Strategic Behaviour and the Cost-Effectiveness Threshold

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1

Supply-side threshold (k)

Determined by the **opportunity cost** of **new interventions**

PharmacoEconomics
https://doi.org/10.1007/s40273-017-0585-2

ORIGINAL RESEARCH ARTICLE

Estimating the Reference Incremental Cost-Effectiveness Ratio for the Australian Health System

Laura Catherine Edney · Hossein Haji Ali Afzali · Terence Chai Cheng · Jonathan Karnon

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Abstract

Background Spending on new healthcare technologies increases net population health when the benefits of a new technology are greater than their opportunity costs—the benefits of the best alternative use of the additional resources required to fund a new technology.

Objective The objective of this study was to estimate the expected incremental cost per quality-adjusted life-year (QALY) gained of increased government health expenditure as an empirical estimate of the average opportunity costs of decisions to fund new health technologies. The estimated incremental cost-effectiveness ratio (ICER) is proposed as a reference ICER to inform value-based decision making in Australia.

Methods Empirical top-down approaches were used to estimate the QALY effects of government health expenditure with respect to reduced mortality and morbidity. Instrumental variable two-stage least-squares regression was used to estimate the elasticity of mortality-related QALY losses to a marginal change in government health expenditure. Regression analysis of longitudinal survey data representative of the general population was used to isolate the effects of increased government health expenditure on morbidity-related, QALY gains. Clinical judgement informed the duration of health-related quality-of-life improvement from the annual increase in government health expenditure.

Results The base-case reference ICER was estimated at AUD26,033 per QALY gained. Parametric uncertainty associated with the estimation of mortality- and morbidity-related QALYs generated a 95% confidence interval AUD20,758–37,667.

Conclusion Recent public summary documents suggest new technologies with ICERs above AUD40,000 per QALY gained are recommended for public funding. The empirical reference ICER reported in this article suggests more QALYs could be gained if resources were allocated to other forms of health spending.

Electronic supplementary material The online version of this article (doi:10.1007/s40273-017-0585-2) contains supplementary material, which is available to authorised users.

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Published online: 22 December 2017

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2

Demand-side threshold (v)

Determined by society's **willingness-to-pay** for **improved health 'benefit'**

Journal of Health Economics

Trying to estimate a monetary value for the QALY

Jose Luis Pinto-Prades, Graham Loomes, Raul Brey

3

Additional considerations

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- In practice, funding decisions involve a number of **complex considerations** which are *not* reflected by **conventional demand/supply-side thresholds**
- Funding might **displace health care services** that provide 'benefit' to other patients - *not accounted for in a demand-side approach*
- Specifying **λ** might result in **strategic pricing behaviour** from manufacturers
- Manufacturers may be **unwilling to supply new technologies** if λ is **low**, but may make **large profits** at the expense of **population health** if λ is **high**
- A decision maker interested in both **consumer** and **producer** interests may wish to understand the **trade-offs** associated with **different values of λ**

4

A new conceptual model

5

Overview

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- This paper proposes a **new conceptual model of the cost-effectiveness threshold** that incorporates these **additional considerations**
- Considers both **opportunity cost** and society's **willingness-to-pay** for health 'benefit' from conventional **supply-side** and **demand-side** approaches
- Considers **costs incurred by manufacturers** in developing technologies and the **incentive for manufacturers to strategically price up to λ**
- Allows for considerations of **'consumer surplus'** and **'producer surplus'**, so decision makers may consider **how λ impacts upon the distribution of surplus between consumers (patients) and producers (manufacturers)**

6

Assumptions

1. There is an accepted measure of **'benefit'** that patients derive from health care
2. **Funding new technologies** has an **opportunity cost** in terms of **foregone 'benefit'**
3. New technologies are **costly** to produce, and manufacturers will **not supply at a loss**
4. A **single threshold**, λ, is **publicly specified** by a health care system decision maker, with **new technologies adopted only if the ICER is less than λ**
5. Manufacturers of new technologies are **protected from price competition** (e.g. through the **patent system**), allowing for **super-normal profits**
6. Each adopted new technology is **strategically priced** such that the **ICER is equal to λ**
7. **Distributions** of **'reserve prices'** and **'reserve ICERs'** are **broad and continuous**
8. All 'reserve ICERs' are **non-negative** (technologies do not 'dominate' at 'reserve price')
9. Each new technology is **independent** and **developed by a different manufacturer**

7

Consumer perspective

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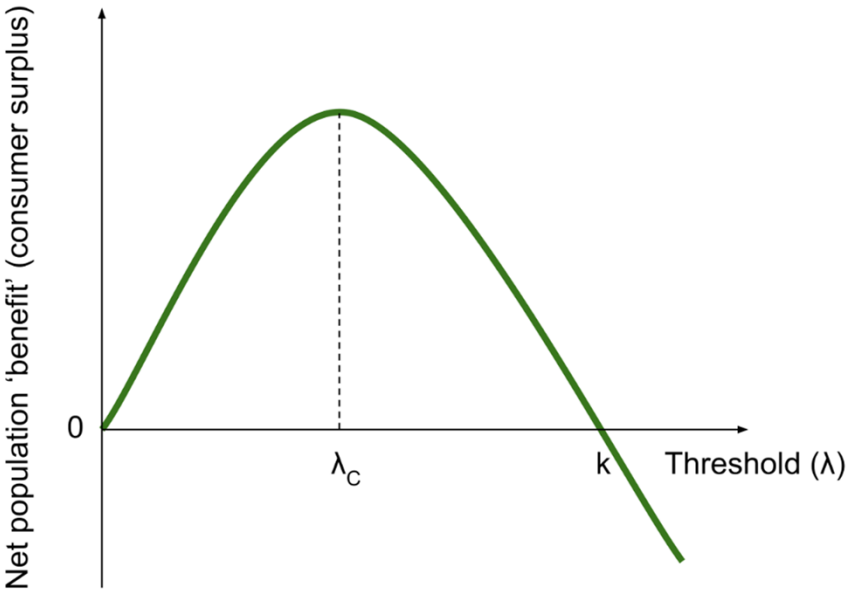

9

Producer perspective

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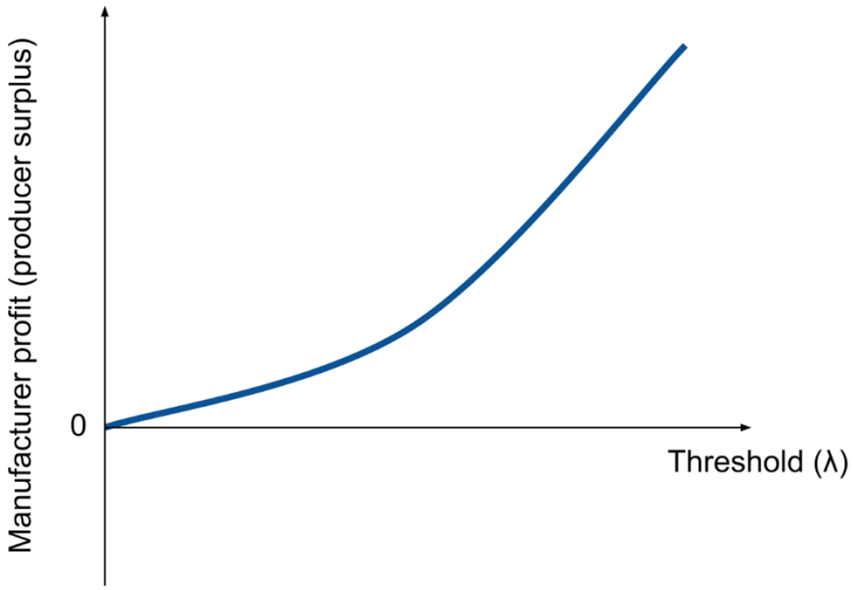


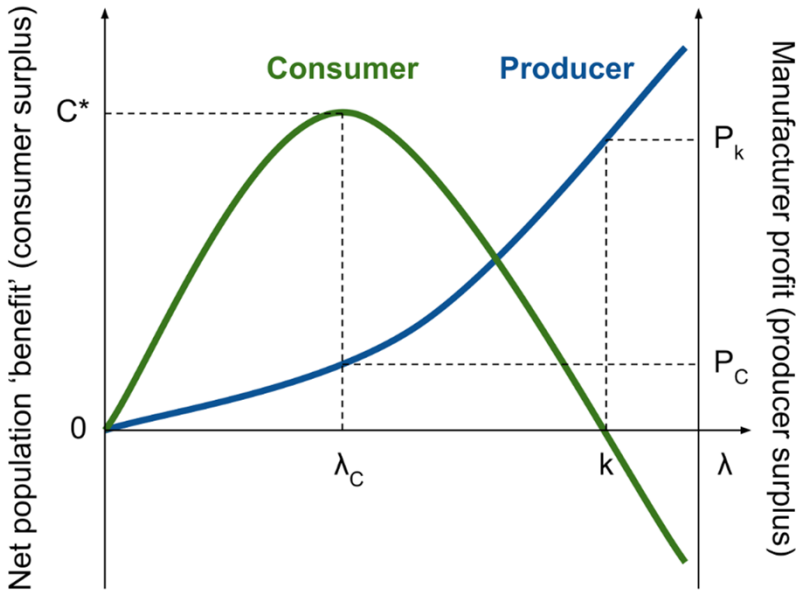
11

Combining the perspectives

12

Converting into a common metric

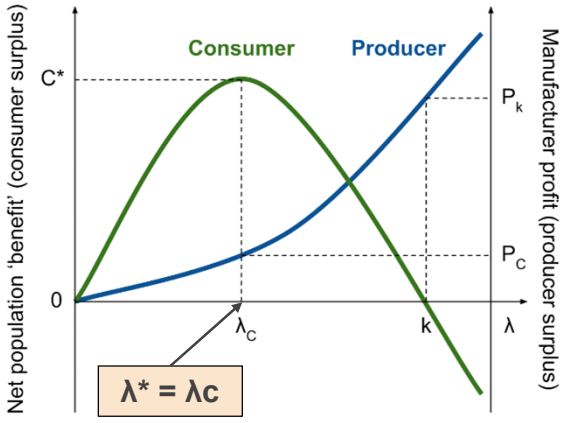
- Unless the measure of 'benefit' considered under the consumer perspective is already specified in **monetary terms**, combining consumer and producer surplus requires that each be considered using a **common metric**
- Whether this is done by converting consumer surplus into monetary terms or by converting producer surplus into units of 'benefit' is immaterial; the challenge is **identifying an appropriate conversion rate**
- A conventional **demand-side threshold** provides a natural source for such a conversion rate, since it provides an estimate of the **monetary value of a unit of 'benefit'** that **reflects society's preferences** (denoted as **v**)



Policy objectives

15

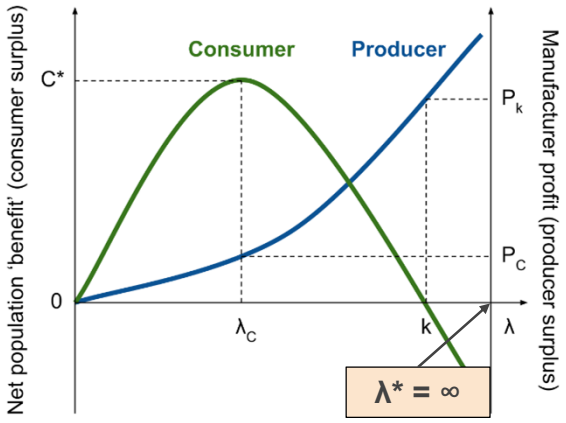
‘Maximize consumer surplus’



Consumer surplus is maximized by **specifying a threshold of λc**.

16

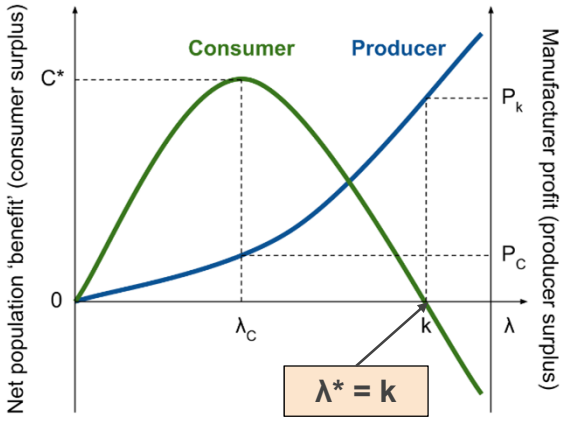
‘Maximize producer surplus’



Producer surplus is maximized with an **infinitely high threshold**.

17

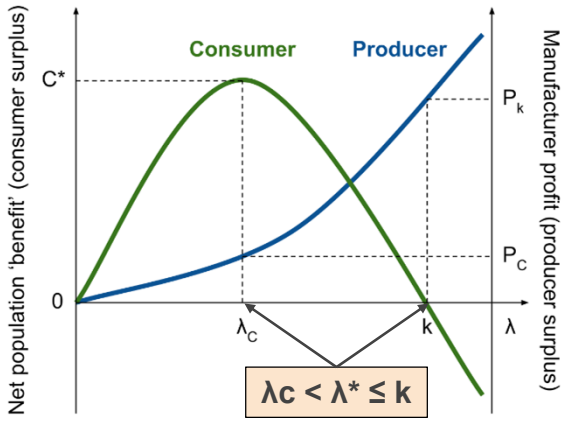
‘Max producer surplus, subject to consumer and producer surplus each being non-negative’



Since producer surplus increases with the threshold, and consumer surplus is negative at any threshold above **k**, this objective is satisfied by specifying a threshold of **k**.

18

‘Maximize the combined surplus, subject to each being non-negative’



Since consumer and producer surplus both increase with the threshold up to **λc**, but consumer surplus is negative above **k**, the optimal threshold must lie between **λc** and **k**.

19

Conclusions

20

Implications for policy, theory, and empirical research

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- The **optimal threshold** depends critically upon the **policy objective**
- Depending on the objective, the optimal threshold may be **lower** or **higher** than **either conventional approach** (supply-side or demand-side)
- A **supply-side** estimate of the threshold (k) is necessary to understand the shape of the **consumer threshold curve** and the **optimal threshold 'range'**
- A **demand-side** estimate of the threshold (v) is necessary to **convert consumer and producer surplus into a common metric**
- Future **empirical research** must estimate **not only k and v,** but also the **shapes of the consumer and producer threshold curves**

21

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Any questions?

22