Web Appendix for "Hush Money"

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Analysis When Sealing is Permitted

Claim 1. P will induce type H1 to choose C.

Proof. Consider the alternatives. First, P could induce H1 to choose T. However, if H1 chooses T, then ij chooses T for all i,j. To see this, notice that H1 chooses T implies that $\pi_H d + k_D + V < S_O + \gamma_O V$ and $\pi_H d + k_D + V < S_C + \gamma_C V$. But these inequalities hold a fortiori if we replace π_H with π_L and/or j = 1 with j = 0. Thus H1 chooses T implies ij chooses T for all i,j and hence P's payoff from type ij is $\pi_i d - k_P$ for all i,j. Next, notice that P could defect from S_C to demand $\tilde{S}_C = \pi_H d + k_D + (1 - \gamma_C)V$; type H1 would accept this demand but the other types would continue to choose T. This would raise P's expected payoff since $\tilde{S}_C > \pi_H d - k_P$. Thus, P will not induce H1 to choose T.

Similarly, P could induce H1 to choose O. However, if H1 chooses O, then ij chooses either O or T for all i,j. To see this, notice that H1 chooses O implies $S_O + \gamma_O V < S_C + \gamma_C V$ and $S_O + \gamma_O V \leq \pi_H d + k_D + V$. In this case, type i0 also strictly prefers O to C (since $S_O + \gamma_O V < S_C + \gamma_C V$ implies $S_O < S_C$), but type i0 might prefer T to O. Thus H1 chooses O implies ij chooses O or T for all i,j. Now notice that P could instead demand $\tilde{S}_C = S_O + \epsilon$ where $S_O + \epsilon + \gamma_C V < S_O + \gamma_O V$. Type H1 will accept $\tilde{S}_C$, which improves P's payoff from type H1. If any other type changes from O to C, this will similarly benefit P. No changes from T to O or O to T will be induced by offering $\tilde{S}_C$. Finally, a type ij which previously chose T may be induced to accept $\tilde{S}_C$. If type ij previously chose T, then $\pi_i d + k_D + jV < S_O + j\gamma_O V$, which implies that $S_O > \pi_i d + k_D + j(1 - \gamma_O)V > \pi_i d - k_P$. Thus, P would prefer settlement at $\tilde{S}_C = S_O + \epsilon$ to trial at $\pi_i d - k_P$. Starting from a putative equilibrium in which type H1 chose O, we have shown that defecting to demand $\tilde{S}_C$ strictly improves P's payoffs. Thus, P will not induce H1 to choose O. QED

Claim 2. P will induce type L1 to choose either C or T.

Proof. From Claim 1, we know that type H1 will choose C, so $S_C + \gamma_C V \leq S_O + \gamma_O V$ and $S_C + \gamma_C V \leq \pi_H d + k_D + V$. Now consider type L1's preferences: $S_C + \gamma_C V \leq S_O + \gamma_O V$, so L1 will choose C rather than O; but $S_C + \gamma_C V$ may be greater than, equal to, or less than $\pi_L d + k_D + V$. Thus, L1 might choose T. QED

Claim 3. If L1 chooses T, then L0 also chooses T.

Proof. If L1 chooses T, then $\pi_L d + k_D + V < S_C + \gamma_C V$ and $\pi_L d + k_D + V < S_O + \gamma_O V$. Now consider L0's preferences: L0 will choose T if and only if $\pi_L d + k_D < S_C$ and $\pi_L d + k_D < S_O$. But both of the latter inequalities are implied by the former inequalities. Thus, L1 chooses T implies L0 chooses T. QED

Claim 4. If H0 chooses T, then L0 also chooses T.

Proof. If H0 chooses T, then $\pi_H d + k_D < S_C$ and $\pi_H d + k_D < S_O$. Now consider L0's preferences: L0 will choose T if and only if $\pi_L d + k_D < S_C$ and $\pi_L d + k_D < S_O$. Both of the latter inequalities are implied by the former inequalities. Thus, H0 chooses T implies L0 chooses T. QED

Claim 5. If H0 chooses O, then L0 chooses O or T.
Proof. If H0 chooses O, then $S_O < S_C$ and $S_O < \pi_H d + k_D$. Now consider L0's preferences: since $S_O < S_C$, L0 will choose O over C, but S_O may be greater than, equal to, or less than $\pi_L d + k_D$. Thus, L0 might choose T. QED

Claim 6. If H0 chooses C, then L0 chooses C or T.
Proof. If H0 chooses C, then $S_C \leq S_O$ and $S_C \leq \pi_H d + k_D$. Now consider L0's preferences: since $S_C \leq S_O$, L0 will choose C over O, but S_O may be greater than, equal to, or less than $\pi_L d + k_D$. Thus, L0 might choose T. QED

Claim 7. P will not induce all types to choose C.
Proof. If all types choose C, then $S_C \leq \pi_L d + k_D$ (which is necessary to induce L0 to choose C). Alternatively, P could defect to offering $\tilde{S}_O = \pi_L d + k_D$ and $\tilde{S}_C = \pi_L d + k_D + V_C - V_O$. Types L0 and H0 will now choose O and types L1 and H1 will still choose C. P's payoff is not lower against types L0 and H0, and is higher against types L1 and H1. QED

Application of these claims leaves 7 undominated configurations, as described in Proposition 1.

Derivation of P's Optimal Demands for Configurations 2-7

2. $\left[\genfrac{}{}{0pt}{}{TC}{TT}\right]$ The self-selection constraints associated with this configuration are as follows:

(H0)	(a) $\pi_H d + k_D < S_C$	(b) $\pi_H d + k_D < S_O$
(H1)	(a) $S_C + \gamma_C V \leq S_O + \gamma_O V$	(b) $S_C + \gamma_C V \leq \pi_H d + k_D + V$
(L1)	(a) $\pi_L d + k_D + V < S_O + \gamma_O V$	(b) $\pi_L d + k_D + V < S_C + \gamma_C V$
(L0)	(a) $\pi_L d + k_D < S_O$	(b) $\pi_L d + k_D < S_C$

To obtain this configuration, P does not offer outcome O (or, alternatively, P sets S_O very high) and is only constrained by the need to induce H1 to choose C. Thus, $S_C = \pi_H d + k_D + V_C$.

3. $\left[\genfrac{}{}{0pt}{}{OC}{TT}\right]$ The self-selection constraints associated with this configuration are as follows:

(H0)	(a) $S_O < S_C$	(b) $S_O \leq \pi_H d + k_D$
(H1)	(a) $S_C + \gamma_C V \leq S_O + \gamma_O V$	(b) $S_C + \gamma_C V \leq \pi_H d + k_D + V$
(L1)	(a) $\pi_L d + k_D + V < S_O + \gamma_O V$	(b) $\pi_L d + k_D + V < S_C + \gamma_C V$
(L0)	(a) $\pi_L d + k_D < S_O$	(b) $\pi_L d + k_D < S_C$

Collectively, these imply the following constraints:

(i) $\pi_L d + k_D + V_O < S_O \leq \pi_H d + k_D$;

(ii) $\pi_L d + k_D + V_C < S_C \leq \pi_H d + k_D + V_C$; and

(iii) $0 < S_C - S_O \leq V_C - V_O$.

Clearly, P wants to set S_C and S_O as high as possible, subject to these constraints. However, under Assumption 3, P cannot set both S_C and S_O at their upper limits and still satisfy (iii). Thus for this configuration, the best P can do is to set $S_O = \pi_H d + k_D$ and $S_C = S_O + V_C - V_O$, or $S_C = \pi_H d + k_D + V_C - V_O$.

4. $\left[{}^{OC}_{OC}\right]$ The self-selection constraints associated with this configuration are as follows:

(H0)	(a) $S_O < S_C$	(b) $S_O \leq \pi_H d + k_D$
(H1)	(a) $S_C + \gamma_C V \leq S_O + \gamma_O V$	(b) $S_C + \gamma_C V \leq \pi_H d + k_D + V$
(L1)	(a) $S_C + \gamma_C V \leq S_O + \gamma_O V$	(b) $S_C + \gamma_C V \leq \pi_L d + k_D + V$
(L0)	(a) $S_O \leq \pi_L d + k_D$	(b) $S_O < S_C$

Collectively, these imply the following constraints:

(i) $S_O \leq \pi_L d + k_D$;
(ii) $S_C \leq \pi_L d + k_D + V_C$; and
(iii) $0 < S_C - S_O \leq V_C - V_O$.

Clearly, P wants to set S_C and S_O as high as possible, subject to these constraints. However, under Assumption 3, P cannot set both S_C and S_O at their upper limits and still satisfy (iii). Thus the best P can do is to set $S_O = \pi_L d + k_D$ and $S_C = S_O + V_C - V_O$, or $S_C = \pi_L d + k_D + V_C - V_O$.

5. $\left[{}^{CC}_{TC}\right]$ The self-selection constraints associated with this configuration are as follows:

(H0)	(a) $S_C \leq S_O$	(b) $S_C \leq \pi_H d + k_D$
(H1)	(a) $S_C + \gamma_C V \leq S_O + \gamma_O V$	(b) $S_C + \gamma_C V \leq \pi_H d + k_D + V$
(L1)	(a) $S_C + \gamma_C V \leq S_O + \gamma_O V$	(b) $S_C + \gamma_C V \leq \pi_L d + k_D + V$
(L0)	(a) $\pi_L d + k_D < S_O$	(b) $\pi_L d + k_D < S_C$

To obtain this configuration, P does not offer outcome O and offers the highest possible S_C subject to the constraints $\pi_L d + k_D < S_C \leq \min\{\pi_L d + k_D + V_C, \pi_H d + k_D\}$. Under Assumption 3, this means $S_C = \pi_H d + k_D$.

6. $\left[{}^{TC}_{TC}\right]$ The self-selection constraints associated with this configuration are as follows:

(H0)	(a) $\pi_H d + k_D < S_C$	(b) $\pi_H d + k_D < S_O$
(H1)	(a) $S_C + \gamma_C V \leq S_O + \gamma_O V$	(b) $S_C + \gamma_C V \leq \pi_H d + k_D + V$
(L1)	(a) $S_C + \gamma_C V \leq S_O + \gamma_O V$	(b) $S_C + \gamma_C V \leq \pi_L d + k_D + V$
(L0)	(a) $\pi_L d + k_D < S_O$	(b) $\pi_L d + k_D < S_C$

To obtain this configuration, P does not offer outcome O and is only constrained by the need to induce H1 and L1 to choose C rather than T, and H0 and L0 to choose T rather than C. Thus, P wants to choose S_C as high as possible subject to $\pi_H d + k_D < S_C \leq \pi_L d + k_D + V_C$. Since this interval is non-empty under Assumption 3, it follows that $S_C = \pi_L d + k_D + V_C$.

7. $\left[\begin{smallmatrix}CC\\TT\end{smallmatrix}\right]$ The self-selection constraints associated with this configuration are as follows:

(H0)	(a) $S_C \leq S_O$	(b) $S_C \leq \pi_H d + k_D$
(H1)	(a) $S_C + \gamma_C V \leq S_O + \gamma_O V$	(b) $S_C + \gamma_C V \leq \pi_H d + k_D + V$
(L1)	(a) $\pi_L d + k_D + V < S_O + \gamma_O V$	(b) $\pi_L d + k_D + V < S_C + \gamma_C V$
(L0)	(a) $\pi_L d + k_D < S_O$	(b) $\pi_L d + k_D < S_C$

To obtain this configuration, P does not offer outcome O and is only constrained by the need to induce H0 and H1 to choose C rather than T, and L0 and L1 to choose T rather than C. Thus, P wants to set S_C as high as possible subject to the constraints $\pi_L d + k_D + V_C < S_C \leq \pi_H d + k_D$. However, this interval is empty under Assumption 3. Thus this configuration is infeasible.

<u>Derivation of P's Optimal Configuration Choice When Sealing Is Allowed</u>

P strictly prefers configuration 1 to 2 if $q < \hat{q} \equiv k/[\Delta + V_C + 2k]$ or if $q > \hat{q}$ and $p < f_{12}(q) \equiv q(V_C + k)/[q\Delta + q(V_C + k) - (1-q)k]$, where $\Delta \equiv (\pi_H - \pi_L)d$. For $q > \hat{q}$, $f_{12}(q)$ is a decreasing convex function, with $f_{12}(1) = (V_C + k)/[\Delta + V_C + k]$ (> ½ under Assumption 3).

P strictly prefers configuration 1 to 3 if and only if $p < f_{13}(q) \equiv (V_C + k)/[\Delta + V_C + k - V_O]$.

P strictly prefers configuration 1 to 4 if $q > \tilde{q} \equiv k/(V_O + k)$ or if $q < \tilde{q}$ and $p > f_{14}(q) \equiv [(1-q)k - qV_O]/(1-q)(\Delta + k)$. For $q < \tilde{q}$, $f_{14}(q)$ is a decreasing concave function with $f_{14}(0) = k/(\Delta + k)$ ($< \tilde{q}$ under Assumption 3) and $f_{14}(\tilde{q}) = 0$. Note also that $\tilde{q} > \hat{q}$.

Finally, P strictly prefers configuration 2 to 3 if and only if $q > \tilde{q}$.

These conditions are sufficient to derive Figure 1, which shows P's optimal configuration choice for each (q,p) combination. This choice is unique on the interior of the specified sets; along boundaries between sets P is indifferent between the two relevant configurations.

<u>Analysis When Sealing is Not Permitted</u>

Proposition 2 is also proved through a series of claims, which are given below and numbered to indicate their analogs in the unrestricted case; their proofs are trivial and omitted.

<u>Claim 0'</u>. If D of type ij is indifferent between O and T, D chooses O.

<u>Claim 1'</u>. P will induce type H1 to choose O.

<u>Claim 3'</u>. If L1 chooses T, then L0 also chooses T.

<u>Claim 4'</u>. If H0 chooses T, then L0 also chooses T.

Application of these claims leaves 5 undominated configurations, as given in Proposition 1'.

<u>Derivation of P's Optimal Demand for Configurations 1-5</u>

This analysis is conducted under Assumption 4 (see Section 3).

1. $\left[\begin{smallmatrix} to \\ tt \end{smallmatrix}\right]$ The self-selection constraints associated with this configuration are as follows:

(H0) $\pi_H d + k_D < S_O$
(H1) $S_O + \gamma_O V \leq \pi_H d + k_D + V$
(L1) $\pi_L d + k_D + V < S_O + \gamma_O V$
(L0) $\pi_L d + k_D < S_O$

P wants to set S_O as high as possible subject to these constraints. Thus $S_O = \pi_H d + k_D + V_O$.

2. $\left[\begin{smallmatrix} to \\ to \end{smallmatrix}\right]$ The self-selection constraints associated with this configuration are as follows:

(H0) $\pi_H d + k_D < S_O$
(H1) $S_O + \gamma_O V \leq \pi_H d + k_D + V$
(L1) $S_O + \gamma_O V \leq \pi_L d + k_D + V$
(L0) $\pi_L d + k_D < S_O$

P wants to set S_O as high as possible subject to the constraints $\pi_H d + k_D < S_O \leq \pi_L d + k_D + V_O$. However, this set is empty under Assumption 4. Thus this configuration is infeasible.

3. $\left[\begin{smallmatrix} oo \\ tt \end{smallmatrix}\right]$ The self-selection constraints associated with this configuration are as follows:

(H0) $S_O \leq \pi_H d + k_D$
(H1) $S_O + \gamma_O V \leq \pi_H d + k_D + V$
(L1) $\pi_L d + k_D + V < S_O + \gamma_O V$
(L0) $\pi_L d + k_D < S_O$

P wants to set S_O as high as possible subject to the constraints $\pi_L d + k_D + V_O < S_O \leq \pi_H d + k_D$. Since this set is non-empty under Assumption 3', it follows that $S_O = \pi_H d + k_D$.

4. $\left[\begin{smallmatrix} oo \\ to \end{smallmatrix}\right]$ The self-selection constraints for this configuration are as follows:

(H0) $S_O \leq \pi_H d + k_D$
(H1) $S_O + \gamma_O V \leq \pi_H d + k_D + V$
(L1) $S_O + \gamma_O V \leq \pi_L d + k_D + V$
(L0) $\pi_L d + k_D < S_O$

P wants to set S_O as high as possible subject to these constraints; thus (under Assumption 4) $S_O = \pi_L d + k_D + V_O$.

5. $[{}^{oo}_{oo}]$ The self-selection constraints for this configuration are as follows:

(H0) $S_O \leq \pi_H d + k_D$
(H1) $S_O + \gamma_O V \leq \pi_H d + k_D + V$
(L1) $S_O + \gamma_O V \leq \pi_L d + k_D + V$
(L0) $S_O \leq \pi_L d + k_D$

P wants to set S_O as high as possible subject to these constraints; thus, $S_O = \pi_L d + k_D$.

Summary of P's Expected Payoff under Configurations 1-5

1. $[{}^{to}_{tt}]$ $EU^P(q,p) = p(1-q)[\pi_H d - k_P] + (1-p)[\pi_L d - k_P] + pq)[\pi_H d + k_D + V_O]$

2. $[{}^{to}_{to}]$ infeasible under Assumption 3'

3. $[{}^{oo}_{tt}]$ $EU^P(q,p) = (1-p)[\pi_L d - k_P] + p[\pi_H d + k_D]$

4. $[{}^{oo}_{to}]$ $EU^P(q,p) = (1-p)(1-q)[\pi_L d - k_P] + (p + q - pq)[\pi_L d + k_D + V_O]$

5. $[{}^{oo}_{oo}]$ $EU^P(q,p) = [\pi_L d + k_D]$

Derivation of P's Optimal Configuration Choice When Sealing is Not Allowed

In this analysis, we maintain the following strengthened version of Assumption 4:
Assumption 4': $\Delta > V_O + k$ (called the "small k" assumption in the text).

P strictly prefers configuration 1 to 3 if and only if $q > \tilde{q}$.

P strictly prefers configuration 1 to 4 if and only if $p > g_{14}(q) \equiv q(V_O + k)/[\Delta - (1 - 2q)(V_O + k)]$. The function $g_{14}(q)$ is increasing and concave (under Assumption 4'), with $g_{14}(0) = 0$ and $g_{14}(1) = (V_O + k)/[\Delta + V_O + k]$.

P strictly prefers configuration 1 to 5 if and only if $p > f_{15}(q) \equiv k/[\Delta + q(V_O + k)]$. The function $g_{15}(q)$ is decreasing and convex; $g_{15}(0) = k/\Delta$ ($< \tilde{q}$ under Assumption 4') and $g_{15}(1) = k/[\Delta + V_O + k]$.

P strictly prefers configuration 3 to 4 if and only if $p > g_{34}(q) \equiv q(V_O + k)/[q(V_O + k) + \Delta - V_O]$. The function $g_{34}(q)$ is increasing concave, with $g_{34}(0) = 0$ and $g_{34}(1) = (V_O + k)/[\Delta + k] < g_{14}(1)$. Both $g_{14}(q)$ and $g_{34}(q)$ begin at zero and are increasing and concave functions. It is straightforward to show that (for $q > 0$), $g_{14}(q) >,=,< g_{34}(q)$ as $q <,=,> \tilde{q}$.

P strictly prefers configuration 3 to 5 if and only if $p > g_{35}(q) \equiv k/[\Delta + k]$. Notice that $g_{35}(q)$ is a constant which is less than $g_{14}(\tilde{q}) = g_{34}(\tilde{q}) = k/[\Delta - V_O + k]$.

P strictly prefers configuration 4 to 5 if $q > \tilde{q}$, or if $q < \tilde{q}$ and $p > g_{45}(q) \equiv [k - q(V_O + k)]/(1 - q)(V_O + k)$. The function $g_{45}(q)$ is decreasing concave, with $g_{45}(0) = k/(V_O + k)$.

These conditions are sufficient to derive the dashed lines in Figure 2, which shows P's optimal configuration for each (q,p) combination. This choice is unique on the interior of the specified sets; along boundaries between sets P is indifferent between the two relevant configurations.

<u>Sensitivity of the Results to Changing Assumption 3</u>

The alternative assumptions to Assumption 3 are captured in the following:[1]

<u>Assumption 5</u>: a) $V_C < \Delta$, b) $\Delta < V_O$.

Figures 4 and 5 below indicate how changing Assumption 3 influences the partitioning of (q,p) space into regions of equilibria.[2] When Assumption 5a holds, the difference in the expected award at trial under high versus low culpability is greater than the reduction in future litigation cost that a current sealed settlement can achieve. As can be seen in Figure 4, the main effect of Assumption 5a, as compared with Assumption 3 (besides some modifications of the boundaries between the regions), is that now $\left[{CC \atop TC}\right]$ dominates $\left[{OC \atop TC}\right]$. Thus, open settlements occur, but only when q is low enough; otherwise only sealed settlements will be offered as an alternative to trial.

Figure 5 illustrates the regions when Assumption 5b is applicable. Note that, in comparison with Figure 1, here $\left[{TC \atop TC}\right]$ dominates $\left[{OC \atop TC}\right]$. This case shares the same property observed for that of Assumption 5a: when q is sufficiently high, only sealed settlements will be observed as the alternative to trial. However, as noted earlier, an equilibrium configuration involving all three outcomes is possible, given appropriate choices of p and q.

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[1] Note that, by construction, $V_O < V_C$. The two alternative assumptions to Assumption 3 above are that $\Delta < V_O$ or that $V_C < \Delta$; we ignore the non-generic cases wherein $\Delta = V_O$ or V_C.

[2] Figure 4 is sensitive to whether $k < \Delta - V_O$ ("k small") or not ("k large"). We have chosen to illustrate the small k case; the only change in the large k case is that the lower boundary to the $\left[{TC \atop TT}\right]$ region would be convex and not concave (as shown).

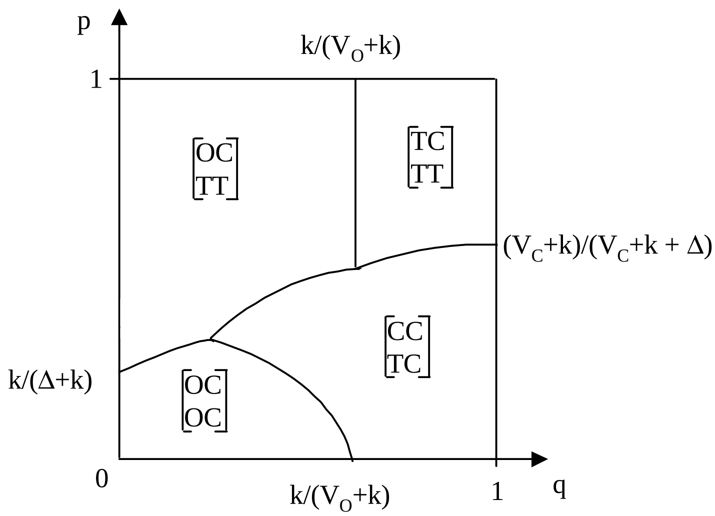

Figure 4: Regions of Equilibria Under Assumption 5a
When Court Costs are Small

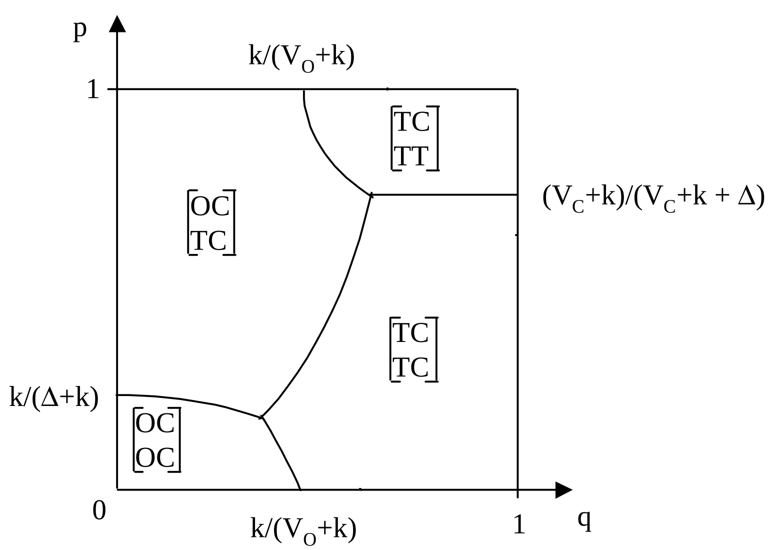

Figure 5: Regions of Equilibria Under Assumption 5b