Big Pharma's Reaction to a Generic Substitution Policy

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Introduction

- ✓ Increase in pharmaceutical drug expenditures
- ✓ Growing availability of cheaper generics
- ✓ Third party payer fostering generic drugs

  (3PP – health authorities, HMOs, insurers)
- ✓ Our focus: Generic Substitution Policies (GSP)

Introduction

- ✓ **What is a GSP**?
- ✓ If a doctor prescribes a off-patent branded drug, the pharmacist is allowed to substitute it for a cheaper generic version.
- ✓ The converse is forbidden.
- ✓ The substitution has to guarantee that the active ingredient is the same.
- ✓ Where?

  USA, Canada, Australia.

  Europe, exceptions: UK, Austria, Belgium, Greece and Ireland

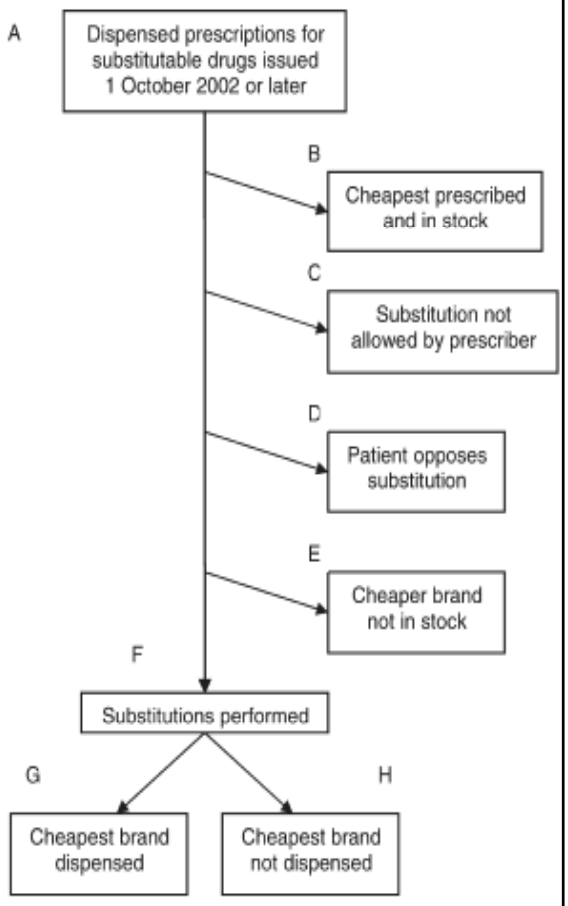
  (Tilson and Barry, 2005).

Introduction

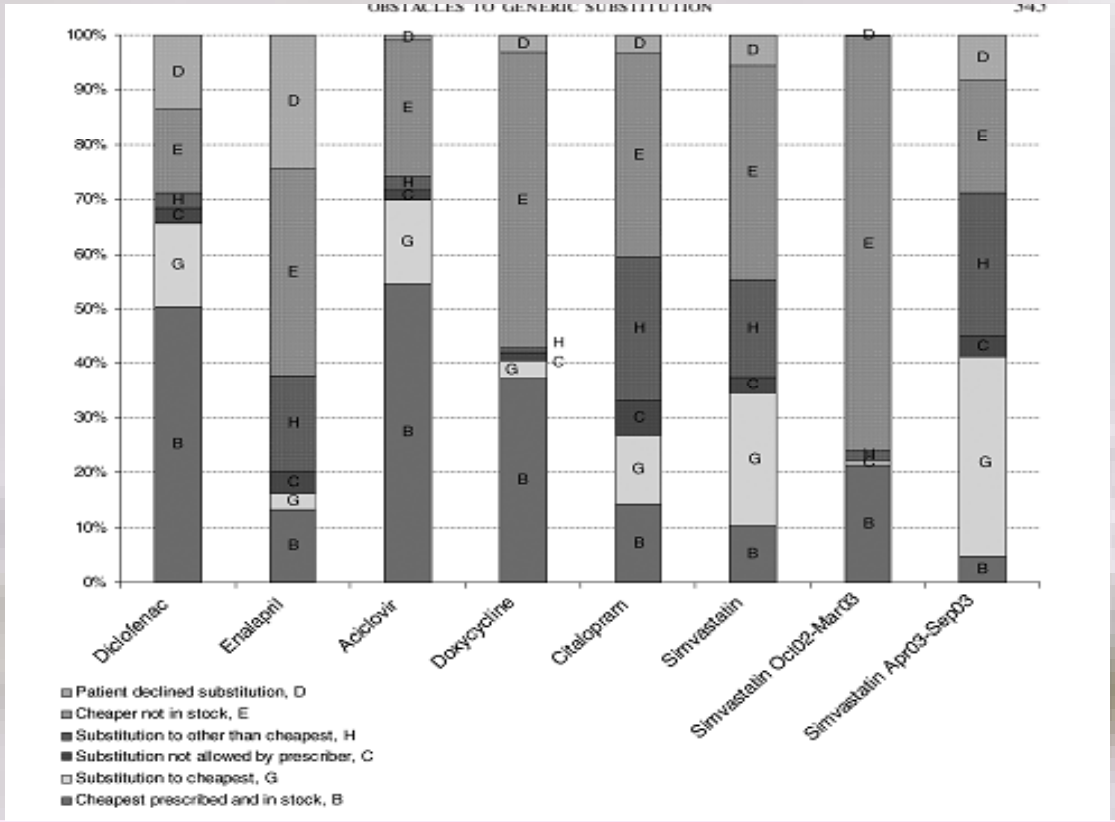
Example: **Sweden**

What are the obstacles to generic substitution, Andersson, K. et al. (2005).

Sum,
Either doctor or patient may oppose substitution;
patient pays the difference in prices;
Pharmacist must dispense generic after a brand prescription with substitution allowed.



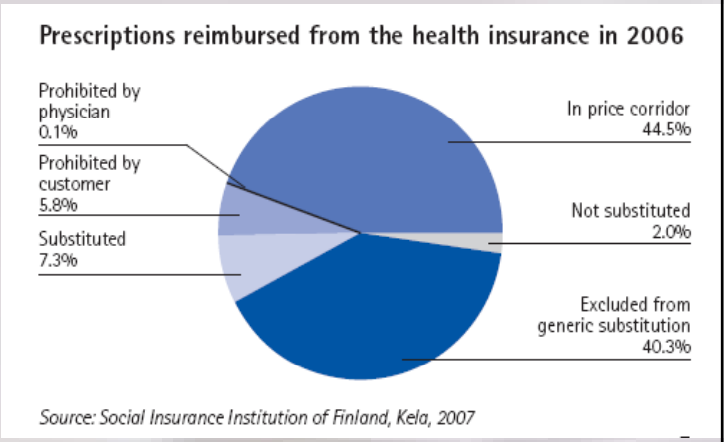
Introduction



Introduction

Example: **Finland**

Sum,
Either doctor or patient may oppose substitution;
patient doesn't pays the difference in prices;
Pharmacist must dispense generic after a brand prescription with substitution allowed.



Pharma facts Finland, 2008, www.pif.fi

Data on generic substitution:
Generic substitution generated nearly €40 million of savings in Finland in six months

http://www.kela.fi/in/internet/english.nsf/NET/220703130721MP?openDocument
Kela Finland

Introduction

Building blocks of our analysis

✓Doctors and pharmacists have a relevant inducement effect on patients' choice

Empirical: Mason and Bearden (1980)

Experimental: Merino-Castello (2003)

✓ Doctors and pharmacists are target of policies by 3PP to foster the prescription and sale of generics

✓ Doctors and pharmacists are target of policies by Big Pharma to foster the prescription and sale of branded (detailing and discounts)

Introduction

Building blocks of our analysis (cont.)

✓ Our focus – **doctor** role in the GSP

Examples of payments done by 3PP and Big Pharma

i) **from 3PP**

Wall Street Journal, Jan.2008, *Doctors Paid To Prescribe Generic Pills*

Health plans offer financial incentives to entice doctors to prescribe cheaper generic medicines, including paying doctors $100 each time they switch a patient from a brand-name drug.

ex.:

Blue Cross Blue Shield of Michigan - primary-care physicians were asked to consider switching patients from a brand-name drug and received $100 for each plan member (Zocor v simvastatin);

Excellus Blue Cross Blue Shield – if a doctor increases ratio G to B by 5 points, he gets a reimbursement increase per patient visit;

Blue Cross Blue Shield of Massachusetts: gives doctors a bonus of up to $4 per patient a month for meeting a list of goals that includes higher generic prescription rates.

Introduction

ii) **From Big Pharma** (plenty of evidence)

- Recent survey of 3167 physicians, New England Journal of Medicine (2006, Apr.26), *National Survey of physician-industry relationship*, indicates that:
Pharma $$ 94% reported some sort of relationship with the pharmaceutical industry;
Most say they received food and samples, 35% reimbursed for professional meetings or continuing medical education, 28% paid for consulting, giving lectures, or enrolling patients in trials.
-*Physicians and the pharmaceutical industry, Is gift ever just a gift*, JAMA, 2000, 283(3).
A meta-analysis of 29 studies. Concludes that the relationship doc-ind affects the prescribing behavior.

-How is detailing done? Data
When drug reps visit doctors, they often know what the doctor has prescribed;
Reps "access to individual doctors" prescription record;
- *IMS Health Inc. and Verispan, LLC v Kelly A. Ayotte et al . (2008)*
New Hampshire's Prescription Information Law "that among other things prohibited certain transfer of physicians' prescribing histories for use in detailing"

Introduction

- ✓ Patients are reluctant to accept generics (Andersson et al.,2005)

  Lower quality perception (Gaither et al., 2001)

- ✓ The role of **patients' memory**

  - the patient remembers, at the pharmacy, the convincing effort exerted by the doctor, at his office.

  - Δ doctor's effort □ Δ Pr(pharmacist successful | pharmacist effort)

  - "a theory of second changes" (?)

Introduction

Our main questions

1. When implementing a GSP, does the pharmacist effort crowd-out the doctor's?
2. GSP brings in a new signal on doctor's effort: sales are detached from prescription. → How do incentives based on this new signal affect doctor's effort?
3. The stakes of the principals may be quite complex
   - HA: equity, insurance, patient's benefit, cost containment
   - Big Pharma: revenues, detailing costs, information costs
   →Without solving the whole model, how much can we say about the optimal incentive payments? Should they be based on sales or on prescription?
4. What role does patient's memory play?
5. How does Big Pharma react to the implementation of a GSP?

The model – description and assumptions

Describe the GSP model

- ✓ Disallowing generic substitution is a particular case of this model.
- ✓ Players – risk neutral
  Doctor; Lab; Patient and Pharmacist in a reduced form
  Doctor is subject to a limited liability constraint.
- ✓ 2 drugs
  - same active ingredient
  - one branded (B)
  - one generic (G)
  - selling G yields no profit (competition or lab doesn't produce)
  - selling B yields □>0.

The model - description and assumptions

- ✓ Patients:
  - prefer branded drugs
  - can be convinced about the similar quality of generics
  - will accept a prescription of G with probability $e \in [0,1]$

- ✓ Doctors:
  - but also e denotes doctor's convincing effort
  - utility function additively separable in money and in cost of effort
    $c(e) = e^2/2$
  - if doctor fails, the pharmacist comes into play

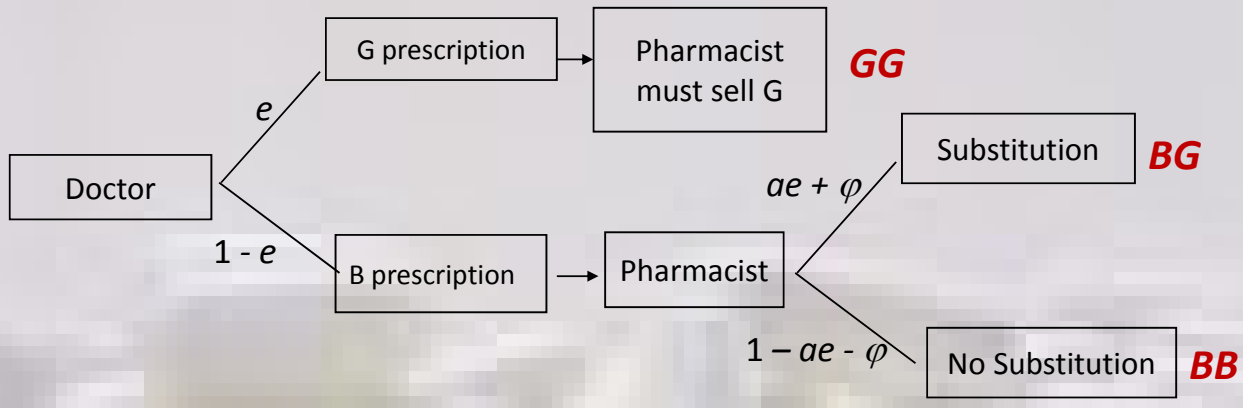
- ✓ Pharmacist convincing power (reduced form): $\beta \geq 0$,
  remark: β could also represent how tough the reference pricing policy (copayment if G is rejected)

- ✓ Patient accept generic substitution with probability $\beta + \alpha e$
  where $\alpha \geq 0$ denotes patient's memory

  Assumption $0 \leq \beta + \alpha \leq 1$

The model - description and assumptions

✓ The outcomes {GG, BG, BB}



✓ The probabilities

P(GG) = *e*
P(BG) = *(1-e)(ae+□)*
P(BB) = *(1-e)(1-ae-□)*

The model - description and assumptions

These probabilities convey information in two separate signals: prescription and sale (dispensation).

Lemma

i) Suppose that the patient has memory (*a>0*). With respect to the doctor's effort, neither the prescription outcome is a sufficient statistic for the dispensation outcome, nor the dispensation outcome is a sufficient statistic for the prescription outcome.

ii) The signal *s*□*{GG,BG,BB}* satisfies the MLRP:

$$\frac{dP(GG)/de}{P(GG)} > \frac{dP(BG)/de}{P(BG)} > \frac{dP(BB)/de}{P(BB)}, \text{for all } e \in (0,1)$$

iii) The probability P(BG) is a concave function in e and, if a>□, it has a local maximum at $e = \frac{a-\varphi}{2a} < 1$

The model - description and assumptions

✓ The Lab

- pays incentives (detailing) to the doctor so that he reduces his convincing effort

- profit maximizer

$$E\square = \square Pr(B\ sold) - detailing\ costs$$

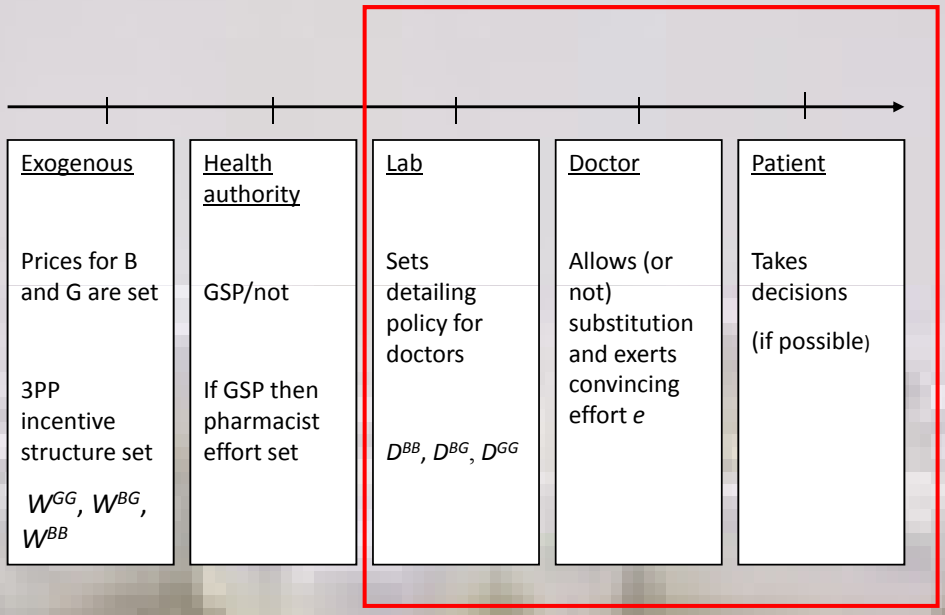
✓ □ The doctor incentive payments

$$0 = W^{BB} \square W^{BG} \square W^{GG}$$
$$D^{BB} \square D^{BG} \square D^{GG} = 0$$

0 ? D ? S ? W ? 0

The model - description and assumptions

✓ Timing



The model – results

NO GSP (which is the same as saying a=0, □=0)

The doctor maximizes $EU^N(D,e) = eW + (1-e)D - \frac{e^2}{2}$

Theorem

i) The EU function is concave in effort.

ii) The optimal level of effort is given by $e^N(D) = \begin{cases} 1 \text{ if } W - D \geq 1 \\ W - D \text{ if } 0 < W - D < 1 \\ 0 \text{ if } W - D \leq 0 \end{cases}$

The model – results

The lab maximizes $E\Gamma = \left(1 - e^{N}(D)\right)(\pi - D)$

Assumption $W - 1 < \pi < W + 1$

Theorem

i) The optimal level of detailing is given $D^{N*} = \frac{1}{2}(\pi + W - 1)$

ii) The equilibrium level of effort e, which coincides with the prevalence of generics P(GG), is given by $e^{N*} = \frac{1}{2} + \frac{1}{2}(W - \pi)$

Remark: detailing is a strategic complement of 3PP incentives but the Lab responds to a 1 u.m. increase in W by raising D by 0,5 u.m. and so 3PP is still able to raise doctor's effort.

The model – results

***Implementing a* GSP** (which is the same as saying a>0, □>0)

The doctor maximizes $EU^S(D,e) = eW + (1-e)[(ae+\varphi)S + (1-ae-\varphi)D] - \frac{e^2}{2}$

* Focus is on interior solutions

Lemma The objective function $EU^S(D,e)$ is strictly concave in e iff $D < \frac{1}{2a} + S$

* Notation

$$W_M(D,S) = 1 + D(1-a-\varphi) + (a+\varphi)S \geq 0$$
$$W_m(D,S) = D(1-a-\varphi) - (a-\varphi)S$$

Lemma If the objective function $EU^S(D,e)$ is strictly concave then $W_m(D,S) < W_M(D,S)$

Theorem If $EU^S(D,e)$ is strictly concave and W□ $[Max\{W_m(D,S),0\}, W_M(D,S)]$, then the optimal effort is interior and given by $e^S(D,S) = \frac{W - D - (a-\varphi)(D-S)}{1-2a(D-S)}$

The model – results

Pharmacist's equilibrium effort

✓ we take as exogenous, for simplicity

✓ that is, we assume that pharmacist payments only depend on outcome and his objective function is $EU^f(G_f, B_f) = (ae + \varphi)G_f + (1 - ae - \varphi)B_f - \frac{\varphi^2}{2}$

✓ since cross partial derivative is zero,
φ^* is independent of doctor's effort ($\varphi^* = G_f - B_f$).

The model – results

The relationship between pharmacist and doctor's effort

Theorem

Suppose $EU^S(D,e)$ is strictly concave and W [illegible] $[Max\{W_m(D,S),0\}, W_M(D,S)]$, then

i) If $S<D$ then e is strategic complement of [illegible] (i.e. $\frac{de^S}{d\varphi} > 0$).

ii) If $S>D$ then e is strategic substitute of [illegible] (i.e. $\frac{de^S}{d\varphi} < 0$).

Intuition

Suppose $S<D$.

If the doctor fails at the prescription stage, doctor prefers no substitution at the pharmacy.

Hence, [illegible] (substitution more likely) [illegible] pharmacist stage less attractive, so Doctor will [illegible]e to avoid pharmacist stage.

Remark: alternative interpretation on [illegible] - [illegible] copayment when patient rejects substitution.

The model – results

Doctor's response to incentives

1) Incentives *W* and *D* - straightforward

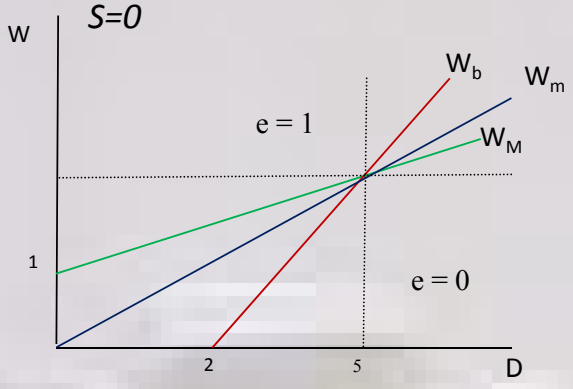
Theorem (W and D)
Suppose $EU^S(D,e)$ is strictly concave and $W \in [Max\{W_m(D,S),0\}, W_M(D,S)]$, then doctor's effort increases with prescription incentive W, and decreases with detailing incentive D.

2) Incentive *S*

Notation Let $W_b(D) = \frac{a-\varphi}{2a} + D$

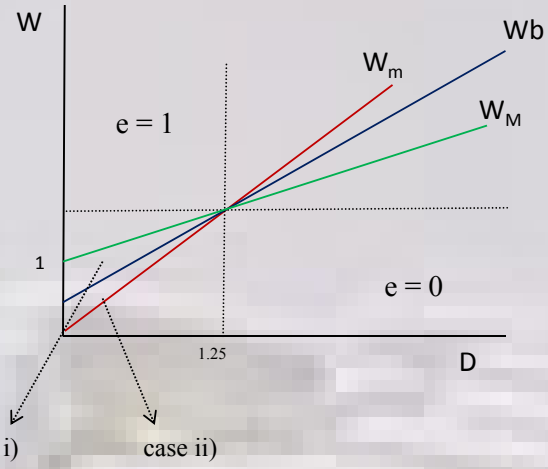
The model – results

a=0.1 < □=0.5 and S=0



Concave *EU(D,e)* *Convex EU(D,e)*

a=0.4 > φ=0.1 and S=0



case i) case ii)

Concave EU(D,e) *Convex EU(D,e)*

The model – results

Theorem (S) Suppose $EU^S(D,e)$ is strictly concave , then

a) If $a <$ □, then doctor's effort decreases with S incentive,
for all W□ $[Max\{W_m(D,S),0\}, W_M(D,S)]$,

b) If a □ □

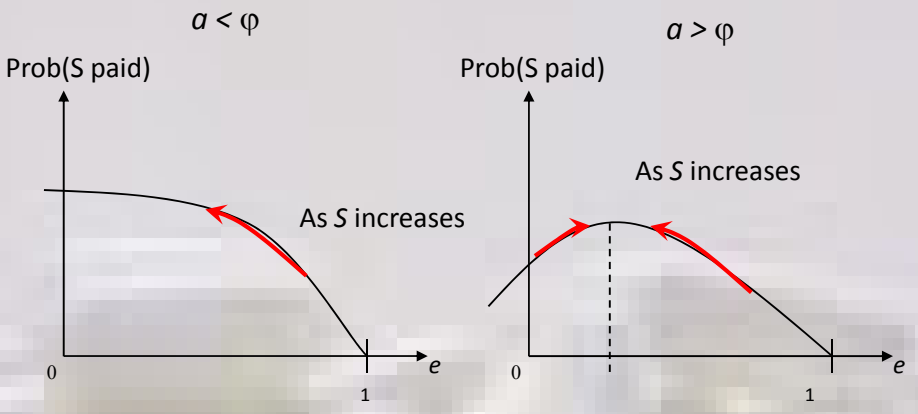
i) doctor's effort decreases with S incentive, if W□ $[Max\{0, W_b\}, W_M(D,S)]$,

ii) doctor's effort increases with S incentive,
if W□ $[Max\{0, W_m(D,S)\}, Max\{0, W_b)\}]$.

See previous pictures.

The model – results

Intuition for case i) and ii)



$When\ W = W_b\ then\ e = \frac{a - \varphi}{2a}$

The model – results

Incentives through sales or incentives through prescription?

Incentives through <u>prescription</u> (doesn't depend on sale)

$$0 = W^{BB} = W^{BG} < W^{GG}$$
$$D^{BB} = D^{BG} > D^{GG} = 0$$

Incentives through <u>sales</u> (doesn't depend on prescription)

$$0 = W^{BB} < W^{BG} < W^{GG}$$
$$D^{BB} > D^{BG} = D^{GG} = 0$$

The model – results

Corollary of Theorem (S)
Suppose $EU^S(D,e)$ is strictly concave , then

a) If $a < \square$, then $W^{BG} = 0$ and $D^{BG} > 0$ for all $W \square [Max\{W_m(D,S),0\}, W_M(D,S)]$.
So 3PP foster substitution and Lab prevents substitution through prescription incentives.

b) If $a \square \square$

i) then $W^{BG} = 0$, if $W \square [Max\{0, W_b\}, W_M(D,S)]$,

ii) then $D^{BG} = 0$, if $W \square [Max\{0, W_m(D,S)\}, Max\{0, W_b)\}]$.
So Lab prevents substitution through sales incentives while 3PP foster it.

NOT too strong.

The model – results

What if there are money transfers?

Transfering 1 u.m. i) from W^{BG} to W .
ii) from D to D^{BG} .

Theorem (i)
Suppose $EU^S(D,e)$ is strictly concave and $W \square [Max\{W_m(D,S),0\}, W_M(D,S)]$, then doctor's effort increases if transfer i) occurs.
Thus, 3PP should foster substitution through prescription incentives.

Stronger statement.

Comment: despite the sale of a generic being good news, the second chance effect makes the prescription incentive more effective.

The model – results

Theorem (ii)
Suppose $EU^S(D,e)$ is strictly concave and W□ [Max{$W_m(D,S)$,0} , $W_M(D,S)$].
Suppose also that □ >1/2, a < □-1/2, then
doctor's effort decreases if transfer ii) occurs.
Therefore, Lab should detail through prescription incentives too.

Comment :
. Because a < □-1/2< □, this result is in the same direction as corollary of theorem (S).
. if the patient memory is very weak and the pharmacist convincing power very strong, then Lab idea to prevent generic substitution is directly avoiding it by □**S** rather than avoiding in indirectly by □**D**.

From corollary theorem (S)

1) a < □, ↑S □↓e then W^{BG} =0 and D^{BG}>0

2) a > □,

i) ↑S □↓e then W^{BG} =0 and D^{BG}>0, when W is large.

ii) ↑S □↑e then W^{BG} >0 and D^{BG}=0, when W is small.

From theorem (i) and theorem (i)

i) W^{BG} → W □ ↓e then W^{BG} =0

ii) D → D^{BG} and □ >1/2, a < □-1/2 □ ↓e
then D→ min level because of MLRP D>D^{BG}

The model – results

Big Pharma's reaction to a GSP

No great deal of predictions, except for 2 cases.

1st Case: $S = W^{BG} + D^{BG} = 0$

Consider 3PP incentives are based on prescription: $0 = W^{BB} = W^{BG}$
(optimal if e decreases with S, with weak memory and/or W weak)

Consider Lab incentives are based on sales: $0 = D^{GG} = D^{BG}$
(sales can be directly observed by the Lab and prescription data is under the non-disclosure law)

The model – results

The doctor optimal effort becomes $e^S(D,0) = \frac{W - D(1+a-\varphi)}{1-2aD}$

The Lab maximizes expected profit $E\Pi^S(e, e^S(D,0)) = (1-e^S)(1-ae^S-\varphi)(\pi - D)$

After simplification… we still have a tough expression

$$E\Pi^S(e, e^S(D,0)) = \left[1-\varphi-(1+a-\varphi)\frac{W-D(1+a-\varphi)}{1-2aD} + a\left(\frac{W-D(1+a-\varphi)}{1-2aD}\right)^2\right]$$

We content ourselves in finding $Sign\left\{\left.\frac{d\Pi^S(D)}{dD}\right|_{D=D^{NA}=\frac{1}{2}+\frac{1}{2}(W-\pi)}\right\}$

Theorem
Suppose that S = W^{BG} = D^{BG} = 0 and that W is around π, which in turn is around $\frac{1}{2}+\frac{1}{4a}$. Then *Sign* is positive.

The model – results

2nd Case: D = D^{BG} > 0

Consider 3PP incentives are based on prescription: $0 = W^{BB} = W^{BG}$

Consider Lab incentives are based on prescription: $D^{BG} = D > 0$

The doctor optimal effort becomes $e^{*S} = W - D^{*S}$

The Lab maximizes expected profit $E\Pi^{S}(e, e^{*S}) = (1 - e^{*S})(\pi - D)$

$$FOC: D^{*S} = W - \frac{a-\varphi}{4a} \mp \frac{1}{4a}\sqrt{(a-\varphi)^2 + 8a}$$

$$SOC \text{ are satisfied}$$

No conclusions comparing D^{*N} and D^{*S} ☹

We content ourselves in finding $Sign\left\{\left.\frac{d\Pi^{S}(D)}{dD}\right|_{D=D^{N*}=\frac{1}{2}-\frac{1}{2}(W-\pi)}\right\}$

Theorem
Suppose that $W^{BG} = 0$ and $D=D^{BG} > 0$. Then *Sign* is positive.

Therefore, $D^{*S} > D^{*N}$.

Main lessons

✓Implementing a GSP brings the pharmacist into the game → interaction.

✓ #1: This interaction takes opposite directions depending on S

. If substitution after B-prescription is rewarded, then crowding out effect

. If Lab mainly rewards B-sales and 3PP rewards G-prescription, then crowd in effect .

✓ When patient's memory is strong, the 3PP might be tempted to reward doctor for substitution ate the pharmacy.

✓ #2: Even with strong memory, such rewards have a perverse effect on doctor (in general is not such a good idea to give incentives based on sales to improve substitution, even if sales are informative)

✓#3: When patient memory is weak and pharmacist convincing power is strong, detailing seems to reward G-substitution, but in fact is making doctor free-riding more attractive.

✓ #4: There are sufficient conditions that ensure that GSP increases detailing.

Pharmaceutical industry spending* (IN BILLIONS)

	1997	2000	2003
Direct-to-consumer advertising	$1.1	$2.5	$3.2
Detailing aimed at physicians	$3.4	$4.8	$5.3
Drug samples (market value)	$6.0	$8.0	$16.4

*Source: IMS Health