

On the interaction between state and  
voluntary health care insurance:  
a preliminary economic analysis

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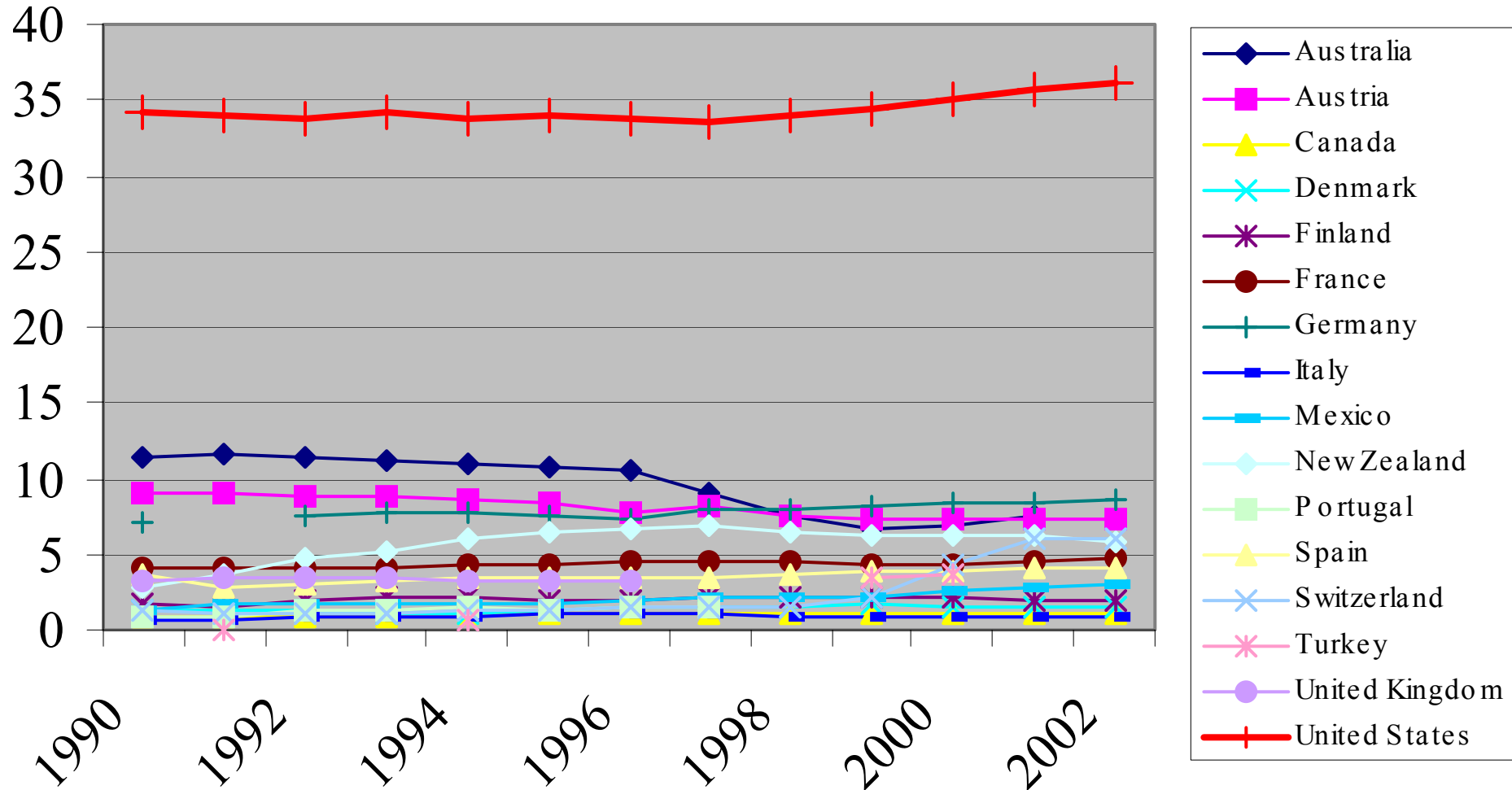
# Government policy choices

- Nature of statutory package
  - Size
  - Composition
- Distribution of tax burden
- Quality of public sector (by intervention)
- Subsidies to private sector (‘vouchers’, by intervention)

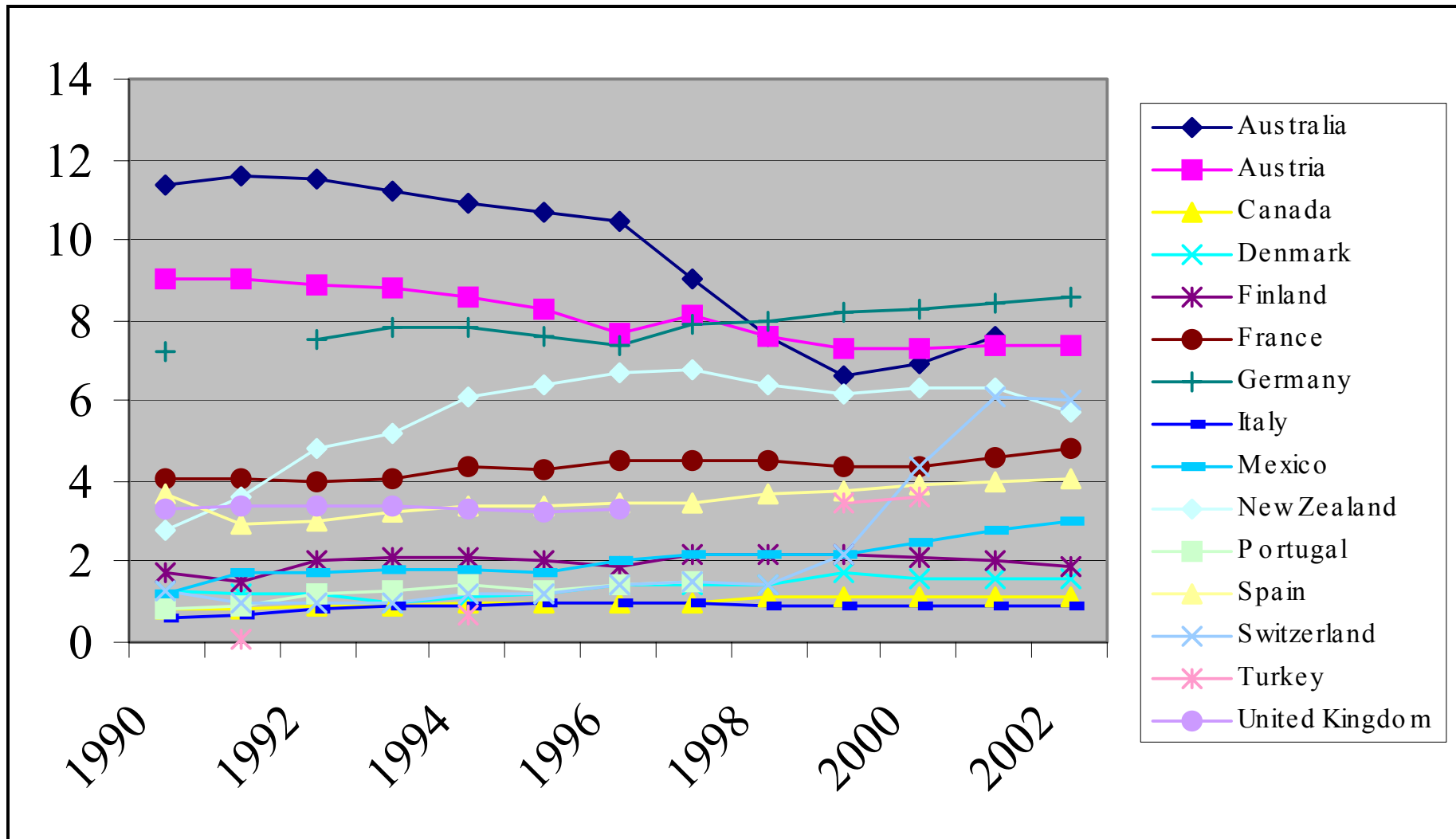
# Background

- Increased interest in the role of voluntary health insurance in supplementing a statutory package of health care
- Numerous concerns: moral hazard, adverse selection, equity, long term trust in insurers
- World Bank seeking to develop a policy in low income countries.

# Trends in VHI as % total health expenditure



# Trends in VHI as % total health expenditure (excluding USA)



# Voluntary health insurance: previous papers

- Besley (1989)
  - Can the publicly funded statutory package abate the moral hazard problem associated with competitive insurance markets?
- Petretto (1999)
  - What is the optimal size of the statutory package, given a complete market in private insurance?

# This paper

- Given the existence of a market in voluntary insurance, *what interventions* should be included in statutory health coverage?
- Focuses mainly on complementary VHI
- Very preliminary analysis:
  - Competitive & complete VHI market
  - No copayments
  - No moral hazard
  - No externalities
  - No quality difference between public and private sector
  - Market prices not affected by insurance arrangements

# Model set-up

- $n$  health care problems
- Each problem  $i$  has a technology with cost  $x_i$ , health benefit  $b_i$
- Statutory package is financed by general taxation and offers a subset of technologies at zero price to patients (i.e. *community rated*)
- Citizens may voluntarily insure against costs of interventions outside the statutory package, at actuarially fair premiums (i.e. *risk rated*)
- Citizens differ in wealth and health

# The individual

- Utility  $U(h,y)$  depends on health  $h$  and wealth  $y$
- Health with no health care is  $h_o(y)$
- Wealth with no health care is  $y_o(y)$
- Incidence of health problem  $i$  is distributed as  $\pi_i(y)$
- In the first instance, assume just two wealth types: rich R and poor P
- Later assume continuum of wealth

# Benchmark case: no statutory insurance

Let  $\theta_i = 1$  if and only if intervention  $i$  is insured against.

Then problem for citizen type  $z$  is :

$$\text{Maximize } U(h_0^z + \sum_i \pi_i^z \theta_i b_i, y_0^z - \sum_i \pi_i^z \theta_i x_i)$$

subject to  $\theta_i \in \{0,1\}$

Yields result that intervention  $i$  is covered iff

$$\frac{b_i}{x_i} \geq \frac{\partial U^z}{\partial y} / \frac{\partial U^z}{\partial h}$$

# With statutory package

$\lambda_i = 1$  if and only if intervention  $i$  is in the statutory package.

Then problem becomes

$$\text{Maximize } U(h_0^z + \sum_i (\theta_i + \lambda_i)b_i\pi_i^z, y_0^z - t^z - \sum_i \theta_i x_i \pi_i^z)$$

$$\text{subject to } \theta_i + \lambda_i \leq 1 \quad \forall i$$

intervention  $i$  is covered iff

$$\frac{b_i}{x_i} \geq \frac{\partial U^z}{\partial y} \bigg/ \frac{\partial U^z}{\partial h}$$

but note now that income may have been reduced

(because of tax to pay for statutory package),

so hurdle for VHI is tougher

# Government

- Must fund the package from statutory general taxation
- Has a social welfare function
$$W(\rho U^R, (1-\rho) U^P)$$
- Must choose the optimal statutory package  $\{\lambda_i\}$  and taxes  $t^R$  and  $t^P$  for the rich and poor

# Case (a) – no voluntary insurance

$$\text{Maximize } W \left( \rho U(h_0^R + \sum_i \lambda_i \pi_i^R b_i, y_0^R - t^R), (1-\rho)U(h_0^P + \sum_i \lambda_i \pi_i^P b_i, y_0^P - t^P) \right)$$

$$\text{Subject to } \sum_i \lambda_i \{ \rho \pi_i^R + (1-\rho) \pi_i^P \} x_i = \rho t^R + (1-\rho) t^P$$

$$\lambda_i \in \{0,1\}$$

So interventions in statutory package satisfy

$$\frac{b_i}{x_i} \geq \frac{\mu [\rho \pi_i^R + (1-\rho) \pi_i^P]}{\left[ \rho \pi_i^R \frac{\partial W}{\partial U^R} \frac{\partial U^R}{\partial h} + (1-\rho) \pi_i^P \frac{\partial W}{\partial U^P} \frac{\partial U^P}{\partial h} \right]} = \frac{\mu \Pi_i}{\left[ \rho \beta_R \pi_i^R + (1-\rho) \beta_P \pi_i^P \right]}$$

where

$$\beta_Z = \frac{\partial W}{\partial U^Z} \frac{\partial U^Z}{\partial h} \text{ and } \Pi_i = \rho \pi_i^R + (1-\rho) \pi_i^P$$

# Marginal tax conditions

$$\frac{\partial W}{\partial U^R} \frac{\partial U^R}{\partial y} = \frac{\partial W}{\partial U^P} \frac{\partial U^P}{\partial y} = \mu$$

In the special case of a linear income tax

$$\mu = \left( \rho \frac{\partial W}{\partial U^R} \frac{\partial U^R}{\partial y} y_0^R + (1 - \rho) \frac{\partial W}{\partial U^P} \frac{\partial U^P}{\partial y} y_0^P \right) / \left( \rho y_0^R + (1 - \rho) y_0^P \right)$$

# With no voluntary insurance

- Tax rates (and size of statutory package) chosen so as to equalize:
  - Marginal utility of wealth for each group
  - Benefit/cost ratio of marginal intervention
- Hurdle rate is adjusted for relative ‘importance’ of the population groups
- If there is a pro-poor preference, favours interventions with high incidence in the low wealth group

## Case (b) – voluntary insurance available

$$\text{Maximize } W \left( \begin{array}{l} \rho U(h_0^R + \sum_i (\theta_i + \lambda_i) \pi_i^R b_i, y_0^R - t^R - \sum_i \theta_i \pi_i^R x_i), \\ (1 - \rho) U(h_0^P + \sum_i \lambda_i \pi_i^P b_i, y_0^P - t^P) \end{array} \right)$$

$$\text{Subject to } \sum_i \lambda_i \{ \rho \pi_i^R + (1 - \rho) \pi_i^P \} x_i = \rho t^R + (1 - \rho) t^P$$

$$\lambda_i \in \{0, 1\}$$

So interventions in statutory package satisfy

$$\frac{b_i}{x_i} \geq \frac{\mu(\Pi_i - \rho \pi_i^R)}{\left[ (1 - \rho) \pi_i^P \frac{\partial W}{\partial U^P} \frac{\partial U^P}{\partial h} \right]} = \frac{\mu}{\left[ \frac{\partial W}{\partial U^P} \frac{\partial U^P}{\partial h} \right]} = \frac{\partial U^P}{\partial y} \Big/ \frac{\partial U^P}{\partial h}$$

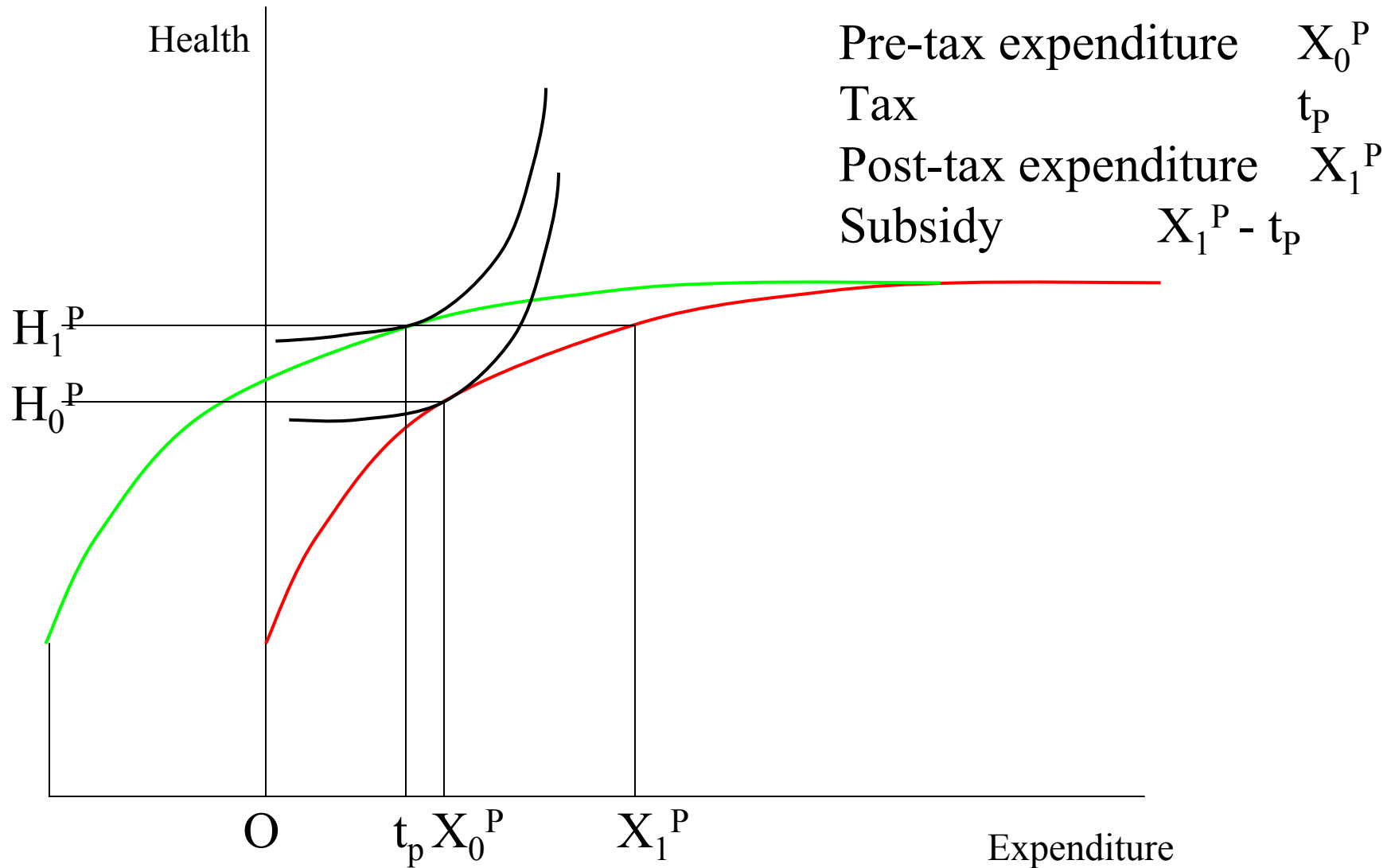
# Interventions in the complementary package purchased by the rich

$$\frac{\partial U^P}{\partial y} \bigg/ \frac{\partial U^P}{\partial h} \geq \frac{b_i}{x_i} \geq \frac{\partial U^R}{\partial y} \bigg/ \frac{\partial U^R}{\partial h}$$

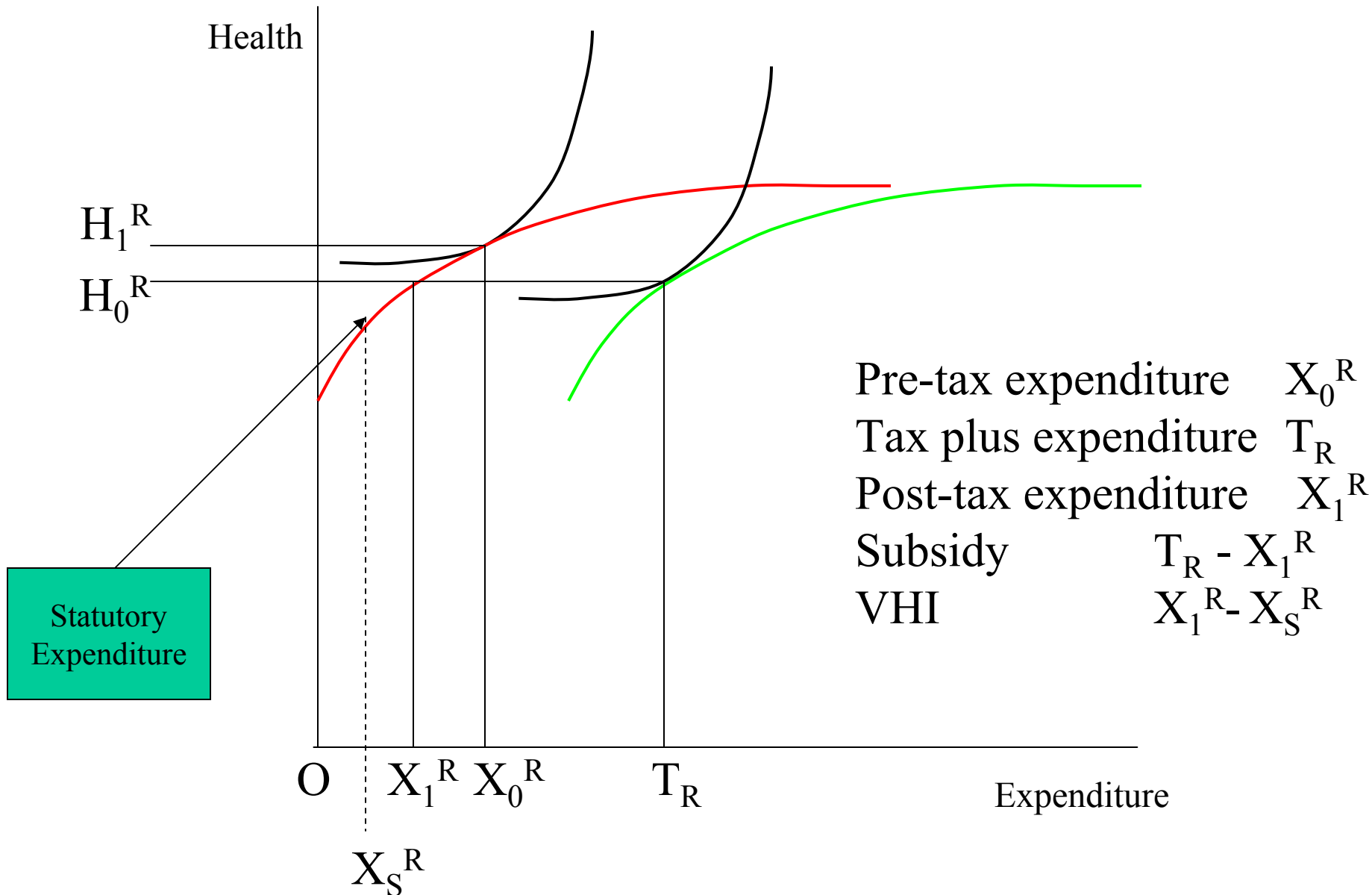
# In presence of complementary voluntary insurance

- The statutory package is chosen according to cost-effectiveness, *solely* on the basis of the marginal conditions for the poor
- But, compared with the pure competitive insurance benchmark, the poor have effectively received a financial transfer from the rich, so poor's package is *broader* than w/o statutory package
- The rich may purchase additional complementary insurance in line with usual marginal conditions (but note transfer of wealth to the poor, so *narrower* coverage than w/o statutory package)

# The poor: health expenditure with a statutory package



# The rich: health expenditure with a statutory package



# Continuous wealth distribution

- Assume a distribution  $\gamma(y)$  of wealth
- Assume a linear rate of wealth tax  $t$
- Additive social welfare function weighted by function  $w(y)$

# New model set-up

Total costs of statutory package

$$SC(\lambda) = \sum_i \lambda_i x_i \int_0^{\infty} \pi_i(y) \gamma(y) dy$$

financed by tax revenue

$$B(t) = \int_0^{\infty} ty \gamma(y) dy = tT$$

SWF to be maximized:

$$SWF = \int_0^{\infty} w(y) \gamma(y) U(h(y), y) dy$$

# Solutions

Without VHI:

$$\frac{b_i}{x_i} \geq \frac{\mu \int_0^{\infty} \gamma(y) \pi_i(y) dy}{\int_0^{\infty} \gamma(y) \beta(y) \pi_i(y) dy}; \quad \mu = \frac{\int_0^{\infty} \alpha(y) \gamma(y) y dy}{\int_0^{\infty} \gamma(y) y dy}$$

where  $\alpha(y)$  is the marginal social value placed on income.

With VHI:

$$\frac{b_i}{x_i} \geq \frac{\mu \int_S \gamma(y) \pi_i(y) dy}{\int_S \gamma(y) \beta(y) \pi_i(y) dy}$$

Where S is the subset of wealth values at which VHI is declined.

# Some preliminary conclusions

- Introduction of complementary VHI likely to be welfare increasing
- Main role of statutory package is to effect a financial transfer from rich to poor, which must be spent on health care insurance
- Statutory package determined by cost-effectiveness ratios only (no equity concerns)
- The poor use only the statutory package
- The rich (might) purchase voluntary complementary insurance.

# A public choice perspective

- Tax base may ‘flee’ (or collection costs increase) if statutory package is not seen as useful by the rich
- So may to some extent need to skew chosen procedures in line with interests of the rich
- With simple tax instrument (e.g. linear income tax) may encounter mix of electoral preferences:
  - The rich do not want a statutory package
  - The poor can afford only a small statutory package
  - Middle income earners prefer a larger statutory package
- So electoral outcome depends on whether a coalition of rich and poor people outvotes middle earners (Epple and Romano, 1996)

# Future work

- Role of duplicate insurance depends on preferences for qualitative differences between statutory and private health care – is quality in public sector a legitimate policy instrument?
- Introduce substitutive insurance not interesting – just another financial transfer between rich and poor
- Vouchers could be used as an incentive for rich to purchase voluntary insurance (can set variable percentage of costs, depending on policy preferences)