}(\delta_1 - \delta_2(s_1 = 1, s_2 = 0))^2\right) \\ +\beta\left(\delta_1 - \bar{\delta}\right)^2\end{array} & \text{if } s_1 = 1 \\ \begin{array}{c}(1 - \alpha - \beta)\left((1 - \delta_1)^2 - \frac{4}{3}(1 - \delta_1) + \frac{1}{2}\right) \\ +\alpha\left(\frac{1}{3}(\delta_1 - \delta_2(s_1 = 0, s_2 = 1))^2 + \frac{2}{3}(\delta_1 - \delta_2(s_1 = 0, s_2 = 0))^2\right) \\ +\beta\left(\delta_1 - \bar{\delta}\right)^2\end{array} & \text{if } s_1 = 0 \end{cases},$$

respectively

$$u_2(\delta_1, \delta_2) = \begin{cases} \begin{array}{l}(1 - \alpha - \beta)\left(\delta_2^2 - \frac{3}{2}\delta_2 + \frac{3}{5}\right) \\ +\alpha(\delta_1 - \delta_2)^2 + \beta\left(\delta_2 - \bar{\delta}\right)^2\end{array} & \text{if } s_1 = 1,\, s_2 = 1 \\ \begin{array}{l}(1 - \alpha - \beta)\left(\delta_2^2 - \delta_2 + \frac{3}{10}\right) \\ +\alpha(\delta_1 - \delta_2)^2 + \beta\left(\delta_2 - \bar{\delta}\right)^2\end{array} & \begin{array}{l}\text{if } s_1 = 1,\, s_2 = 0 \\ \text{or } s_1 = 0,\, s_2 = 1\end{array} \\ \begin{array}{l}(1 - \alpha - \beta)\left((1 - \delta_2)^2 - \frac{3}{2}(1 - \delta_2) + \frac{3}{5}\right) \\ +\alpha(\delta_1 - \delta_2)^2 + \beta\left(\delta_2 - \bar{\delta}\right)^2\end{array} & \text{if } s_1 = 0,\, s_2 = 0 \end{cases}.$$

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First-order conditions are:

$$\delta_2^*(\delta_1) = \begin{cases} \frac{3}{4}(1-\alpha-\beta)+\alpha\delta_1+\beta\bar{\delta} & \text{if } s_1=1,\ s_2=1 \\ \frac{1}{2}(1-\alpha-\beta)+\alpha\delta_1+\beta\bar{\delta} & \begin{array}{l}\text{if } s_1=1,\ s_2=0 \\ \text{or } s_1=0,\ s_2=1\end{array} \\ \frac{1}{4}(1-\alpha-\beta)+\alpha\delta_1+\beta\bar{\delta} & \text{if } s_1=0,\ s_2=0 \end{cases}.$$

and

$$\begin{aligned}
\delta_1^*(\delta_2) &= \begin{cases} \frac{2}{3}(1-\alpha-\beta)+\frac{2}{3}\alpha\delta_2(s_2=1)+\frac{1}{3}\alpha\delta_2(s_2=0)+\beta\bar{\delta} & \text{if } s_1=1 \\ \frac{1}{3}(1-\alpha-\beta)+\frac{1}{3}\alpha\delta_2(s_2=1)+\frac{2}{3}\alpha\delta_2(s_2=0)+\beta\bar{\delta} & \text{if } s_1=0 \end{cases} \\
&= \begin{cases} \frac{1}{1-\alpha}\left(\frac{2}{3}(1-\alpha-\beta)+\beta\bar{\delta}\right) & \text{if } s_1=1 \\ \frac{1}{1-\alpha}\left(\frac{1}{3}(1-\alpha-\beta)+\beta\bar{\delta}\right) & \text{if } s_2=0 \end{cases}.
\end{aligned}$$

Thus

$$\delta_2^*(\delta_1) = \begin{cases} \frac{1}{12}(1-\alpha-\beta)+\frac{1}{1-\alpha}\left(\frac{2}{3}(1-\alpha-\beta)+\beta\bar{\delta}\right) & \text{if } s_1=1,\ s_2=1 \\ -\frac{1}{6}(1-\alpha-\beta)+\frac{1}{1-\alpha}\left(\frac{2}{3}(1-\alpha-\beta)+\beta\bar{\delta}\right) & \text{if } s_1=1,\ s_2=0 \\ \frac{1}{6}(1-\alpha-\beta)+\frac{1}{1-\alpha}\left(\frac{1}{3}(1-\alpha-\beta)+\beta\bar{\delta}\right) & \text{if } s_1=0,\ s_2=1 \\ -\frac{1}{12}(1-\alpha-\beta)+\frac{1}{1-\alpha}\left(\frac{1}{3}(1-\alpha-\beta)+\beta\bar{\delta}\right) & \text{if } s_1=0,\ s_2=0 \end{cases}.$$

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