COURS D'EVALUATION DES POLITIQUES PUBLIQUES

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This textbook has been written by my former students. It is mostly based ont the book by Boardman and Winning, 2007 "Cost Benefit Analisis". The best reference on the topic.

INTRODUCTION GENERALE

Il faut distinguer **l'évaluation des projets** et **l'évaluation des politiques publiques**

Un projet, est plus simple à évaluer car plus facile à cerner et à définir

Une politique publique est composée de plusieurs actions publiques dont on peut penser qu'elles sont coordonnées
En fait, on désigne souvent sous le terme **« politiques publiques » un ensemble faiblement coordonnée d'actions**
Par exemple, c'est le cas de la « politique des drogues » en France, où les actions répressives et les actions de soins sont menées de manière parfaitement autonomes Il existe certes un plan d'action de la MILDT qui est censé coordonner l'action gouvernementale mais qui se contente de donner une apparence de cohérence

La **première partie de ce cours** est consacrée à **l'évaluation de projets** dont la méthode est l'analyse coût-bénéfice et la **seconde partie** est dédiée à **l'analyse des politiques publiques** où plusieurs méthodes sont en concurrence

PREMIERE PARTIE – L'EVALUATION DES PROJETS PUBLICS

Introduction

L'évaluation économique de l'intérêt des investissements et, plus généralement, des grandes décisions publiques, est une préoccupation permanente des pouvoirs publics En ces temps où les ressources financières sont réduites et où l'efficacité et la compétitivité économique constituent des impératifs majeurs, elle doit l'être encore plus

Dans le domaine de l'évaluation, la France possède une longue tradition À plusieurs reprises, sous l'égide du Commissariat général du Plan puis du CAS, des commissions se sont réunies, dont les travaux ont contribué à définir, améliorer, enrichir les procédures d'évaluation et assurer leur comparabilité, condition nécessaire pour une hiérarchisation des choix Ces publications régulières sont alors l'occasion d'adapter les procédures d'évaluation aux conditions changeantes de l'économie

Pour ne prendre que la vingtaine d'années qui nous précède, on a d'abord vu, en 1994, une commission présidée par Marcel Boiteux fixer la doctrine qui ancre l'évaluation des projets dans le corps de doctrine du calcul économique Les principes correspondants ont été successivement appliqués à l'évaluation des effets sur l'environnement[1], à la fixation du taux d'actualisation[2], à la biodiversité[3], à la prise en compte du risque[4] et à la valeur collective du carbone[5]

Le présent cours bénéficie de cette longue lignée de réflexions qui, fondées sur l'usage du calcul économique, l'ont progressivement adapté et enrichi Les nouveautés récentes en matière de calcul économique portent sur l'analyse spatiale, les problèmes de gouvernance de l'évaluation et sur l'extension du calcul économique au-delà de ses champs d'application traditionnels que sont les transports et l'énergie

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(1) Rapport Boiteux 1 (1994), Transports : pour un meilleur choix des investissements ; Rapport Boiteux 2 (2001), Transports : choix des investissements et coûts des nuisances
(2) Rapport Lebègue (2005), Le prix du temps et la décision publique
(3) Rapport Chevassusau-Louis (2009), L'approche économique de la biodiversité et des services liés aux écosystèmes
(4) Rapport Gollier (2011), Calcul du risque dans les investissements publics
(5) Rapport Quinet (2008), La valeur tutélaire du carbone

Deux tendances sont particulièrement marquantes **La première** est la **contrainte pesant sur les budgets publics** Les nombreux projets candidats à la réalisation dépassent et de beaucoup les disponibilités financières, invitant à davantage scruter leur évaluation économique Les erreurs sont moins facilement rattrapables, leurs conséquences plus graves Il est impératif de pouvoir justifier les gains attendus de l'usage des ressources publiques et les pertes supportées dont le bilan justifie l'intervention publique, tous facteurs que le calcul économique est particulièrement apte à évaluer

La seconde est la baisse de compétitivité de notre appareil productif De ce point de vue, le calcul économique est un outil irremplaçable dans la mesure où, par essence, il évalue, pour les activités de production, les gains de productivité permis par le projet : dans le secteur de l'énergie, les économies de coûts procurées aux entreprises, dans les transports, les réductions de coût généralisées pour les déplacements professionnels et pour le transport de marchandises

Et pourtant, malgré ces raisons qui plaident pour un recours accru au calcul économique, on constate que son usage est limité Les retours d'expérience en France montrent **qu'il n'est systématique que dans le secteur des transports** ; il est présent aussi, mais à un moindre degré, dans le secteur de l'énergie Là où il est utilisé, on constate de **grandes hétérogénéités** dans la mise en œuvre, rendant les comparaisons entre projets difficiles ; on constate aussi un manque de transparence et de lisibilité des résultats, les rendant peu propres à bien éclairer les décideurs Du coup, **les processus de décision l'utilisent peu**, comme le fait apparaître de façon frappante et parfois cruelle l'expérience des débats publics

Ces caractéristiques se retrouvent peu ou prou dans les pays et organismes étrangers: l'Allemagne, le Royaume-Uni, les Pays-Bas, la Suède et la Norvège, la Banque européenne d'investissements (BEI) Partout, à l'exception peut-être de la BEI, **le calcul économique ne connaît de véritable extension que dans les transports** et les problèmes de transparence, de lisibilité, se rencontrent aussi dans des proportions similaires, de même que le poids réduit dans les décisions Mais on constate aussi que dans ces pays, ces défauts constituent des incitations à améliorer l'outil à la fois sur le plan technique – obtenir des évaluations plus complètes et plus fiables – et sur le plan de son insertion dans le processus de décision – le rendre plus convainquant et plus utilisable –

Le cours d'Economie politique donné par Bruno Amable vient questionner de manière critique la perspective normative adoptée par ce cours Pour ce

dernier, les objectifs dits normatifs des réformes économiques ne répondent pas à un principe d'intérêt collectif mais illustrent les conditions dans lesquelles se sont figées les rapports de force entre les acteurs concernés

INTRODUCTION TO COST-BENEFIT ANALYSIS

Purpose: to provide a non-technical overview of CBA
A CBA calculates net social benefits (NSB) for each policy alternative: net social benefits equal social benefits (B) minus social costs (C):

Introduction

Definitions

Cost-Benefit Analysis (CBA) is a policy assessment method that quantifies the value of policy consequences (usually called impacts) in monetary terms to all members of society
A CBA calculates net social benefits (NSB) for each policy alternative: net social benefits equal social benefits (B) minus social costs (C):

NSB = B – C

Arguments Against the Use of CBA:
Some dispute the fundamental assumptions of CBA (ie that the sum of individual utility **should be maximized and that one can trade off utility gains and losses among people**) They argue that there is no theoretical basis for making trade-offs between one person's benefits and another person's costs
Public policy participants disagree about specific issues in CBA, such as **how to monetize costs and benefits**, what impacts are (especially over time), whether an impact is a cost or a benefit, and how to make trade-offs between the present and the future
Assuming that self-interest leads to an efficient allocation of resources then **government annalists bear the burden of providing a rationale for any governmental interference with private choice Often, economists lumps this rationale under the assumption of market failures** When market fails there is a *prima facie* rationale for government intervention However, it is important to emphasize that it is not more than that **One must be able to demonstrate the superior efficiency of particular intervention** To help effective social decision making through efficient allocation of society's resources when markets fail When markets fail and resources are used inefficiently, CBA can be used to clarify which of the potential alternative programs, policies or projects (including the status quo) is the most efficient

Types of CBA:
Ex ante CBA – conducted prior to the intervention Useful to show **whether resources should be used on a program or project**
Ex post CBA – conducted at the end of the intervention **Provides information about the particular class of intervention**
In medias res CBA- **conducted during the intervention**
Comparative CBA – compares the e*x ante* predictions to e*x post* results for the same project (very few of these comparisons have been conducted because the clients of e*x post* analyses are different from the clients of e*x ante* analyses)
Ex ante analysis is most useful for making resource allocation decisions In medias res CBA analysis can also be used for this purpose, but ex post analysis is too late to divert resources to alternative uses
Ex post analysis is the most useful for looking at the efficiency of a particular project, then in medias res, then ex ante The reason is that more is learned about the actual impacts of the project as time goes by
Ex post analysis also provides information about the probable costs and benefits of similar future interventions The amount of learning depends on the representativeness of the particular project, ie, how generalizable the project is to other projects or large-scale projects?

Learning about **the efficacy of CBA** occurs **by comparing ex ante analyses to either in medias res or ex post analyses** These comparisons provide information about the accuracy of ex ante CBAs These comparisons also help our understanding of prediction error

The demand for CBA

Many countries now mandate CBAs (or related techniques) prior to the enactment of various programs or regulations

In the US, for example, various executive orders and acts require a CBA to be conducted prior to new regulations The UK requires project appraisal CBAs are also in demand because of citizen resistance to new taxes (forcing government to at least consider more efficient policies) and increased concern for the environment (to ensure that the valuation of environmental impacts are included in the debates and decisions)

The process of cost-benefit analysis **takes many resources**: analytic time (opportunity cost), skilled human capital (opportunity cost), and money (which represents the opportunity cost of other scarce inputs to the analytic process)

Government employees have a tendency **to see "costs" and "benefits" from an individual self- interested perspective or from a variety of agency-interested perspectives** The **agency perspectives** are based on the specific organizational role of the government employee

The **three archetypal perspectives are those of guardian, spender and analyst**

Because the analyst perspective basically corresponds to CBA as described in this course, it is not discussed further here

Guardians view projects from **a revenue-expenditure perspective** (ie revenue inflows = "benefits"; expenditure outflows = "costs") They have a tendency to regard CBA as naïve and impractical and as a tool of spenders

Personnel in line agencies may vacillate between a spender and guardian perspective depending on the political and budgetary climate Financial control personnel in line agencies tend to have a guardian perspective

Some consequences **of the guardian perspective**:
It downplays **or ignores non-financial** social benefits (time saved, lives, etc) and costs (time spent, pollution)
It interprets the meaning **of "costs" idiosyncratically** (and incorrectly!); eg, regarding the cost of labor – guardians focus on actual wage remuneration, while CBA focuses on the opportunity cost of the labor)
Resources owned by government **tend to be viewed as free goods** (rather than having an opportunity cost)
It ignores those costs **not borne by its own level of government**
It **treats subsidies from other levels of governments as "benefits"** (they are a revenue inflow)
It wants to use **a high social discount rate – similar to a financial market discount** rate (usually higher than the social discount rate)

The spender perspective is usually found in service or line departments Some consequences of the spender perspective are:

Expenditures on constituents are viewed as "benefits" rather than costs

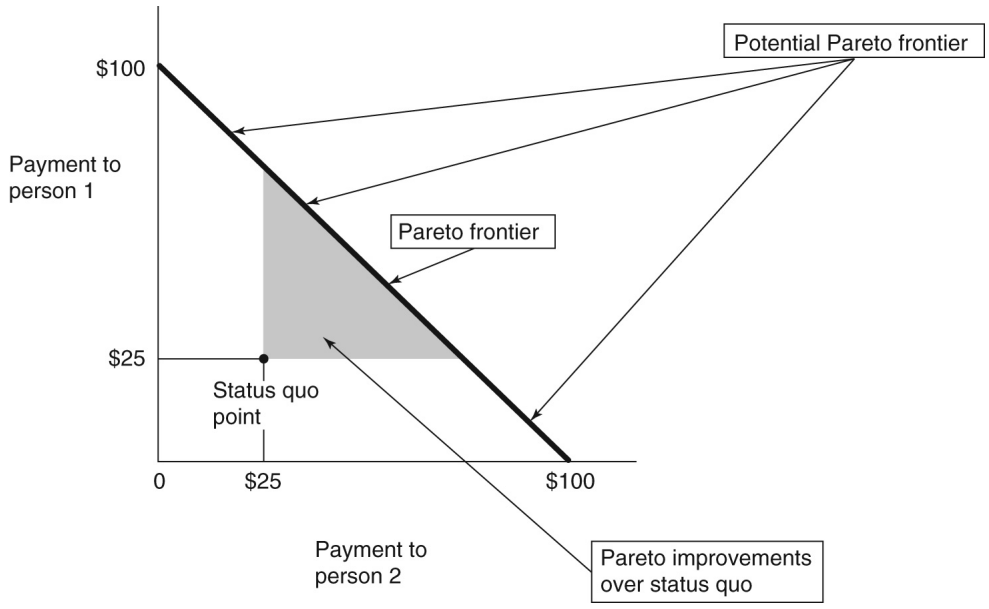
Transfers (from a CBA perspective) received by constituents are viewed as **"benefits"**
Some costs (such as workers' wages) are **viewed as benefits**, this often means support for any project rather than a "do nothing" status quo
Utilized resources that are owned by government are viewed **as having no cost**
Large, capital-intensive projects **with big sunk costs are favored** They are harder to cancel later on
They tend to **view market allocations as inappropriate**, and do not accept that project resources are diverted from other productive uses
They favor **low discount rates** (because, holding everything else constant, this raises the *NPV*)

All about efficiency

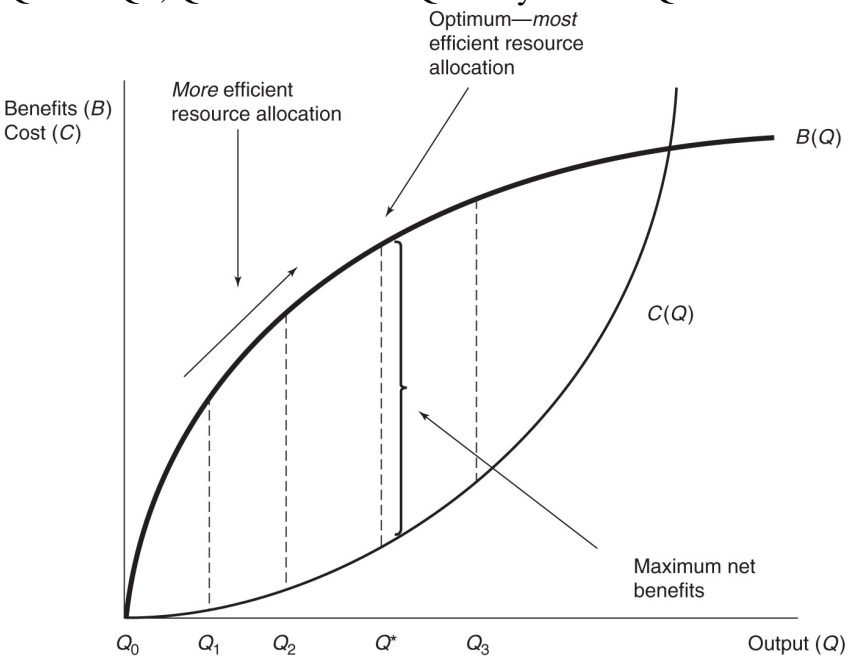
Allocative efficiency: Resources are deployed in their highest valued use in terms of the goods and services they create

Pareto efficiency

Pareto efficiency: An allocation of goods is Pareto efficient if no alternative allocation can make at least one person better off without making anyone else worse off CBA can be used to provide information about the relative efficiency of alternative policies



Imagine a situation where for scale dimension reasons you can only compare Q1 and Q3, Q3 is better than Q2 but you miss Q*



Moving from Q_0 toward Q^* increases efficiency; that is: $NPV(Q^*) > NPV(Q_2) > NPV(Q_1) > NPV(Q_0)$

Moving beyond Q^* reduces efficiency, but Q_3 is more efficient than Q_0: $NPV(Q^*) > NPV(Q_3) > NPV(Q_0)$

Willingness to Pay (WTP) is the payment that one would have to make or receive under the policy so one would be indifferent between the status quo and the policy with the payments

Net Benefits: The link between net benefits and Pareto efficiency is straightforward: if **net benefits are positive, then it is possible to find a set of transfers that makes at least one person better off without making anyone else worse off**

The algebraic sum of the WTP values is the appropriate measure of the net benefits of the impacts of a policy If and only if the aggregate net benefits of the policy (as measured by WTP of affected individuals) are positive, then there exists a set of contributions and payments that make a Pareto improvement over the status quo

Opportunity Cost places a dollar value **on inputs required to implement policies** The opportunity cost of an input is its value in its best alternative use

If all impacts are valued using WTP and all inputs are valued using opportunity costs, then the sign of net benefits indicates if it is possible to increase Pareto efficiency Using a decision rule to implement only Pareto efficient policies is impractical for the following reasons:
The **information burden** of measuring benefits and costs for each individual
The **administrative burden** of actually making each required transfer
Compensation would induce people to overstate costs and understate benefits

The Kaldor-Hicks criterion

Alternative decision rule: Adopt only policies that have positive net benefits
Reasons for adopting it:
It is **feasible**
Society maximizes aggregate wealth
If different policies have different winners and losers, then, in aggregate, costs and benefits will average out over the entire population
It counters incentive to give too much weight to organized groups and too little weight to unorganized groups
It is possible to do redistribution wholesale rather than within each separate policy

Theoretical limitations of WTP as basis for social orderings

The rule for creating a social ranking of alternatives is not fully satisfactory Arrow's Theorem (AT)

Arrow's Theorem

K Arrow (1951) proved that **any social choice rule that satisfies a basic set of fairness** conditions could produce illogical results The conditions are:
Individuals may have any **transitive preferences** (axiom of unrestricted domain)
If alternative1 **is unanimously preferred** by all individuals over alternative 2, then alternative 2 should not be chosen (axiom of Pareto choice)
The **ranking of two alternatives should not depend on what other alternatives** are available (axiom of independence)No one person should have dictatorial power (axiom of non-dictatorship)

Arrow's Theorem states that any rule that satisfies all four conditions will fail to ensure a transitive social ordering of policy alternatives

TABLE 2-2 Cyclical Social Preferences under Pairwise Majority Rule Voting

Preference Ordering	*Voter 1*	*Voter 2*	*Voter 3*
First Choice	*X*	*Z*	*Y*
Second Choice	*Y*	*X*	*Z*
Third Choice	*Z*	*Y*	*X*

(1) Pairwise Voting Outcomes: X versus Y, X wins; Y versus Z, Y wins; X versus Z, Z wins.
(2) Implied Social Ordering: X is preferred to Y, Y is preferred to Z, but Z is preferred to X!

Therefore, **the net benefits rule needs to violate at least one axiom** if it is always to produce a transitive social ordering of policies

In order to ensure the use of WTP in implementing the potential Pareto principle will produce a transitive ordering of policies, assumptions (violating the axiom of unrestricted domain) must be placed on individual preferences (ie, the utility function of individuals must be such that the individual demand functions that they imply can be aggregated into a market demand curve that has the sum of individual incomes as an argument) Also, all individuals must see the same prices

Also, compensating variation (a commonly used measure of WTP) can produce **Scitovsky reversals**

Scitovsky reversals result when the sum of compensating variations for a group

of individuals is positive for a move from one Pareto-efficient policy to another and from the new policy back to the original Therefore, the sum of compensating variation being positive is a necessary but not sufficient condition for a potential Pareto improvement

One can avoid these theoretical problems by a**ssuming policies affect only the price of a single good** (ie, assume away price effects in the markets for other goods)

Dependence of WTP on Distribution of Wealth

The WTP of a person depends on the wealth of the individual So, if the distribution of wealth of society changes, then individual **WTP changes**, and perhaps, the ranking of alternatives could change Dependence of net benefits on distribution of wealth is not a problem if losers are actually compensated (a la Pareto principle) In the potential Pareto principle, however, it is possible that the policy could lower the sum of utilities if people with different levels of wealth have different marginal utilities of money (since the benefits and costs would be valued differently by different income groups) Therefore, the potential Pareto principle weakens for policies with costs and benefits concentrated on different wealth groups However, if the potential Pareto principle is applied consistently, winners and losers would even out and the overall effect would be an increase in aggregate utility for everyone

Criticisms of CBA question the validity of Pareto efficiency because it depends on the present distribution of wealth They advocate creation of a social welfare function that maps utility, wealth, or consumption of society into an index ranking alternative distribution of goods An efficient policy is then one that maximizes the value of the social welfare function The social welfare function, in practice, must be provided by the analyst The analyst can either:
Compare policies in terms of both efficiency and distributional criteria
Report net benefits by wealth or income group as well as for society as a whole

Dependence of Net Benefits on Assumptions about Standing

Jurisdictional Boundaries

CBA usually defines society at the national level The distinction becomes relevant in policies that spill over national boundaries Problems also occur **at sub-national levels where governments want to look only at their (state,**

county, etc) level

To overcome this problem, the analyst can conduct parallel analyses at different levels (ie, local and national or national and global) as required by either the client or project specifics

Jurisdictional Membership

This is a question as to whose utility should be counted (ie, **illegal aliens, citizens abroad, legal non-citizens, etc)** One answer is to use legally defined **rights This, however,** is not always acceptable (ie, slaves, Jews in Nazi Germany, etc did not have acceptable legal rights but should still have been counted) This requires analysts to challenge rights presumptions Note: CBA only counts WTP of people (**not flora and fauna** beyond what people are WTP on behalf of the flora or fauna)

Exclusion of Socially Unacceptable Preferences

This uses prohibitions to legal rights as a guide about prevailing social values and whether certain preferences should have standing There is also difficulty in deciding on standing when dealing with preferences from foreign cultures (and their views on the roles of women, for example)

Inclusion of Preferences of Future Generations

This should be included, but it is difficult to measure the WTP of future generations Usually this isn't too much of a problem because we can use the value (WTP) of people now as a proxy (very few policies affect only the future) Most people today care about future generations and include the interests of the future in their own valuations

Conclusions: limitation of CBA: other analytical approaches

Technical Limitations (in Monetization) and Relevance of Goals Other Than Efficiency

Technical Limitations of CBA Application of potential Pareto principle requires impacts to be monetized If impacts can't be monetized, then one can do a qualitative CBA or, if only one impact can't be monetized, use cost-effectiveness analysis

Qualitative CBA Monetize as many impacts as possible Then make

qualitative estimates of the remaining costs and benefits (rough estimates) The analyst can also utilize estimates founds in other CBA's (if short on time or resources) Even if the impact is not monetized, the analyst should quantify it numerically The degree of accuracy in these estimates will depend on the cost of obtaining them

Cost-effectiveness Analysis This can be used if the major benefit can be quantified but not monetized Policies can then be ranked in terms of cost-effectiveness It does not, however, allow the analyst to conclude that the highest ranked policy contributes to greater efficiency (as the net benefits criteria do) The analyst can evaluate policies in two ways:
Get as much impact for a specific cost
Get a specific impact at the lowest cost

The Relevance of CBA When Goals Other Than Efficiency Matter

One goal (value) underlies CBA (Pareto efficiency) When efficiency is not the only goal or when impacts can't be monetized, multi-goal analysis can be used If only efficiency and equality of outcome is important, then a distributionally weighted CBA is used

Multi-Goal Analysis
All policy alternatives should be compared in terms of all the relevant values Analysts must move from values to general goals to specific objectives that can be used to evaluate alternative policies Evaluate each alternative with respect to each objective As no one policy is likely to be best in terms of all objectives, the analyst can only make a recommendation using tradeoffs

Distributionally Weighted CBA
Net benefits are calculated for each of several relevant groups distinguished by income, wealth, or some other factor The net benefits are then multiplied by a weighting factor and then summed and ranked The main problem is choosing an appropriate set of weights, such as a weight inversely proportional to wealth (or income) or a higher weight on those with wealth below a threshold (poverty level?)

Dissatisfaction with assumptions in distributionally weighted CBA (such as forcing efficiency and equality of outcome to be commensurate) has led some to suggest that a multi-goal analysis be done instead (where efficiency and equality are different goals) Cost effectiveness analysis might also be a more reasonable approach to a distributionally weighted CBA

Concerns about the role of cba in the political process: does CBA Debase the Terms of Public Discourse?

There are several objections to the pricing of certain goods (ie life):
Decreases perceived value by implying they can be compared to goods traded in markets
Decreases value by weakening the claim that some goods should not be for sale at any cost
Undercuts the claim that some goods are priceless

The way non-market goods are actually monetized undercuts the charge that CBA debases public discourse (ie, monetization of a life isn't the *value* of a life but what people are willing to pay to avoid risks that will result in one less death in a population)

Does CBA Undermine Democracy?

The concern is **that CBA imposes the single value of efficiency on public policy** This would be justified if the comparison were between a world where public policy is determined solely through democratic processes and a world where public policy is determined strictly through CBA In real life, however, **the actual government is not an ideal democracy (ie, well-organized constituencies are represented better than less organized constituencies) and CBA only has a modest influence on public policy** CBA actually may contribute to a more democratic process by paying attention to diffuse interests that are typically underrepresented

VALUING BENEFITS AND COSTS IN PRIMARY MARKETS

Purpose: Estimating consumer surplus, producer surplus, and government revenue (ie, social surplus) in primary markets (ie, markets that are directly affected by a policy or project)

Introduction

Observed prices and shadow prices

This chapter discusses how to estimate "**conceptually correct**" measures of benefits and costs It begins, however, with a discussion of why these "conceptually correct" measures are frequently not used in actual CBA studies and what the implications of this are

The primary reason why conceptually correct and actual measures differ is that the easiest measures to obtain **are observed prices**, which **may or may not** be the conceptually correct measurers Whether the observed prices are accurate measures of benefits and costs depends on the character of the market

Prices that are determined in well-functioning, competitive markets tend to be **good estimates of benefits and costs**, while observed prices in distorted markets tend to be **poor measures**

In cases where observed prices don't reflect the true (social) value of a good accurately or where prices don't exist (eg, for public goods, a process called **shadow pricing** is used
Shadow pricing is when observed prices are adjusted (or values are assigned when observed prices do not exist) so that they come as close as possible to measuring the social value of the good in question Even with shadow pricing, however, the measures of benefits and costs used in actual studies can differ from their conceptually correct counterparts for several reasons
Errors can be made in CBA Those doing the analysis may incorrectly believe they have the correct measures, when they do not

It is often difficult to derive an appropriate shadow price It may be technically infeasible or beyond the time and resources available to derive the

correct price Here, those conducting the CBA should point out the resulting biases
The differences between the actual and the correct measures are small enough that the results are not affected very much In such instances, shadow pricing may not be necessary

Valuing outcomes: willingness-to-pay

In CBA, costs and benefits are based on the **concept of willingness-to-pay (WTP)**

Benefits are the sum of the maximum amounts that people would be willing to pay for a policy outcome, and **costs are the sum of the opportunity costs of the resources required by the policy**
Benefits are first considered (measured in efficient and inefficient markets) and then costs (again measured in efficient and inefficient markets)

Valuing benefits in efficient markets

The valuation of gross benefits in efficient markets relies on the following rule:
Gross social benefits equal the net revenue plus the change in social surplus
Two situations in which the rule is applicable are examined: (1) a policy that directly affects the quantity of the good available to consumers, and (2) a policy that alters the costs of producing a good

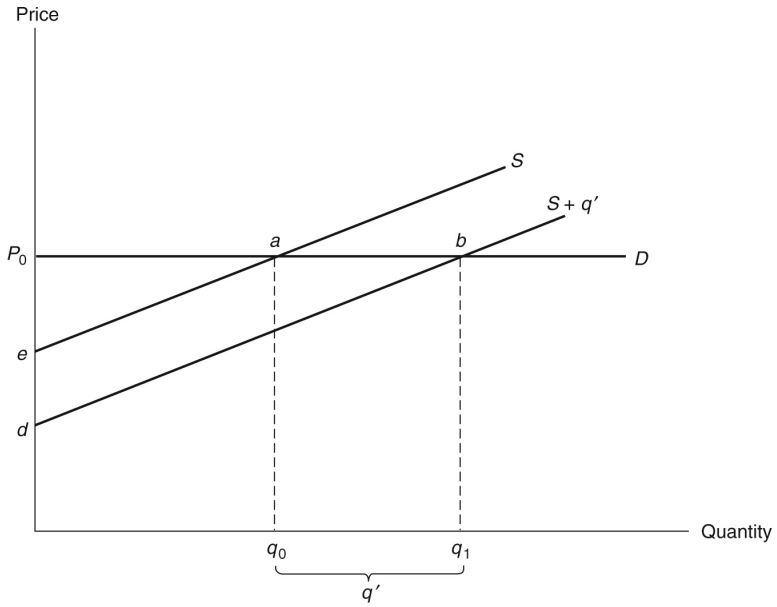
Direct reductions in costs to consumers

Two situations in which a project directly increases the available supply in a market are examined: when the price is unaffected by the increased supply, and when it is affected

If the price of the good is unaffected by the increased supply

Then the demand curve is horizontal Therefore, if the project directly adds a quantity, q', to the market, then the supply schedule as seen by consumers shifts to the right by q' and the increase in social surplus is the area P0 times q' (see next figure) If consumers must purchase the additional units of the good

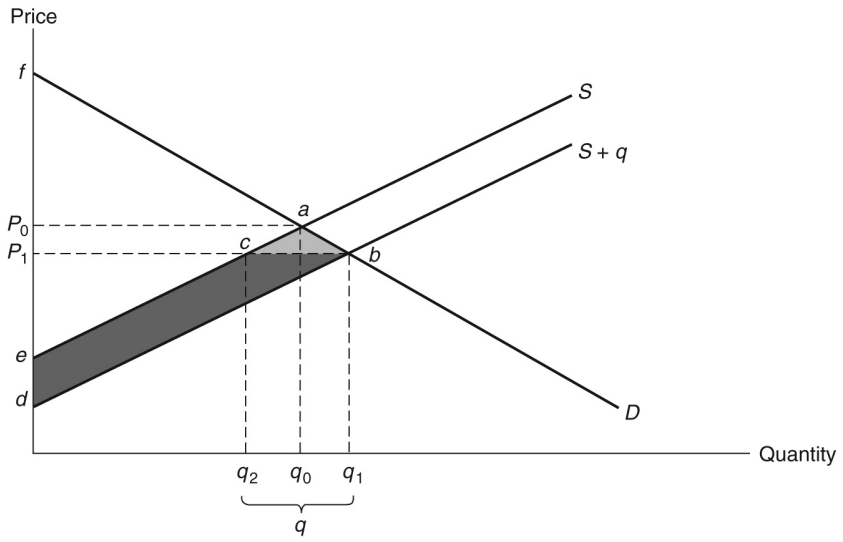
from the project, the government receives revenue equal to P0 times q' If the good is provided free to consumers, then they gain consumer surplus equal to P0 times q'



Social surplus change (ignoring costs of project inputs to the government):

Project (a): Direct increase in supply of q'— gain of project revenue equal to area of rectangle q_0abq_1
Project (b): Supply schedule shift through cost reduction for producers — gain of trapezoid *abde*

If, on the other hand, the government adds a large enough quantity of a good to the market to reduce its price, then the demand curve is appropriately viewed as downward sloping Therefore, if the government adds a quantity q' to the market, the supply curve again shifts to the right, but this time the price of the good falls to P1 The gain in consumer surplus corresponds to an area bounded by the demand curve and the change in price (area P0abP1 from next figure)



Social surplus change (ignoring costs of project inputs to the government):

Project (a): Direct increase in supply of *q* —gain of triangle *abc* plus project revenue equal to area of rectangle q_2cbq_1

Project (b): Supply schedule shift through cost reductions for producers—gain of trapezoid *abde*

The private-sector suppliers continue to operate on the original supply curve and suffer a loss of producer surplus equal to the area bounded by the original supply curve and the change in price (area P0acP1)

Thus, much of the loss of producer surplus is a transfer from suppliers to consumers and the net gain in social surplus is just the difference between the two areas (the area of triangle abc) If consumers must purchase the additional units of the good from the project, then the project receives revenue equal to the area P1 times q' (q2cbq1) Total gross benefits from the project selling q' units equals the sum of project revenues and the gain in social surplus (area q2cabq1)

If the q' units are given away free, then area q2cbq1 is additional consumer surplus and the total gross benefits remain the same as if the q' units were sold (with a caveat)

The caveat is that the above is true only if the consumers value the free units of the good at P1 or higher

If some of the free units go to consumers who value the units at less than P1, area q2cabq1 overestimates the gross benefits (because some consumers value the marginal consumption of these additional units at less than P1)

If, however, consumers can sell them to others who would have been willing to buy them at a price of P1 (and the associated transaction costs are minimal), then area q2cabq1 remains a good approximate of gross benefits

Reductions in costs to producers

The second type of policy mentioned earlier **shifts the supply curve down** by lowering the private sector's cost of supplying a good to the market In this case, q' additional units are supplied to the market because the reduction in their marginal costs allows private-sector firms to offer the additional q' units profitably As in the case of the direct supply of q', the new equilibrium price is P1

From above figure, the gain in consumer surplus equals the area of trapezoid P0abP1
The change in producer surplus equals the area P1bd (the producer surplus with supply schedule S + q') minus area P0ae (the producer surplus with supply schedule S)
Combining consumer and producer surplus, it is apparent that area P1ce cancels out, and area P0acP1 is actually a transfer from producers to consumers
Hence, the gain in social surplus resulting from the project equals the area of trapezoid abde

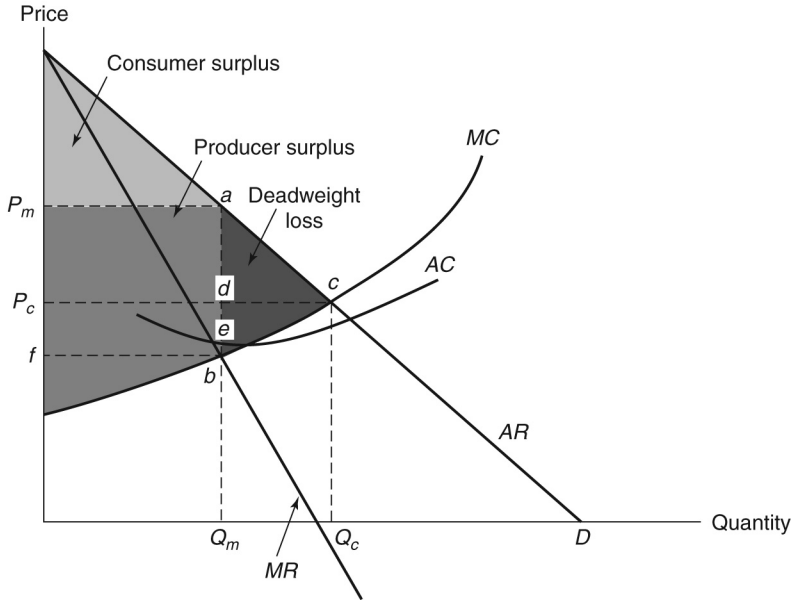
Valuing benefits in distorted markets

In distorted markets or inefficient markets, projects are still measured as changes in social surplus plus net revenues

There are problems, however, in determining the correct social surplus changes **Five different types of market failures** (monopoly, information asymmetry, externalities, public goods, and addictive goods) complicate measuring the correct social surplus

Monopoly

Figure below indicates that, as in the competitive case, the social surplus generated in a monopoly market equals the area between the demand curve and the marginal cost curve to the left of the equilibrium point The social surplus above the price line is consumer surplus, and below the price line is producer surplus



Because a monopoly does not produce at the competitive level, Q_c or charge the competitive price P_c, social surplus is not maximized This lost social surplus is the **deadweight loss** that results from monopolistic behavior

Natural monopolies are useful to examine in some depth because they are especially likely to be the target of government action The properties of a natural monopoly are as follows
Fixed costs are very large relative to their variable costs Therefore, average costs are very large at small amounts of output and fall as output increases Thus, average costs exceed marginal costs over a wide range of output
Average costs exceed marginal costs over the "relevant range of output" (ie, the range between the first unit of output and the amount consumers would demand at a zero price) Therefore, average costs continue to fall over the relevant range of output
As a result, one firm, a natural monopoly, can provide a given amount of output at a lower average cost than could several competing firms

There are at least **four policies** the government could follow in regards to a natural monopoly
Allow the monopoly to **maximize profits** by producing at the monopoly level This results in a deadweight loss
Require the monopoly to set its price where the **average cost curve** crosses the demand curve This transfers some surplus from the monopoly to consumers, expands output, increases social surplus, and reduces deadweight loss
Require the monopoly to set its price w**here the marginal cost curve crosses the demand curve** This eliminates deadweight loss but revenues no longer

cover costs As a result, tax money must be used to subsidize the production of the good
Require the monopoly to **charge a zero price** This also results in a deadweight loss and causes costs to exceed revenues, necessitating subsides

Information asymmetry

Information asymmetry means that information about a product or a job is not equal on both sides of a market There are **two effects of information asymmetry First**, by raising the price and the amount of the good purchased, information asymmetry increases producer surplus and reduces consumer surplus, resulting in a transfer from consumers to sellers **Second,** by increasing the amount of the good sold relative to the full information case, information asymmetry results in deadweight loss These effects can be corrected if either the government or non-governmental sources (either consumers themselves or private third parties) provide the needed information The source of the information is likely to be determined by the type of good:
Search goods: products with characteristics that consumers can learn about by examining them prior to purchasing them Therefore, information asymmetry is unlikely to be a serious problem
Experience goods: products about which consumers can obtain full knowledge, but only after purchasing and experiencing them (eg, movie tickets, restaurants, appliances, etc) Demand for information about experience goods often prompts third parties (newspapers, magazines, etc) to provide information for a price
Post-experience goods: goods that consumers they may not learn about for a long time, if ever, even after purchasing and consuming them (eg, adverse health effects associated with a prescription drug or a new automobile with a defective part) This is the type of good where governmental action may be required to provide the needed information because the information is often expensive to gather and private-sector parties willing to collect it may not exist

Externalities

An externality **is an effect that production or consumption of a good has on third parties not involved in the production or consumption of the good** An externality can be either positive or negative The effect of an externality is that the market underestimates the social costs (negative) or underestimates the social benefits (positive) of the good The gap between the two supply curves for an externality that results from producing a good or the two demand curves

for an externality that involves the consumption process can be viewed as the amount those subjected to the externality would be willing to pay to avoid it (negative) or willing to pay for it (positive) In other words, it represents the costs imposed by or the benefits received from the externality by third parties

If left to its own devices, the market **sets the wrong price for the good** because it fails to take account of the effect of the good on third parties As a result, too much (negative externality) or not enough (positive externality) output is produced This causes a deadweight loss To reduce this deadweight loss, the government has several options For a negative externality, like pollution, it could require the producer to pay a tax on each unit they sell or establish a market for pollution permits (restricting production to the socially optimal level) For a positive externality, the government could subsidize production of the good or produce some of the good itself

Public goods

Public goods have two key attributes: They are **nonexcludable and nonrivalrous** A **good is nonexcludable** if it is impossible, or at least impractical, for one person to maintain control over its use Supplied to one consumer, it is available for all consumers Because there is no way to charge for its use, a free-rider problem results As a consequence, there is no incentive for the private sector to provide it

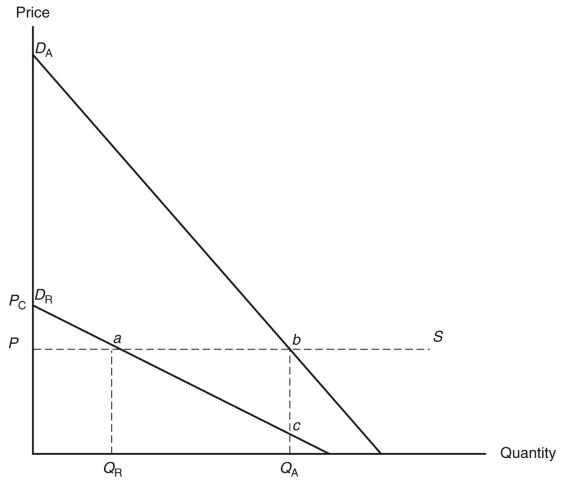
Nonrivalry implies that one person's consumption of a good does not keep someone else from also consuming it; more than one person can obtain benefits from a given level of supply at the same time This also causes a free-rider problem Like other positive externalities, private markets, if left to their own devices, tend to produce less public goods than is socially optimal Therefore, without government intervention, little or none of the public good would be produced Some goods are either nonrivalrous or nonexcludable, but not both

A nonrivalrous, but excludable, good is called a toll good (ie, a toll road), and a rivalrous, but nonexcludable good, is called an open access resource (eg, fishing in international waters)

Addictive goods

Economic models of **addictive goods**, such as tobacco, assume that today's consumption depends on the amount of previous consumption If consumers fail to take full account of how current consumption of an addictive good influences the amount of future consumption, negative intrapersonal externalities result because they impose harm on their future selves

This suggests that consumer surplus from the consumption of an addictive good should be measured under the demand curve that would exist in the absence of addiction, rather than under the demand curve that exists in the presence of addiction As indicated by next figure, however, because more of an addictive good is consumed than would occur in the absence of addiction, deadweight loss occurs This deadweight loss must be subtracted from any



surplus that results from consumption of the good

Valuing inputs : opportunity costs

Public policies usually require resources (ie, inputs) to implement them These resources could be used to produce other goods or services
Therefore, almost all public policies **incur opportunity costs** Conceptually, these costs equal the value of the goods and services that would have been produced had the resources used to implement the policy been used instead in the best alternative way
The relevant opportunity costs are what must be given up today and in the future, not what has already been given up The latter costs are "sunk" costs and should not be included in measuring project costs The area under the

supply curve represents opportunity costs These areas are the theoretically appropriate measures of the costs of the inputs

As a practical matter, however, the most obvious and natural way to measure the value of the resources used by a project is simply the direct budgetary outlay needed to purchase the resources To determine when budgetary outlays should and should not be used as the measure of costs, the conceptually appropriate measure of costs is compared with the direct budgetary outlay measure of costs in three situations:

When the market for a resource is efficient and purchases of the resource for the project will have a negligible effect on the price of the resource, budgetary expenditures usually accurately measure project opportunity costs (ie, when the supply curve is horizontal, the social cost of the input is identical to the budgetary outlay required to purchase the input -- both are equal to P_0 times q') Because most factors have neither steeply rising nor declining marginal cost curves, it is often reasonable to presume that expenditures on project inputs are equal to their social cost

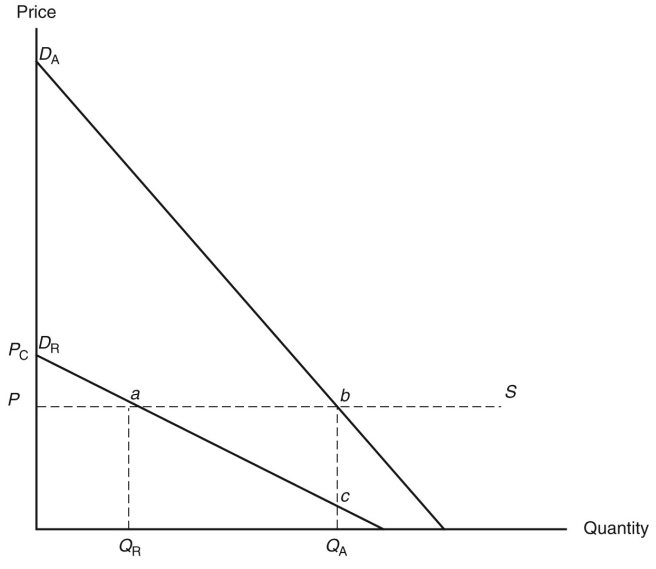
When the market for the resource is efficient, but purchases for the project will have a noticeable effect on prices, budgetary outlays often only slightly overstate project opportunity costs

When the market for the resource is inefficient (ie, there is a market failure), expenditures may substantially overstate or understate project opportunity costs

<u>Measuring Opportunity Costs in Efficient Markets with Negligible Price Effects</u>

The case of a horizontal (perfectly elastic) supply curve is discussed above (social cost equal to budgetary outlay)

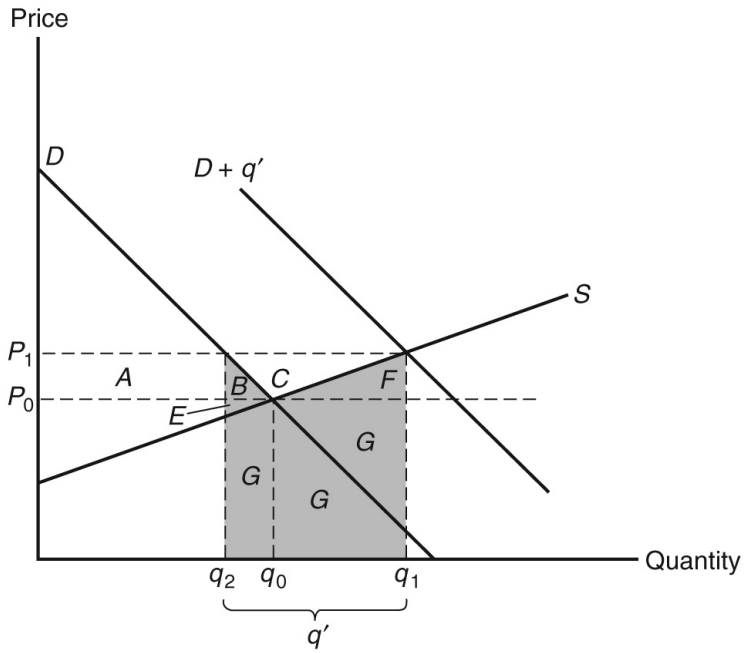
In the case of a vertical (perfectly inelastic) supply curve (such as purchasing



land via eminent domain), the situation is different Even if the government pays the owners a fair market price (hence there are no price effects), the budgetary outlay would understate opportunity costs The reason is that the potential private buyers of the land lose consumer surplus (triangle aPb in above figure) as a result of the government taking away their opportunity to purchase land This loss is not included in the government's purchase price

Measuring Opportunity Costs in Efficient Markets with Noticeable Price Effects

When a large quantity of a resource is purchased, its price may increase, even if it is purchased in an efficient market Therefore, the project faces an upward sloping supply curve for the resource The price increase causes the original buyers in the market to decrease their purchases from q0 to q2 (see next figure)



However, total purchases, including those made by the project, expand from q0 to q1 Thus, the q' units of the resource purchased by the project come from two distinct sources: (1) units bid away from their previous buyers, and (2) additional units sold in the market The price change must be taken into account in computing the opportunity cost

The general rule is that opportunity cost equals expenditure less (plus) any increase (decrease) in social surplus occurring in the factor market The basic point here is that when prices change, budgetary outlays do not equal social costs Unless the rise in prices is quite substantial, however, the change in social surplus will be small relative to total budgetary costs
This suggests that in many instances budgetary outlays will provide a pretty good approximation of true social cost
If prices do go up substantially, however, budgetary costs need to be adjusted for CBA purposes
If the demand and supply curves are linear (or can be reasonably assumed to be approximately linear), the amount of this adjustment can be calculated as the amount of the factor purchased for the project, q' multiplied by ½(P1 - P0)
The opportunity cost of purchasing the resource for the project can also be computed directly by multiplying the amount purchased by the average of the new and old prices – that is, by ½(P1 + P0) times q'
The average of the new and old prices is a shadow price; it reflects the social opportunity cost of purchasing the resource more accurately than either the old price or the new price alone

Measuring Costs in Inefficient Markets

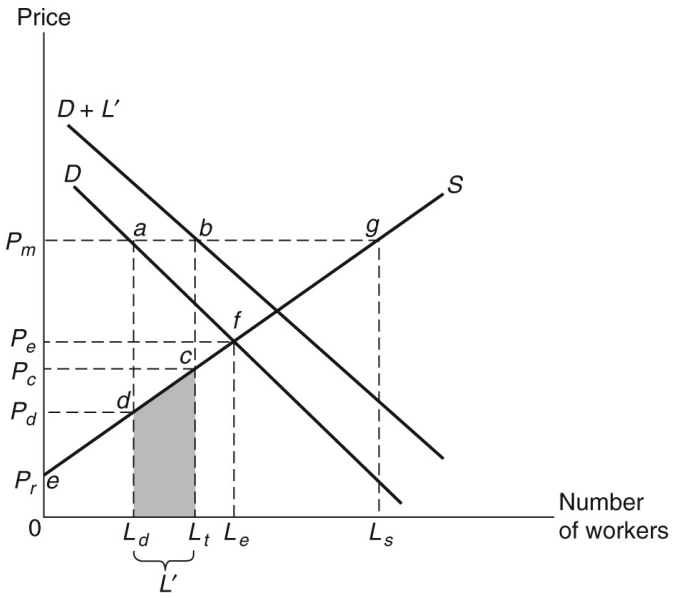
A variety of circumstances can lead to inefficiency: absence of a working market; market failures (eg, public goods, externalities, monopolies, markets with few sellers, and information asymmetries); and distortions due to government interventions (such as taxes, subsidies, regulations, price ceilings, and price floors) Any of these distortions can arise in factor markets, complicating the estimation of opportunity cost Three situations, in which shadow pricing is needed to measure accurately the opportunity cost of the input the government uses, are considered below:
The government purchases an input at a price below the factor's opportunity cost
The government hires labor from a market in which there is unemployment
The government purchases inputs for a project from a monopolist

Purchases at below opportunity costs

As an example, consider the compensation paid to jurors for their time Typically, it is a flat per diem not reflecting the value of jurors' time (as implied by their wage rates) Thus, budgetary outlay to jurors almost certainly understates the opportunity cost of jurors' time Consequently, some form of

shadow pricing is necessary A better estimate of jurors' opportunity cost, for example, would be their commuting expenses plus the number of juror-hours times either the average or median hourly wage rate for the area

Hiring unemployed labor There are at least five possible alternative measures of the social cost of hiring L' unemployed workers (see next figure):



Alternative A Value the opportunity costs at zero This treats the unemployed as if their time is valueless This is inappropriate for two reasons First, many unemployed persons are engaged in productive activities such as job search, childcare, and home improvements Second, even if the unemployed were completely at leisure, leisure itself has value to those enjoying it

Alternative B Use the total budgetary expenditure on labor for the project (P_m times L') The budgetary outlay for labor, however, is likely to overstate the true social cost of hiring unemployed workers for the project The difference between the value the unemployed place on their time, as indicated by the supply curve, and P_m, the price they are actually paid while employed, is producer (ie, worker) surplus, which may be viewed as a transfer to the workers from the government agency hiring them To obtain an accurate measure of the social cost of hiring unemployed workers for the project, this producer surplus amount must be subtracted from the budgetary expenditure on labor Alternative B fails to do this

Alternative C As suggested above, subtract the producer surplus (area abcd) from the budgetary outlay and use the area under the supply curve between L_d and L_t (area abL_tL_d) as the cost estimate This area provides an estimate of the opportunity cost of the newly hired workers

Alternative D A shortcoming of alternative C is that it assumes that all the unemployed workers are located between point c and point d on the supply curve Figure 414, however, indicates that all unemployed persons who value their time between P_r and P_m would be willing to work for a salary of P_m Therefore, it would be more accurate to assume that the unemployed persons who are hired for the project are distributed equally along the supply curve between points e and g and value their time on average, by $\frac{1}{2}(P_m + P_r)$ Thus, the social cost of hiring L' workers for the project would be equal to $\frac{1}{2}(P_m + P_r) * L'$

Alternative E A problem with alternative D is that P_r is likely to be unknown If so, a possible assumption is that unemployed persons hired for the project are distributed along the supply curve between P_m and zero Hence, the social cost of hiring workers for the project would be computed as $\frac{1}{2}P_m * L'$ Note that this estimate is equal to one-half the government's budgetary outlay This estimate is smaller and almost certainly less accurate than that computed using alternative D, but it is more easily obtained for use in actual studies It is best viewed as a practical lower-bound estimate of the true project social costs for labor, while the full value of project budgetary cost for labor (alternative B) provides an easily obtained upper-bound estimate

Purchases from a monopoly

In the case of government purchases from a monopoly, the demand curve for the input shifts to the right and the price and quantity sold increases This causes the monopolist's producer surplus to increase (because it sells more at a higher price), the original buyers' consumer surplus to decrease (because they are charged a higher price), and the government's budgetary outlay to overstate the true social costs from the purchase (because the price the monopoly charges exceeds the marginal cost of production)

To correct the overstatement of social costs, the price should be adjusted downward using shadow pricing The error resulting from using unadjusted budgetary expenditures, however, may not be very large The size of the bias depends on how much the price the monopoly charges exceeds its marginal costs (ie, how much monopoly power it actually has)

The general rule Other market distortions can also affect opportunity costs A summary of the biases created by these distortions is as follows:
When supply is taxed, direct expenditure outlays overestimate opportunity cost
When supply is subsidized, expenditures underestimate opportunity cost
When supply exhibits positive externalities, expenditures overestimate opportunity cost
When supply exhibits negative externalities, expenditures underestimate opportunity costs

The general rule to determine opportunity costs in such cases is: "Opportunity cost equals direct expenditures on the factor minus (plus) gains (losses) in social surplus occurring in the factor market"

Project Effects on Government Revenues and Taxes

Government projects typically result in either tax increases or decreases that engender increases or decreases in deadweight loss The change in deadweight loss that results from raising an additional dollar of tax revenue or from reducing taxes by a dollar is called "marginal excess tax burden" (METB)

Estimates of the METB for different types of taxes are presented in a next chapter This chapter makes the point that if a government project is funded by additional taxes and this increases excess burden, then this increase should be counted as a social cost resulting from the project

Similarly, if project revenues allow taxes to fall and thereby reduce excess burden, then this reduction should be counted as a project benefit Specifically, project expenditures and project revenues that affect the government's financial position should be translated into social costs and benefits by multiplying them by the METB This is rarely done in practice, however

VALUING BENEFITS AND COSTS IN SECONDARY MARKETS

Purpose: Estimating consumer surplus, producer surplus, and government revenue (ie, social surplus) in secondary markets (ie, markets that are indirectly affected by a policy or project)

Valuing costs and benefits in efficient secondary markets

A primary reason for secondary market effects **is that price changes of goods in primary markets change the demand for the complements and substitutes of the primary market goods** These complements and substitutes are exchanged in secondary markets

Complements are goods that tend to be purchased and used with another good (eg, hamburger buns are complements to hamburgers) Substitutes are goods that can be used in place of another good (eg, hot dogs are substitutes for hamburgers)

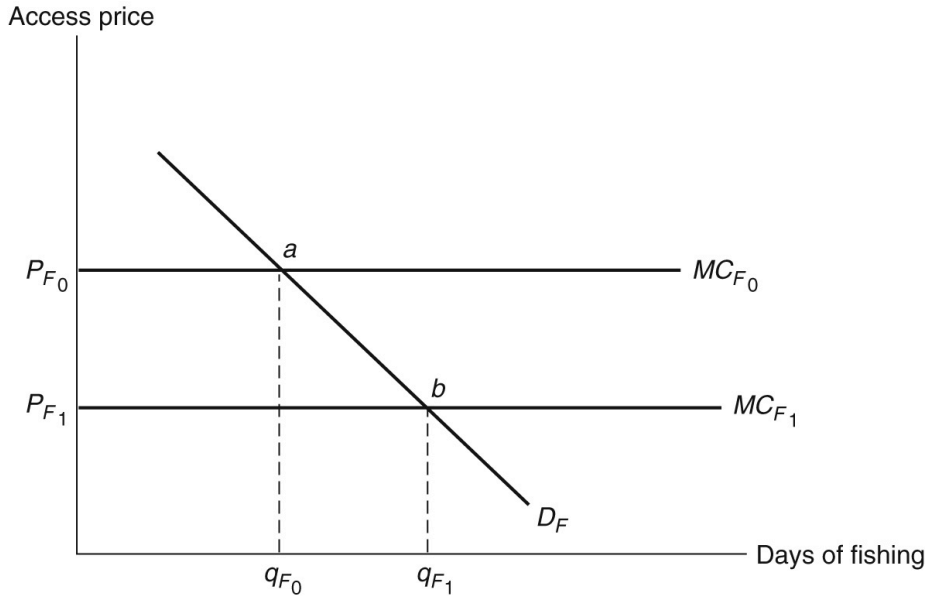
The effect in the primary market **may or may not** affect the price in secondary markets

Efficient market effects without price changes

The impacts **in undistorted secondary markets should be ignored if the prices in the secondary markets don't change and the change in social surplus in the primary market is measured** The reason is that (absent price adjustments in secondary markets) impacts **are typically fully measured as a social surplus change in the primary market**

For example: a nearby lake is stocked with fish This causes the effective price of fishing days to decrease This, in turn, causes the number of fishing days to increase The **decline in the price of fishing days shifts the demand curve for fishing equipment** (a complement) to the right Because **the local market is only a small portion of regional demand, it does not affect the price of fishing equipment Moreover, any increase in consumer surplus resulting from the increased value that people place on fishing equipment is already reflected in the demand curve in the primary market** (ie, reflected in their WTP for fishing days), therefore is a part of the change in social surplus in the primary market **Secondary markets can only be**

ignored, however, if the social surplus in the primary market is actually measured

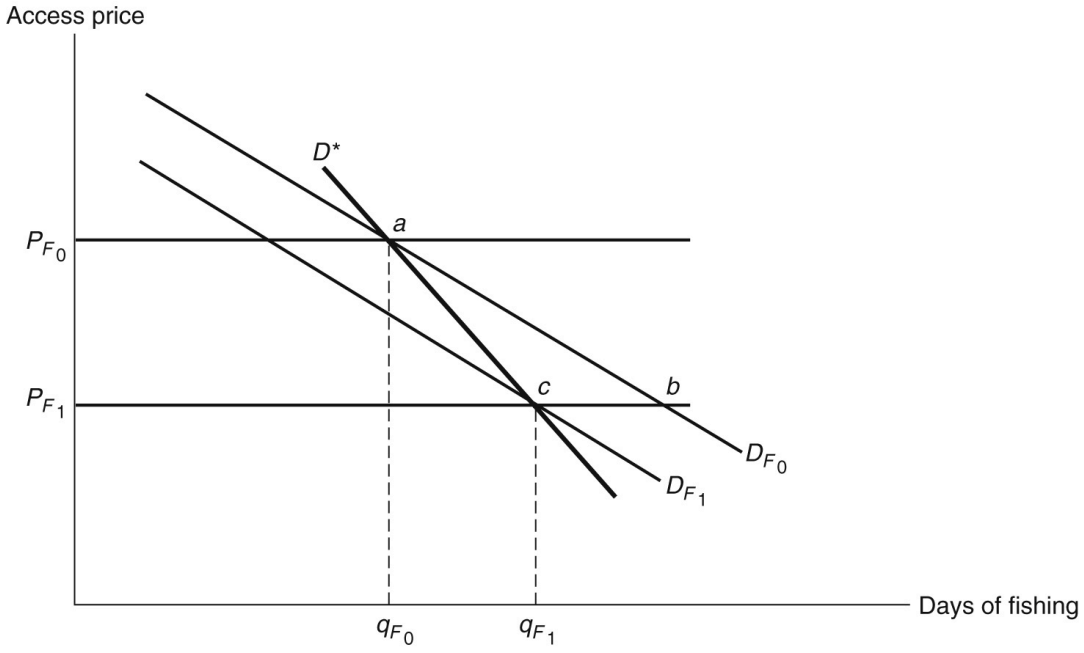


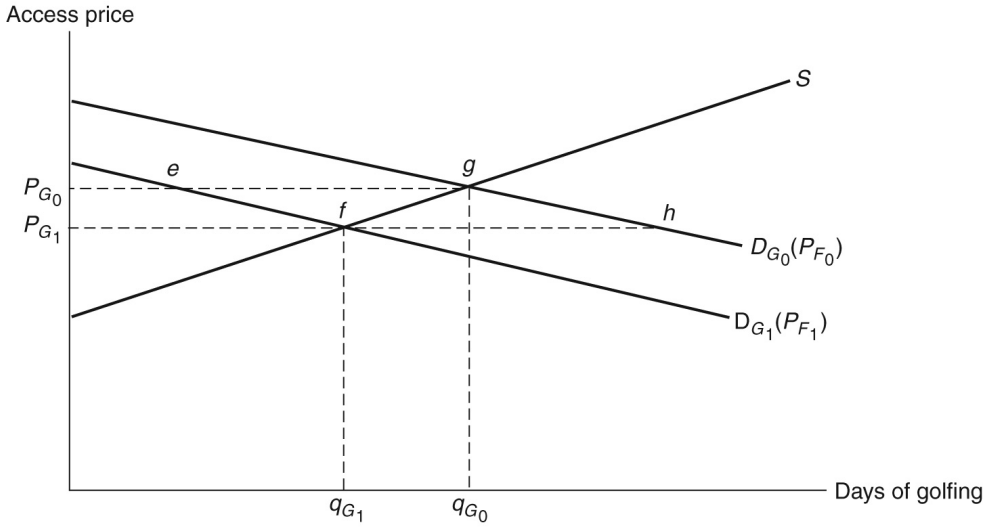
Efficient market effects with price change

The situation is **more complex when the price in the secondary market changes because the supply curve is positively sloping** This can be seen by returning to the fishing example and considering the secondary **market for golf (a substitute**) In this case, **the price of fishing days again decreases, increasing demand** and social surplus This causes the **demand for golf to fall** This shift, in itself, is **already reflected in the primary market (ie, consumers are aware of the existence both fishing and golf and decide their WTP for fishing accordingly**) The shift in demand, however, **causes the price of golfing to decrease (due to the sloping supply curve) This increases consumer surplus to golfers but decreases producer surplus by a larger amount, thereby**, **reducing net social surplus** The reduction in the price of golf also causes some consumers to switch back from fishing to golfing

Connecting the original (pre-fishing days price change) and final (post-golf price change) equilibrium points on the fishing days supply and demand diagram creates an "**observed" or "equilibrium" demand curve [see curve D*** in Figure 52(a)] This curve indicates the demand for fishing days once prices in other **markets have fully adjusted** to the original change in the price for fishing days The other demand **curves (D_{F0} and D_{F1}) hold the price of all**

other goods constant Thus, these curves are difficult to estimate accurately **Observed demand curves, as a result, are often the ones actually available for use in CBA**



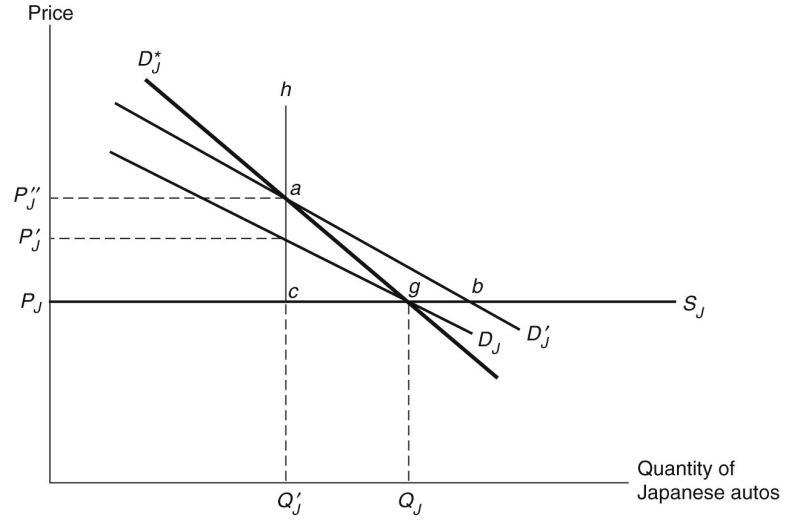


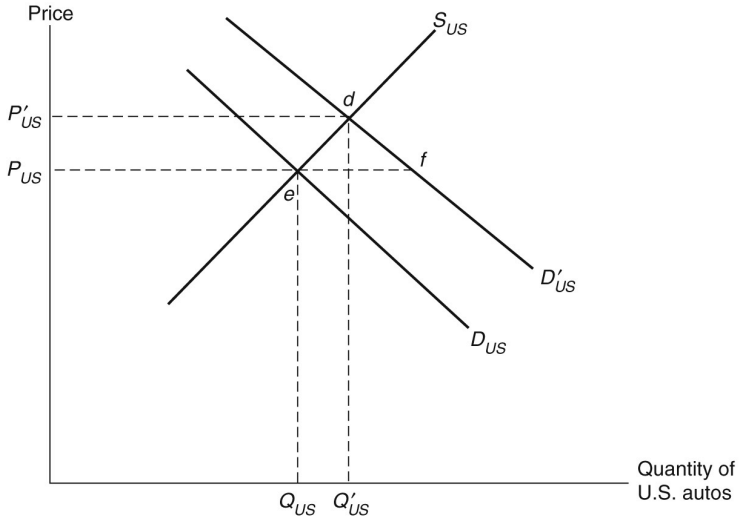
The demand shift from DFO to DF1 Price decrease and increase od consumer surplus by PF0abPF1 But on the golf market, the demanded quantity is

decreasing from qg0 to qG1, price decrease and increase fo consumer surplus by PG0efPG1 and reduction in producers surplus by PG0gfPG1 The net variation is efg In practice PF0acPF1 rather than PF0abPF1 more often measures the variation of the consumer surplus on the fishing market If measured this way, the increase in consumer surplus in the fishing market would be understated by the triangle abc, but this triangle typically closely approximates triangle efg the net loss in social surplus in the golfing market The demand line D* is an observed or equilibrium demand schedule The only observable That's why we use it DF0 and DFGO are demand "holding constant" the price on the other markets We ignore these demand curves Using D* is an approximation making sense because abc=efg More broadly individuals make their decisions taking in consideration all the prices changes in all the other markets (D*)

Therefore, D* is the curve more likely to be used in a CBA This curve, however, **understates the true measure of the gain of social surplus in the primary market But this understatement is a close estimation of the net loss of social surplus in secondary markets due to price changes** In other words, **if changes in social surplus in secondary markets are ignored and an equilibrium demand curve is used to measure a change in social surplus in the primary market, then errors result that tend to be offsetting**
Hence, the effects **in undistorted secondary markets should be ignored regardless of price changes, as long as benefits in the primary market are measured using empirically measured "observed" demand curves that do not hold prices constant in secondary markets**

In 1981, Japan and the US agreed **to cut imports of Japanese** cars through the Voluntary Restraint Agreement (VRA) The idea was that, Japanese cars being substitutes for US cars, to restrict the imports **would improve US sales**The restrictions on imports did, in fact, **raise the price of Japanese cars and, thereby, increase the demand for US cars** This shift in demand increased in quantity and price the US cars sold, which, in turn, caused the demand for Japanese cars to go up (shift to the right), increasing Japanese car prices even more Among the effects of this policy are: **an increase in producer surplus for US car manufacturers; an increase in producer surplus for Japanese car manufacturers; a deadweight loss; and a large decrease in consumer surplus** The net effect was a loss in social surplus within the US





Valuing benefits and costs in distorted secondary markets

In distorted markets, price doesn't equal social marginal costs Two examples: markets in which there are negative externalities or taxes

First, the negative externality

Consider the possibility that lead sinkers (part of fishing equipment) could poison part of wildlife The social cost (say X cents per sinker) of this loss of wildlife is not included in the price of the sinkers Therefore, **an increase in consumption of lead sinkers imposes a cost of X times the increase in quantity that should be included in a CBA**

The second example is taxes
Consider two substitute goods: Good A, which is not initially taxed, and good B, which is taxed Suppose now that a tax is imposed on good A
The tax on good A raises its price, increasing government revenue, decreasing consumer surplus, and creating deadweight loss The demand for the substitute (good B), however, shifts to the right (due to the increase in the price of good A), resulting in more revenue for the government (from the already existing tax on good B)
This may offset the deadweight loss created in market A

Important note: When there are distortions in secondary markets, benefits and costs can't be measured solely by observing effects that occur in primary markets Effects in distorted secondary markets must be valued separately

These effects, however, are very difficult to measure in the real world Fortunately, they are usually of little importance Unless the good in question has strong substitutes or complements, large price changes would be needed to produce noticeable demand changes in secondary markets

Therefore, effects in distorted secondary markets can usually be ignored

Indirect effects of infrastructure projects

Public infrastructure projects that reduce transportation costs (eg, road building or harbor deepening) may **have indirect effects on the markets for consumption goods** that use inputs shipped by truck or boat if shipping firms reduce their prices and then the firms producing the consumption goods pass on their cost savings to consumers by reducing their prices

The analysis **of these indirect effects is similar to the analysis of effects in secondary markets: if the product markets in which the indirect effects occur are undistorted, and the surplus changes that occur in the shipping markets are fully measured, then the indirect effects can be ignored**

Secondary market effects from the perspective of local communities

If those with standing are restricted to the local area, should effects from undistorted secondary markets be included as project benefits (as promoters of local projects often claim they should be)? **The reasons why one should be very cautious with it includes:**

From a broader perspective, the benefits are actually just a transfer from non-residents to residents

If standing is restricted to local area residents, benefits received by non-residents must be excluded

Even if the demand for local goods and services that are produced in secondary markets increases, suppliers only receive an increase in surplus if price also increases (and then the producer surplus is partially offset by the reduction in consumer surplus of local residents because they now pay higher prices)

Possible multiplier effects would be small because non-residents often own local businesses, and many purchases by local businesses are outside the local area

One last word: effects in secondary markets usually generate community benefits for a project only when they are distorted – for example, local levels of unemployment are high and other resources are idle, and there are barriers to

DISCOUNTING FUTURE BENEFITS AND COSTS

Purpose: This section deals with theoretical issues pertaining to the selection of an appropriate *real* social discount rate (SDR)

First let's recall what discounting is

Basic of discounting

Projects with Lives of One Year

Discounting takes place over periods not years However, for expositional simplicity, we assume that each period is a year This section discusses projects that last one year
There are three possible methods to evaluate potential projects: future value analysis, present value analysis and net present value analysis Each gives the same answer

Future Value Analysis – Choose the project with the largest future value, *FV*, where the future value in one year of an amount *X* invested at interest rate i is:

$$FV = X (1 + i)$$

Present Value Analysis – Choose the project with the largest present value, *PV*, where the present value of an amount *Y* received in one year is:

$$PV = Y/(1 + i)$$

Note that if the *PV* of a project equals *X*, and the *FV* of a project equals *Y*, both equations and imply:

$$PV = \frac{FV}{(1+i)}$$

This equation shows that discounting (the process of calculating the present value of future amounts) is the opposite of compounding (the process of calculating future values)

Net Present Value Analysis – Choose the project with the largest net present value, which calculates the sum of the present values of all the benefits and costs of a project (including the initial investment):

NPV = PV(benefits) – PV(costs)

Usually projects are evaluated relative to the status quo If there is only one new potential project and its impacts are calculated relative to the status quo, it should be selected if its NPV > 0, and should not be selected if its NPV < 0 If the impacts of multiple, mutually exclusive alternative projects are calculated relative to the status quo, one should choose the project with the highest NPV, as long as this project's NPV > 0 If the NPV < 0 for all projects, one should maintain the status quo

Compounding and discounting over multiple years

Future Value over Multiple Years – Interest is compounded when an amount is invested for a number of years and the interest earned each period is reinvested Interest on reinvested interest is called compound interest The future value, FV, of an amount X invested for n years with interest compounded annually at rate i is:

$FV = X\,(1+i)^n$

Present Value over Multiple Years – The present value, *PV,* of a amountY
received in *n* years, with interest compounded annually at rate *i* is:

$$PV = \frac{Y}{(1+i)^n}$$

The present value for a stream of benefits or costs over *n* years *is*:

$$PV(B) = \sum_{t=0}^{n} \frac{B_i}{(1+i)^t} \text{ or } PV(C) = \sum_{t=0}^{n} \frac{C_i}{(1+i)^t}$$

Net Present Value of a Project – Inserting equations (66) and (67) into (63) gives the following useful expression for computing the *NPV* of a project:

$$NPV = \sum_{t=0}^{n} \frac{NB_i}{(1+i)^t} \quad NPV = \sum_{t=0}^{n} \frac{B_i}{(1+i)^t} - \sum_{t=0}^{n} \frac{C_i}{(1+i)^t}$$

Or, equivalently, the *NPV* of a project equals the present value of the net benefits ($NB_i = B_i - C_i$):

$$NPV = \sum_{t=o}^{n} \frac{NB_i}{(1+i)^t}$$

Timing Of Benefits And Costs Thus far, we have assumed that impacts occur immediately, or at the end of the first year, or at the end of the second year, and so on If most costs are incurred during the first few years of a project and most benefits arise later, this assumption is conservative in the sense that the *NPV* is lower than if it were computed under an alternative assumption Time lines are very useful ways to specify exactly when benefits and costs do occur If benefits arise throughout a year, rather than at the end as we assumed above, one possibility is to compute the NPV as if the benefits occurred in the middle of the year Alternatively, one could compute the NPV under the assumption they occur at the beginning of the year and under the assumption that they occur at the end of the year and take the average

Long Lived Projects And Terminal Values Some projects may have some benefits (and costs) that occur far in the future For such projects, one can use a generalised version of equation (69) with infinity, ¥, replacing *n*:

$$NPV = \sum_{t=0}^{n} \frac{NB_i}{(1+i)^t}$$

Some projects can be reasonably divided into two periods – a "near future"(the discounting period), which pertains to the first *k* periods, and a "far future", which
pertains to the subsequent periods and is captured by the horizon value, H_k For such projects, the *NPV* can be computed:

$$NPV = \sum_{t=0}^{k} \frac{NB_t}{(1+i)^t} + PV(H_k)$$

where, $PV(H_k)$ is the present value of the horizon value (ie the *PV* of all

benefits and costs that arise after the first k periods) Usually, there is a natural choice for k -- the "useful" life of the project, such as when or an asset undergoes a major refurbishment or the assets are sold

Alternative Methods for Estimating Horizon Values
Horizon value based on simple projections - This is a theoretically appropriate method However, it may be difficult to make even simple projections
Horizon value based on salvage value or liquidation value - Horizon value is the scrap value of the assets of a project This method is appropriate when:
1) No other costs or benefits arise beyond the discounting period
2) There is a well functioning market in which to value the asset
3) The market values reflect social values (ie, no externalities)

In practice it is often very difficult to determine the market value of an asset used in a government project Consider, for example, the market value of a 25 year-old road! Even if a market value did exist, it probably would not reflect its social value

Estimating Horizon value based on depreciated value - This method estimates the (economic) depreciation of an asset based on empirical market studies of similar assets and then subtracts this amount from the initial value (One never uses accounting depreciation in CBA) It is applicable when there is no market for some capital item, because, for example, it remains in the public sector, but one knows the depreciation rate of similar assets Of course, one should make adjustments where appropriate, for example, if the asset is used more or less intensely than average

Estimating horizon value based on the initial construction cost - This method uses some arbitrary proportion of the initial construction cost as an horizon value

Set the horizon value equal to zero - This method chooses a fairly long discounting period and sets the present value of subsequent net benefits to zero If the discounting period is too short, this method may omit important impacts

Comparing projects with different time frames

Analysts should not choose one project over another solely based on the *NPV* of each project if the time spans are different Such projects are not directly comparable Two appropriate methods to evaluate projects with different life spans a

Rolling over the Shorter Project
If project A spans *n* times the number of years as project B, then assume that project B is repeated *n* times and compare the *NPV* of *n* repeated project Bs to the NPV of (one) project A For example, if project A lasts 30 years and project B lasts 15 years, compare the NPV of project A to the *NPV* of 2 back-to-back project B's, where the latter is computed:

$NPV = x + x/(1+i)15$
where, x = *NPV* of one15-year project B

Equivalent Annual Net Benefits (EANB) Method
The EANB is the amount received each year for the life of the project that has the same *NPV* as the project itself The EANB of a project is computed by dividing the NPV by the appropriate annuity factor, a_i^n:

$EANB = NPV/ (a_i)^n$
The appropriate annuity factor is the present value of an annuity of $1 for the life of the project (n years), where i = interest rate used to compute the NPV Obviously, one would choose the project with the highest EANB

Other Considerations
Shorter projects also have an additional benefit (not included in EANB) because one does not necessarily have to roll-over the shorter project when it is finished A better option might be available at that time This additional benefit is called quasi-option value and is discussed further previous chapter

Real versus nominal dollars

Conventional private sector financial analysis measures monetary amounts in nominal dollars (sometimes called current dollars) But, due to inflation, one cannot buy as many goods and services with a dollar today as one could one, two or more years previously–"a dollar's not worth a dollar anymore" It is important to control for inflation (ie general price increases) We control for inflation by converting nominal dollars to real dollars

(sometimes called constant dollars) We usually use the consumer price index (CPI), but sometimes use the gross national product (GNP)

Estimates of Inflation and Problems with CPI

The CPI is the most commonly used measure of inflation Prior to 1998, the CPI overstated inflation by about 08% to 16% per annum Four reasons for the overstatement are:

1) Commodity substitution effect: The CPI did not accurately reflect changes in consumer purchases, such as switching to lower-priced substitutes;
2) New goods: The "basket" of goods did not include some new products, eg, new (cheaper) generic drugs;
3) Quality improvements: The CPI did not accurately reflect changes in product quality, eg more safe or reliable cars;
4) Discount store effect: Consumers are shopping more at discount stores, which have less expensive products

When using historical data we suggest analysts should: 1) use the actual CPI and 2) use the actual CPI – 1% for data prior to 1998, and actual CPI – ½% for subsequent years

Analyzing Future Benefits and Costs in CBA

Suppose an analyst is interested in computing the NPV of a future project She could either measure the benefits and costs in real dollars and discount using a real discount rate or she could measure the benefits and costs in nominal dollars and discount using a nominal discount rate Both methods would result in the same numerical answer

We **suggest working in real dollars** as it is usually easier and more intuitive Suppose the expected annual rate of inflation during the life of the project is denoted by m Benefits or costs that are given in nominal dollars may be converted to real dollars by discounting them at rate m using equation (65) If the discount rate is given in nominal dollars and is denoted by i, then it may be converted to a real discount rate, denoted by r using the expression:

$$r = \frac{i - m}{1 + m}$$

Note that r is approximately equal to $i - m$, especially if m is small

Estimates of Expected Inflation Estimates of future inflation are available from reputable investment firms, branches of the Federal government, a Federal Reserve Bank, or the OECD The *Economist* presents the results of a recent poll of consumer price forecasts for the current year and the following year In the US, there are three easily accessible survey measures of inflation

Internal Rate of Return (IRR)

The IRR of a project equals the discount rate at which the project's NPV = 0 The IRR indicates the annual rate of return that would be derived from an equivalent project of similar size and similar duration When there is only one alternative to the status quo, one should invest in the project if its IRR > social discount rate However, there are some problems using the IRR as a decision rule We suggest using only the NPV rule for decision making, although the IRR conveys useful information about how sensitive the results are to the discount rate

$$NPV = \sum_{t=0}^{n} w_t NB_t$$

When evaluating government policies or projects, analysts must decide on the **appropriate weights to apply to policy impacts that occur in different years** Given these weights, denoted by w_t, and estimates of the real annual net social benefits, NB_t, the estimated net present value (NPV) of a project is given by:

$$NPV = \sum_{t=0}^{n} w_t NB_t$$

Selection of the appropriate social discount rate (SDR) is equivalent to decide the **appropriate *set of weights* to use in equation Sometimes the weights are referred to as *social discount factors***

Discounting reflects the idea that a given amount of real resources in the future is worth less today than the same amount is worth now This is because:
Via investment, one can transform resources that are currently available into a greater amount in the future
People prefer to consume a given amount of resources now rather than in the future

Thus, it is generally accepted that the **social discount weights decline over time**; specifically, $0 < w_n £ w_{n-1} £ £ w_1 £ w_0 = 1$ However, there **is not as much agreement about the values of the weights** The key issue in this chapter concerns determining the weights

Three unresolved issues are relevant:
Whether **market interest rates** can be used to determine the weights
Whether to **include or not unborn future generations** in determining the weights
Whether **society values an unit of investment the same way it does with an unit of consumption**

Different assumptions about these issues lead to different approaches towards determining the SDR, which, in turn, lead to different discount weights There is considerable disagreement about the underlying assumptions therefore about the most appropriate approach
There is reasonable consensus over the appropriate discount weights once the approach is selected

Does the choice of discount rate matter?
Yes – choice of the rate can affect policy choices Generally, low discount rates promote the projects having the highest total benefits while high SDRs rates promote projects where the benefits are front-end loaded

The theory behind the appropriate social discount rate (sdr)

To understand the theoretical foundation of discounting, one must recognize that it is **rooted in the preferences of individuals**
Individuals tend to **prefer to consume a given amount of benefits immediately, rather than in the future**
Individuals also face **an opportunity cost of forgone in**terest if they postpone **receiving a given amount of funds because they could potentially invest these funds once they are received**

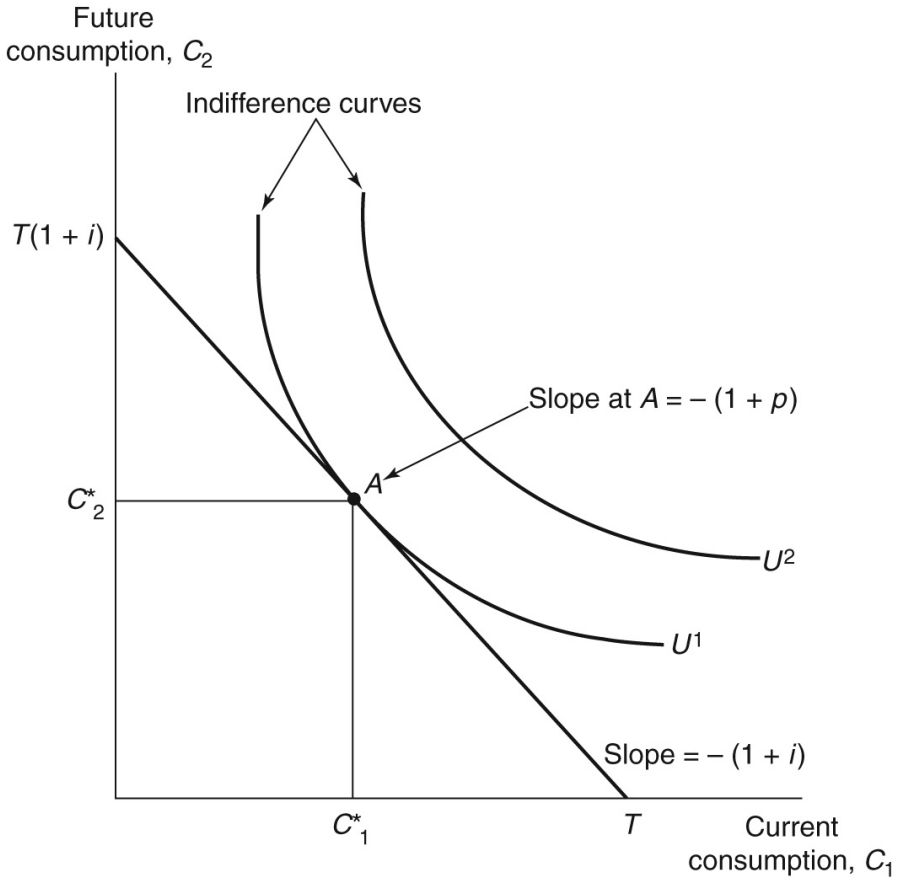
These two important considerations regarding individual decisions -- the *marginal rate of time preference* and the *marginal rate of return on private investment* -- provide a basis to decide how costs and benefits made in the future by society should be discounted in order to be comparable to costs and benefits realized by society today

An individual's marginal rate of time preference (MRTP)

An individual's MRTP is the proportion of additional consumption that an individual requires in order to be willing to postpone (a small amount of) consumption for one year

Two time period

Equality of Discount Rates in Perfect Markets
In a perfectly competitive capital market, an individual's MRTP equals the market interest rate, i, as shown in Figure 1



In this two-period model, an individual may consume his or her entire budget (T) within the first period, he or she may invest it all in the first period and consume T(1 + *i*) in the second period, or may consume at any intermediate point represented by the budget constraint in Figure 101, which has a slope of -(1 + *i*)

Consumption is maximized at the point **at which the indifference curve is tangent to the budget constraint, ie at point A** At point A, the slope of the indifference curve is -(1+p), the marginal rate of substitution (MRS) is 1+p, and the MRTP is p **Consequently, *i* = *p*** Note that, as current consumption increases, MRS and MRTP decrease

Rate of return on private investment equals the market rate equals MRTP The text presents a more general two-period model that pertains to a group of individuals in a hypothetical country and incorporates production It is assumed that this country does not trade with other counties Moreover, the chapter initially ignores taxes and transaction costs associated

with making loans
Consequently, the net rate of return on savings corresponds to the market interest rate
In addition, the chapter initially ignores market failures such as externalities and information asymmetry, which could cause private and social discount rates to diverge from one another

The optimal point is at X in Figure 2 At X, the slope of the social indifference curve, -(1 + px), equals the slope of the consumption possibility frontier, -(1 + rx)
Consequently, the marginal social rate of time preference, px equals rx, the marginal rate of return on investment
Furthermore, at point X, these rates also equals the economy-wide market interest rate, i
Finally, at X, all individuals have the same MRTP because, if their MRTP > I, they would borrow at i and consume more in the current period until their MRTP = i and, if MRTP < I, they would postpone consumption by saving until their MRTP = i

Since everyone's MRTP equals i, i becomes the obvious choice for the SDR

Real Economies: Problems with the Two-Period Model

An actual economy (**with taxes and transaction costs**) would not operate at the optimal point X, but at a point such as Z Yet, at point Z society would underinvest and rz > pz

Furthermore, because different people face different tax rates, risk and costs, numerous values exist for both the MRTPs and the marginal rate of return on investment **Thus, there is no obvious choice for the social discount rate that can be derived from market rates of interest**

An Infinite-Period Model: Discounting Using the Optimal Grow Rate

In his article of 1928, Frank Ramsey suggested an approach for determining the **SDR that does not rely on market rates of interest** Under this approach, which is known as the "**optimal growth rate method**" (OGRM), society discounts future consumption for two reasons: (1) society is impatient and prefers to consume more now than in the future; (2) there is economic growth

Thus, $p_x = d + ge$, where p_x is the SDR based on the optimal growth rate method, d is the pure rate of time preference, g is the growth in per capita consumption, and e is a constant that is described below

The model assumes that, because of economic growth, the consumption of society should grow over time However, because of the declining marginal utility of consumption, consumption should be made more equal than it would have been otherwise

This adjustment should be proportional to the product of the per capita growth rate and an elasticity, ie, that measures how fast the social marginal utility of consumption falls as consumption per capita rises
For example, if e = 1, a 10 percent reduction in consumption today from (say) $40,000 to $36,000 would be considered as an acceptable trade-off for a 10 percent increase in consumption (say) from $80,000 to $88,000 at some future point

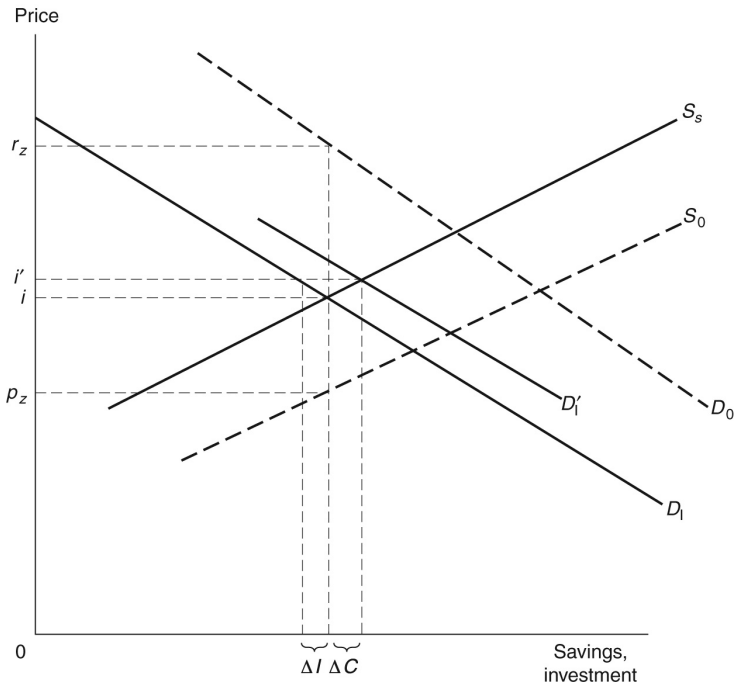
Deriving the sdr from the market

This section discusses four potential social discounting rates derived from markets' observable rates SDRs based on the optimal growth rate method will be discussed later
The use of all these market rates requires from the resources used for a public project to have a better rate of return than they would have had by remaining within the private sector, which is related to the opportunity-cost concept

Using the marginal rate of return on private investment (r_z)

The argument for using the marginal rate of return on private investment as the social discount rate is that, before the government takes resources out of the private sector, it should be able to demonstrate that society would receive a greater rate of return than as things stand
As a result of such an estimation, the return on the government project should exceed r_z, the marginal return on private investment

The most compelling case for the use of r_z was shown by Arnold Harberger, who analyzed a closed domestic market for investment and savings, such as presented in Figure 4 below



In the absence of taxes and government borrowing, the demand curve for investment funds by private-sector borrowers is represented by D_o and the supply curve of funds from lenders (or savers) is represented by S_o

With corporate taxes and personal income taxes, the demand and supply curves would shift to D_I and D_S, respectively, resulting in a market clearing rate of *i* and a divergence between r_z and p_z, as discussed previously

Harberger assumed that a government project would be funded entirely by borrowing in a closed domestic financial market
The demand for funds for the new project would shift the demand curve to D_I', the market rate of interest would rise from i to i', private-sector investment would fall by ΔI and private-sector savings would increase by ΔC
As the increase in private-sector savings equals precisely the decrease in private-sector consumption, the project would "crowd out" both investment (by ΔI) and consumption (by ΔC)

Harberger suggests that the social discount rate should be obtained by weighting r_z and p_z by the respective size of the relative contributions that investment and consumption would make toward funding the project Thus, according to him, the social discount rate should be computed as follows:

$SDR = ar_z + bp_z$

where $a = \Delta I/(\Delta I + \Delta C)$ and $b = (1 - a) = \Delta C/(\Delta I + \Delta C)$

Finally, Harberger asserts that savings are not very responsive to changes in interest rates
This assertion, which has some empirical support, implies that the SS curve is close to vertical position and, as a consequence, ΔC is close to zero
This, in turn, suggests that the value of the parameter a is close to one hence the value of (1 - a) is close to zero In other words, almost all of the resources for public-sector investment are obtained by crowding out private-sector investment
Thus, Harberger suggests that the marginal rate of return on investment, rZ, is a good approximation of the true social discount rate

Numerical Values of r_z
Perhaps, the best proxy for r_z is the before-tax real rate of return on corporative bonds, which is of the order of 45 percent

Criticisms of the Calculation and use of r_z
There are five criticisms of both the use of r_z and of its estimation, suggesting that using an SDR of 45 percent is an upper limit:
Private sector rates of return incorporate a risk premium Therefore, if benefits and costs are measured in "certainty equivalents," as recommended by the text, then, using private sector rates would result in a "double counting," ie it would account for risk in two ways
A project might be funded by taxes, rather than by loans – hence, consumption would also be crowded out
A project may be partially funded by foreigners at a lower rate than 45 percent
Private sector returns may be pushed upward by distortions caused by negative externalities and market prices that exceed marginal costs
There is no fixed pool of investment where government investment replaces private investment dollar for dollar If the government does not fully employ all its resources, a complete crowding out of private investment is unlikely

Using the Marginal Social Rate of Time Preference Method (p_z)

Many analysts hold that the SDR should be thought of as the rate at which individuals in society are willing to postpone a small amount of current

consumption in exchange for additional future consumption (and vice versa) In principle, pz represents this rate

Consequently, many believe that the SDR should equal pz This rate can also be justified if a government project is funded entirely by domestic taxes and if taxes reduce consumption without reducing investment It is then appropriate to set a = 0 and b = 1 in equation (108), yielding an SDR equal to pz

Numerical Values of p_z

In practice, the best return that many people can earn in exchange for postponing consumption is the real after-tax return on savings One option is then to use this rate as an estimate of p_z Starting with the nominal, pre-tax interest rate on government bonds and adjusting for taxes on savings and inflation suggests an estimate of p_z of around 15 percent, with values of 10 percent and 20 percent appropriate for use in sensitivity analysis

Criticisms of the Calculation and Use of p_z:

Individuals differ in preferences and opportunities – some save and some borrow and some save by reducing debt

Since reducing some debt isn't taxed, by doing this, one earns a much higher after-tax return than the others However, it is not clear how one can aggregate these different individual rates into a single SRTP?

Because, simultaneously many individuals is paying mortgages, buying government bonds and stocks and borrowing on credit cards at high interest rates, it is unclear whether individuals have a single MRTP

Efficiency is harmed as $p_z < r_z$, use of p_z as the SDR may serve as a justification for a very long-term investments providing low returns at the expense of higher-returns in the private sector thereby harming efficiency

Using the government's borrowing rate (i)

It is relevant to use government's long-term borrowing rate, i, when it reflects the government's actual cost of financing a project

Numerical Values of i

Starting with the average monthly yield on a 10-year US Treasury bonds for the period between April 1953 and December 2001 and then adjusting for inflation yields a value for i of 37 percent, with a plausible range for sensitivity tests of 3 to 5 percent

Criticisms of the Calculation and Use of i

The use of i as the SDR is justified only if project beneficiaries pay the needed taxes to retire the government's loan, which is unlikely

The US cannot borrow at an unchanging real interest rate

Government's borrowing would raise real interest rates and crowd-out some of the private sector investment

The use of i as the SDR would be the most reasonable option if all the government's borrowed funds were foreign, yet this is unlikely

Using the Weighted Average Approach (WSOC)

Suppose *a* is the proportion of a project's resources that displaces private domestic investment, *b* is the proportion of the resources that displaces domestic consumption and 1-*a*-*b* is the proportion of the resources that are funded by borrowing from foreigners This approach, called the weighted social opportunity cost of capital (WSOC), computes the social discount rate as the weighted average of r_z, p_z, and i More specifically,

$$WSOC = ar_z + bp_z + (1 - a - b)i$$

As $p_z < i < r_z$, it follows that $p_z < WSOC < r_z$
Obviously, the previous methods are special cases of this more general approach

Numerical Values of WSOC

In case a project is funded by taxation, which is the usual case, *b* would be large and *a* and (1-*a*-*b*) would be small and the value of the WSOC would be similar to the value of p_z (ie, 15 percent)
If the project is financed by debt, then *b* would be very small and the value of the WSOC would be between r_z (45 percent) and i (37 percent)

Criticisms of the Calculation and Use of WSOC

Reviews about the calculation of p_z and r_z and i also apply to the calculation of the WSOC
In addition, the value of the WSOC depends on the source of a project's funding and thus would vary among projects Governments usually prefer a single discount rate

The shadow price of capital (spc)

If all the resources used in a project displace the current consumption and if the overall benefits generate more future consumption, then the social discount rate should reflect social choices in trading present consumption for future consumption and p_Z would be the natural choice for the discount rate

However, projects could produce costs and benefits in the form of consumption *or* investment
Due to market distortions, the rate at which individuals are willing to trade present for future consumption, p_Z, differs from the rate of return on private investment, r_Z, as previously discussed

Thus, flows of investment should be treated differently from flows of consumption
The shadow price of capital converts investment gains or losses into consumption equivalents These consumption equivalents, like consumption flows themselves, are then discounted at p_Z

The shadow price of capital method requires discounting to be done in four steps:
Costs and benefits in each period are divided into those affecting consumption and those affecting investment
Flows into and out of investment are multiplied by the SPC to convert them into consumption equivalents
Changes in consumption are added to changes in consumption equivalents
The resulting amounts are discounted at p_z

A general expression for the shadow price of capital is:

$$SPC = \frac{(r_z + \delta)(1 - f)}{p_z - r_z f + \delta(1 - f)}$$

where r_z is the net return on capital after depreciation, δ is the depreciation rate of the capital invested, f is the fraction of the gross return on capital that is reinvested, and p_z is the marginal social rate of time preference

Numerical Values of the SPC

Estimates of r_z and p_z (45 percent and 15 percent, respectively) are provided above For reasons discussed in the text, 17 percent appears to be a reasonable estimate of f and 100 percent seems to be a reasonable estimate of δ Using these values and equation (1011), the SPC equals 13 For sensitivity tests, a value of 147 should be used if p_z is set equal to 10 percent and 121 if p_z is set equal to 20 percent

Using the SPC

It is unnecessary to apply the SPC if any of the following conditions hold: (1) the project is strictly funded by taxation; (2) the supply of foreign funds is extremely responsive to the interest rate; (3) the project is small; (4) the percentage of costs and benefits that comes from investment is the same in every period
Under such circumstances, which are likely to approximate many situations, simply discounting with p_z is appropriate

On the other hand, if a project is entirely or partially financed by debt and the supply of savings and foreign funds are assumed to be very unresponsive to the interest rate, then the displaced investment flows should be converted to their consumption equivalents using the SPC before discounting at p_z

Criticisms of the Calculation and Use of the SPC

This method is theoretically appropriate, although:
It is difficult to explain to policymakers how and why NPV calculations are made
The method has heavy information requirements in comparison to other discounting approaches
The allocation of costs and benefits to investment and consumption is fairly subjective and open to manipulation
The value of the SPC depends on the values of p_z and r_z and can be the subject of criticism regarding the determination of these parameters

Using the optimal growth rate approach to discounting

The text provides evidence that capital markets are imperfect and that individual consumers do not behave as assumed by the standard economic model of intertemporal choice hence, that market interest rates do not reflect well the individual preferences

This suggests market interest rates may not provide appropriate values for the SDR
In addition, it is sometimes argued that, at best, market interest rates only reflect the preferences of those currently alive and thus fail to account appropriately for the effects of long-term projects on future generations

If market rates do not provide an appropriate basis for determining the SDR, it can instead be derived by using the optimal growth rate approach

Numerical values of p_x

As discussed earlier, the SDR based on the optimal growth rate method, p_x, can be computed from the following formula: $p_x = d + ge$
where,
d = the pure rate of time preference
g = the growth in per capita consumption
e = the absolute value of the rate at which the marginal value of consumption declines as per capita consumption increases

The authors of the text estimate that real consumption per capita grew at 23 percent per annum between 1947 and 2002 Basing themselves on values proposed by other economists, they set e = 1 and d =1 percent

These values imply that p_x = 33 percent
Using alternative values for g, e, and d suggests a range for p_x going between 20 and 50 percent for sensitivity analysis

If p_x, rather than p_z, is used as the SDR, the shadow price of capital must be recomputed For example, if p_x = 35 percent, r_z = 45 percent, f = 17 percent, and δ = 10 percent, then the SPC = 109

Criticisms of the calculation and use of the optimal growth rate

The estimate of g used to compute p_x may be inaccurate

The selection of the values for d and e depends on value judgments

If funds for a public sector investment would crowd out private sector investments *and* the private sector investments would reap greater returns than the public sector investment, then the private sector investments would improve social welfare more than the public sector investment This, even if the NPV computed on the basis of p_x is positive

Intergenerational discounting

So far we've discussed only constant (time-invariant) SDRs However, there are at least four reasons for using a time-declining SDR instead:
Empirical evidence suggests that people use lower discount rates for events that occur further into the future
Long-term environmental and health consequences have very small present values when discounted by using a constant rate because often this implies the spending of a relatively small amount today in order to prevent a costly disaster that may occur several centuries later, which is not cost-beneficial
Constant rates do not appropriately take into account the preferences of future such as thoses of future generations
Constant rates do not appropriately allow for uncertainty as to market discount rates in the future The text demonstrates that tolerating this uncertainty implies the use of lower and lower discount rates in order to discount consumption flows occurring father and farther in the future

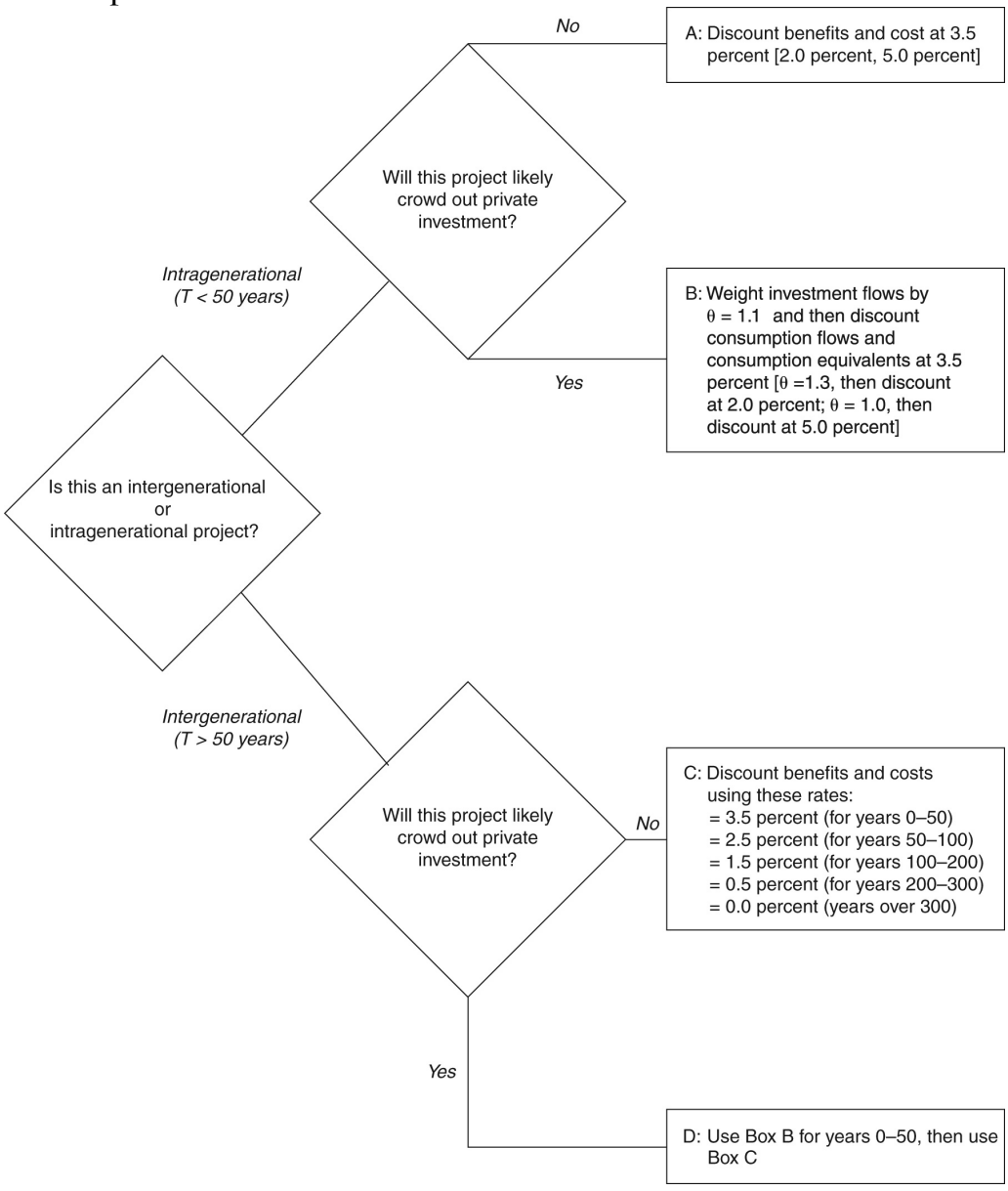
Numerical values for time-declining discount rates
Based on research by Newell and Pizer, the text suggests the two following time-declining rate schedules The first is based on the social marginal rate of time preference The second is based on the optimal growth rate model;

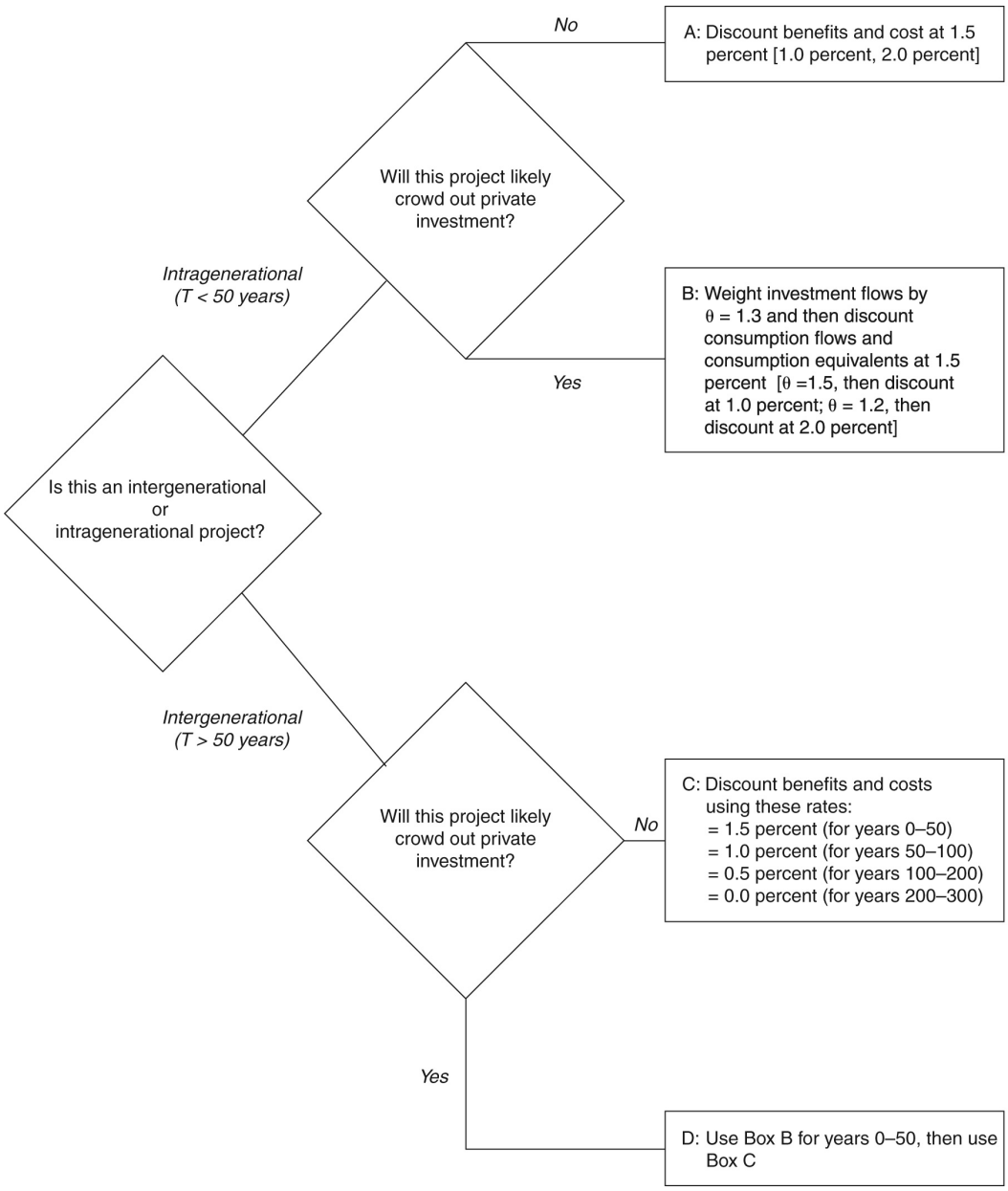
Year	$\mathbf{p_z}$	$\mathbf{p_x}$
0 - 50	15 percent	35 percent
50-100	10 percent	25 percent
100-200	05 percent	15 percent
200-300	00 percent	05 percent
Over 300	00 percent	00 percent

Recommended social discount rates

Figures 5 and 6 summarize the text's recommendations concerning the social discount rate As illustrated by the two following figures, the discount rate as well as upper and lower bounds for sensitivity tests depend on:
Whether the optimal growth rate approach (Figure 5) or the market-based interest rate approach (Figure 6) is preferred

Whether the project is intergenerational (defined as having benefits or costs that would occur at least 50 years in the future) or intragenerational
Whether funding the project is likely to crowd out private investment or consumption





The social discount rate in practice

Discounting practices in government vary enormously Many government agencies do not discount at all Often the discount rate is prescribed by government review and monitoring agencies (eg, OMB, CBO)

In the US and Canada, prescribed rates have gone up to 10 percent however since then, they are trending lower

OMB now uses 7 percent CBO uses lower rates; it favors the MRTP approach and uses 2 percent (based on the US Treasury borrowing rate), with sensitivity tests based on 00 and 4 percent

The GAO favors the average nominal yield on Treasury debt maturing between one year and the lifetime of the project, minus the forecast rate of inflation

In 2003, the British Treasury recommended using an SDR of 35 percent, which is based on the optimal growth rate method It also recommended using a time-declining discount rate for projects with effects likely to occur 30 years after

CHAPITRE - VALUING IMPACTS FROM OBSERVED BEHAVIOUR: INDIRECT MARKET METHODS

Introduction

Generally estimation of change in social surplus requires knowledge of entire demand and supply schedules. In practice the change in social surplus can often be estimated from knowledge of the impact of a policy (egg number of affected persons) and the marginal social benefit or the marginal social cost of one more unit of the affected good or service

In a perfect market, the market price equals both the marginal social cost and the marginal social benefit of an additional unit of good or service. When a market does not exist or market failure leads to a divergence between market price and marginal social cost, analysts try to obtain estimates of what the market price would be if the relevant good were traded in a market where the demand curve measured marginal social benefits and supply curve measured marginal social costs Such ands estimate is a *shadow price*

When a market for the good of interest does not exist, one of two major methods of estimating shadow price can be used.

This chapter recognized that although there may not be a market for the good or service of interest, its value (shadow price) may be reflected indirectly in markets for one or more other related goods. Through statistical analysis of these other markets we can estimate the value of the non marketed good.

The second way to estimate a shadow price is to use *contingent valuation* (survey) methods with are discussed in the following chapter.

The *indirect market method* discussed in this chapter are based on observed behaviour that is *revealed preference*. Basing valuation on observed behaviour is important because it means that people reveal their preferences without having to be asked. As we discuss in the following chapter, *contingent valuation (survey*) methods *rely on stated preferences and are prone to a number of biases*.

The chapter begins with a discussion of using information from private-sector markets to value publicly provided goods (the *market analogy method*). It, then discusses estimation of shadow prices *based on trade offs*. For example, the

trade-off between time and wages to value leisure time or trade-off between salaries and the risk of having a fatal accident to value a statistical life.

All of these methods arc subject *to potential biases* including the *omitted variables problem* and *self-selection bias*. After discussing these problems we turn to the hedonic price method which attempts to overcome them. We then discuss the *travel cost method* and finally the *defensive expenditures method*.

Some of these methods involves estimation of the whole demand or supply curve whereas others provide only an estimate of the shadow price. This chapter focuses on methods of estimation

2. Market analogy Methdod

Governments supply many goods that are also provided by the private sector For example housing campsites university education home care and adoption service are often provided by both the public and the private sectors. The government usually provides these services free or at significantly below market prices. However it may be possible to estimate the demand curve for a government-provided good using data on an analogous good that is produced by the private sector and sold in a well-functioning market.

In some situations the private market may not be legal. For example some countries have no legal private sector adoption services. Nevertheless analysts may turn the black marker to obtain an estimate of the value of such service.

2.1. Using the Market Price of or Expenditures on an Analogous Good

Consider for example a local government project that provides housing for 50 families. The local government may charge a nominal rent of $200 per month so that government revenue equals $10000 per month. Clearly, using this expenditure all families would be willing to pay $200 per month or more and therefore the benefits of this project would be larger than $10000 per month.

Suppose that comparable units in the private sector charge rent of $500 per month we took this market price as the *shadow price* for the publicly provided units their the estimated total monthly benefits of publicly provided housing would be $25000 per month.

Using the **market price would be an appropriate estimate of the value of the publicly provided good** if it equals the average amount that users of their publicly provided good would be willingness to pay.

In their case of government allocation at a lower than market price, however, there is no guarantee that those who receive the good value it as highly as do purchasers in the private market. Families willing to pay the market price, or more, for comparable housing might have already found housing in the private sector. Those who occupy public units typically have **lower than average income and are likely to be willing to pay less** than the market prices, through more than the amount charged by government (ie somewhat between $200 and $500 per month).

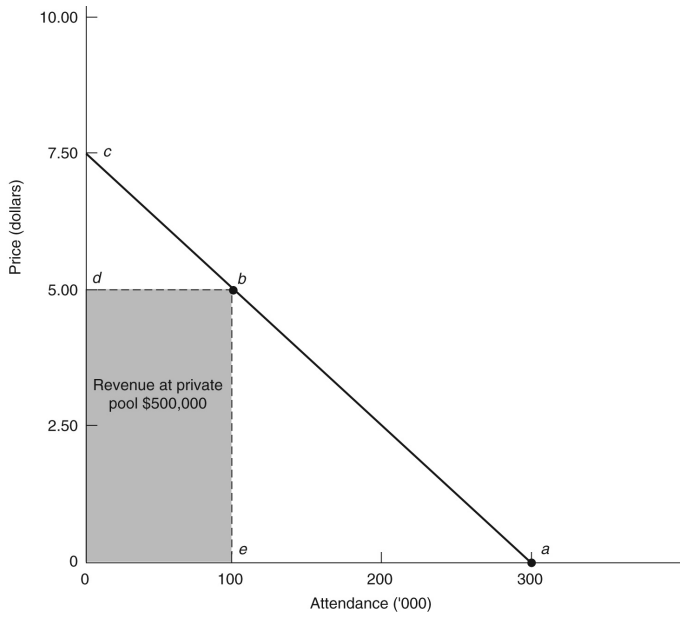
The price of comparable private housing **units might underestimate the value to family** if the publicly provided housing were poorly targeted. Specifically if the units were allocated to (moderately well-off) people who in the absence of obtaining the publicly provided housing would have purchased similar private-sector units at market prices then the market price would be a **lower bound for their willingness-to-pay.** Ironically from the CBA perspective in the absence of market failures the more poorly targeted public housing units are the higher than their benefits.

Such ironies have led some people to suggest that benefits that accrue to low-income persons should be given greater weight than benefits that accrue to high -income persons

2.2 Using Information about an Analogous Private-Sector Provided Good

Suppose a municipal government wants to measure the gross benefits of a swimming pool that it owns and operates. Currently the municipality does not charge an admission fee and the pool receives 300000 visitors per year shown as point a in next figure.

A comparable municipality a privately operated swimming pool charges $5 for admission and receives 100000 visitors per year (point b). Assuming a linear demand curve that passes through these two points thesewe can estimate the gross benefits of the municipal pool as (575)(300000)/2 = Sl125000.



Using revenues at the private pool ($500,000) would underestimate the benefits of the public pool because it omits consumer surplus. It excludes the consumer surplus of those willing to pay more than the $5 the area of triangle cbd, as well as the consumer surplus of those willing to pay something less than $5 but more than $0 the area of triangle bae.

How reasonable is it to interpret the observed price and quantity at the private pool as a point on the demand curve tor the m municipal pool?

The answer depends on the similarity of the two facilities and their markets The pools should be similar in terms of features such as changing room facilities hours of business the friendliness of the staff and levels of crowding and the two communities should be similar in terms of population income and tastes [if these assumptions do not hold then adjustments should be made].

3. The Trade of method

Economists may use the **opportunity cost** -the value of what one gives up to get something- as a measure of its value.

For exemple as we early studied used the after tax wage as the value of travel time saved. The basic is that if you reduce your travel time by an hour then you can increase your incomc by the after-tax wagc rate and vice

versa. Put another way people make trade off between time and money wages and we can use the rates at which they make the trade off to value-to-value time.

Similarly the trade-off people are willing to make between changes in fatality risk ands wages can be used to measure the value of a statistical life.

For example, analysts can examine the trade off people are willing to make between cash expenditure and increased safety from air bags smoke detectors, or other risk reducing goods ands car use this information to impute the value of a statistical life.

One can think about these methods as special cases or extensions of the market analogy method.

For example, the labour market, where people sell their time for wages in an obvious analogous market for time saved. This section first discusses the value for time saved the value of a statistical life save and ends with a discussion of the problems with consumer purchases and wage-risk studies.

3.1 The value of time saved, including the value of travel time saved

This section concerns the trade-of time saved whether that time would have been spent traveling in a queue waiting for provision of a governmental service or some other way.

In the absence of market imperfection the social value of an additional hour of work equals that persons wage rate.
All other things being equal, when people rate also equals the marginal value of their time. In other words, the value of an additional hour of leisure to the person enjoying it equals the wage rate. Thus, the value of a project that saves an hour of a person who who earns $20 per hours both to society ands to that person, is $20.

Setting the calcul of time saved equal to the wage rate is equal relatively easy. However serious problems exist in using the wage rate to value time saved by government projects.

First wages ignore benefits. As benefits are a form of compensation for work, they should be added to wages.

Second this method assumes that people do not work while they are travelling or staying in line.
In practice people can work and drive or fly at the same time. The notebook computer ands the mobile phone facilitates working while flying or driving. If people work while they are traveling or waiting in line, then an hour of such timer saved is worth less than the wage rate.
Of course, this does not apply to truck drivers who are obviously working while they are driving. Fro them it does not make sense to value their time saved at their wage rate plus benefits.

Third, we must take account of taxes. Although it is reasonable to view the value to society of an hour saved for a person who is working at the before-tax wage rate plus benefits, when deciding whether to work, individuals consider the after-tax wage rate plus benefits. Thus, the time saved of people who are not working should be valued at the after-tax wage rate plus benefits.

Fourth, people are willing to pay different amounts to save an hour doing different things.
For example, the value of travel time saved may be less than the value of an hour saved waiting in line.
Some people like traveling, especially through spectacular scenery, such as along the highway from Banff to Jasper.

These people derive consumption benefits from traveling and are willing to pay for the experience of traveling itself. (Consider, for example, the "busman's holiday.").
In contrast, many people dislike waiting in line or in traffic jams and are willing to pay a lot to avoid it. Thus, the value of trine saved depends on what one is doing. Because people generally do not dislike traveling, analysts value an hour of travel time saved for recreational travellers at a fraction (about 45 precent) of the after-tax wage rate plus benefits. In contrast, analysts value an hour of travel tiume saved for people who are working, such as truck drivers, at the before-tax wage rate plus benefits.

Fifth, the wage rate ma y not be an appropriate shadow price for time saved because it assumes **working hours are flexible**. It ignores **structural rigidities** or market and government failures in the labour market. With an

upward-sloping supply curve of labour, the more hours someone works, the more highly that person values leisure. In practice, however, a person ma y not is able to easily adjust the number of hours worked. For example, people who suffer from several weeks of unemployment or who involuntarily work overtime are "off their labour supply curve." Other structural rigidity-ties resulting unemployment. Minimum wages and the monopoly power of unions or other factors may distort the labour market. Consequently, everyone who wants to work at the market wage may not be able to find work at that wage. Indeed, for some people, such as retirees, no wage rate can be observed.

Finally, firms may not pay their employees the marginal social value of their output. For example, firms with market power may share their profits with employees in the form of higher-than-market wages. Of course, if an industry generated negative (positive) externalities, then the wage rate would exceed (be less than) the marginal social value of an hour saved.

Because of the serious nature of these problems, valuing time saved at the wage rate is only a first approximation to its social value.

3.2. The Value of a Statistical life

Valuing lif is a highly contentious issue. Society spends fortunes to rescue trapped miners or to give heart transplant to specific individuals. Yet, it may not spend money to make obvious gains in mine safety or to reduce the risk of heart disease.
In order to make efficient allocation of resources in the health care area or ta determine the benefits of projects that save lives, analysts require a monetary value of a life saved.

Forgone Earnings Method. Early efforts by economists to value life followed a simi-lar method to the one discussed earlier concerning the value of time.

Specifically, if one accepts that a person 's value **to society for one hour equals that person 's wage**. Then one might reason that the value of that person to society for the rest of or her lifetime equals **the present value of his or her future earnings.** One would thus con- clude that the value of a life saved equals **that person's discounted future earnings**. This is the forgone earnings method of valuing a life saved. **It is currently used by the courts in some U.S. states** and in some other countries to award compensation in cases involving death due to negligence.

This method generates a higher value for saving the life of people with higher income than for people with lower incomes. L
It also generate higher values for **younger people than for older people** and for men than for women.

The forgone earnings method provides **unsatisfactory estimates** the of the value of a life saved for reasons similar to those discussed previously concerning the value of time saved. It **assumes full employment**, although the **method can be adjusted to reflect expected lifetime earnings given average employment expectations**. It also assumes people **are paid their marginal social product**, although often they are not. The lives of full **time homemakers** and volunteers who are not paid for their services are unreasonably valued at zero.

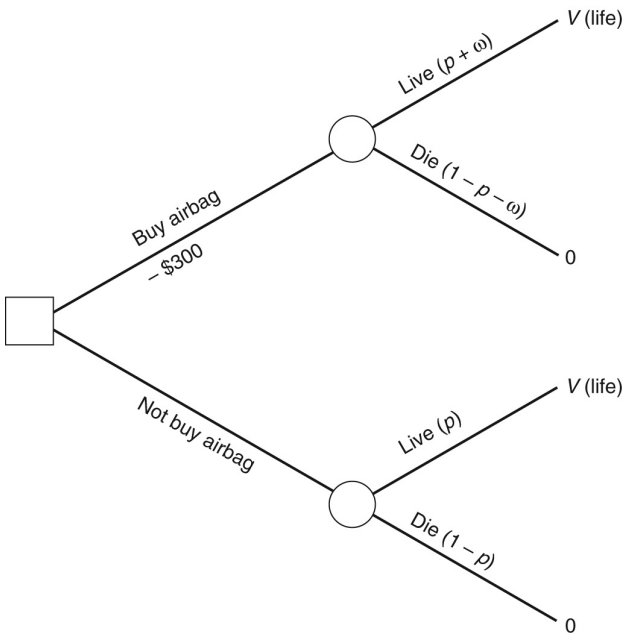
A fundamental problem with the forgone earnings method is that is ignores individuals **willingness-to- pay to reduce the risk of their own deaths**.

This point was made cl early by Thomas Schelling who observed "*there is no reason to suppose that a person's future earnings bear any particular relation to what he would pay to reduce some likelihood of his own death*."

Schelling also distinguished between **the deaths of identifiable individuals and statistical deaths.** A safety improvement to a highway for example does not lead to the saving of the lives of a few individuals who can be identified ex ante but rather to the reduction in the risk of death (or injury) to all users of the highway.

In order to value the benefit of proposed safety improvements, analyses should ascertain **how much people are willing to pay for a reduction in their risk** of death that are of the same magnitude as the reduced risk that would result from the proposed safer improvements.

Simple Consumer Purchase Studies. Suppose airbags were not standard in new cars, but for $300. You could purchase and install an airbag at the time you purchased your new car. The airbag would increase your suïvivai rate from use of the car from p to p + w. Would you buy the airbag? This problem is represented as a decision tree in Figure 2. If a person is indifferent between the two a lternatives,



that is is indifferent between spending the $300 and increasing the p probability of surviving by w (the upper branch alternative) and not spending the $300 (the lower-branch alternative). Then:

(p +w)V(life) - $300 = p V(life)
(p +w)V(life) - pV(life) = S300
wV(life) = $300
V(life) = $300 /w

Suppose w=1/10,000; that is if 10.000 people buy airbags then one statistical life will be saved. Then for a person who is indifferent:

V(life) = ($300)/(1/10.000) = $3 million

This method has been applied not only to the purchase ot airbags but also to the purchase of other safety enhancing devices such as smoke detectors and fire extinguishers.

Simpie Labor Market Studies. **S**imple labor market studies examine the additionnal wage people require in compensation for exposing themselves to greater risk of heat on the job (job fatality risk). Suppose for example one type of construction job has a 1/1,000 greater chance of fatal injury in a year than another type of construction job . Further suppose that the riskier

job offers a salary that is $3,500/year higher than the safer job. If workers are indifferent between these two types of job, then this implies:

(1/1,000) V(life) = $3,500
V(life) = $3.5 million

ln general, if $a is the amount workers are willing to accept in order to compensate for greater risk, and w is the change in fatality risk, then the VSL is given by:

$$VSL = \frac{\$a}{w} \qquad (1)$$

4. Problems with Simple Consumer Purchase and Wage-Risk Studies

One problem with simple consumer purchase and wage-risk studies is that they **assume workers have full information** concerning the risks, that is, w.

For example, in addition to knowing that the chance of dying in a risky job is 1/1,000 higher than in the less risky job, workers have to know what this means.

Second. Evidence that we discuss in previous suggests **that people suffer from cognitive biases that limit their ability to make rational judgments in such situations**. For example, some studies suggest that people over estimate the occurrence of low-probability "bad" events.

When people suffer from this cognitive bias, **labor market studies overestimate the value of life**. If **workers underestimate the fatality risk of a job, then they will accept a lower risk premium** to perform that job, and the VSL will be underestimated.

At the same time, however, people who are relatively less risk averse (more risk seeking) self-select into more risky jobs. The mean fatality risk in recent VSL studies ranges from between about 4 in 100,000 to 22 in 100,000.

However, the average U.S. fatality rate for all occupations is about 4 in 100,000. **Consequently, risk-averse individuals may be underrepresented in wage-risk studies**, which would cause such studies to **underestimate** the VSL.

A third problem is that researchers may not have an accurate measure of the difference in fatality risk faced by different workers or consumers. Many U.S. wage-risk studies use data from the Bureau of Labor Statistics, which are aggregated to the industry level.
These data do not reflect the actual difference in risk faced by workers in different occupations within the same industry.
For example, a coal miner and a secretary in a coal mining company have quite different fatality risks.
Furthermore, we may be based on currently in accurate historical data. Suppose that in a consumer purchase study $a equals $800 and w equals 0.0002 so that the VSL equals $4 million. Now suppose that there was one more death among 5,000 people, then w would equal 0.0004 and the VSL would equal $2 million.

In general, people **experience diminishing marginal utility for safety**; that is, the value of additional amounts of safety declines as the level of safety increases. The relationship between the willingness-to-pay for increased safety and the level of safety (fatality risk) is probably convex.

The willingness-to-pay for additional amounts of safety depends on both the base level of safety and the magnitude of the change in the level of safety. A validity problem arises if the level of risk in the consumer purchase or wage risk studies used to obtain VSL differs substuantlly from the level of risk applicable to where the policy is being applied.

5. Hedonic pricing method

The **hedonic pricing method** sometiome called **the hedonic regression method** offers a way toovercome the **omited variable problems** ans **self selection biais** that arise in the relatively simple valuation methdodss discusses earlier.

Most recent wage risk studies for valuing a statistivcal life (also called labor maket studies) apply hedonic regression method.

5.1. Hedonic regression

Suppose for example that scenic views can be scaled from 1 to 10 and that we want to estimate the benefits of improving the quality level of scenic views in an area by one unit.
We could estimate the relationship between individual's house prices ands the level of their scenic views. But we know that the market value of house depends on other factors such as the size of the lot, which is probably correlated with the quality of scenic view. We also suspect that people who **live in house with good scenic views tend to value scenic views more** than other people?
Consequently, **we would have an omitted variables problem and self-slection biais.**

The hedonic method pricing attempts **to overcome both of the types of problems.**

It consists of two steps.
The first estimae the effect of marginal better scenic view on the value (price) of house, a slope parameter in a regression model while controlling for other variables that affect house prices.

The second step estimates the willingness to pay for a scenic view after controlling for "tastes" which are a proxy of income and other socioeconornic factors.
From this information, we can calculate the change in consumer surplus resulting from projects that improve or worsen the views from some houses.

The hedonic pricing method can be used to **value an attribute**, or a change in an attribute, whenever its **value is capitalized into the price of an asset**, such as houses or salaries.

The first step estimates the relationship between the price of an asset and all of the attributes (characteristics) that affect its value.
The price of a house, P, for example, depends on such attributes as the quality of its scenic view, VIEW, its distance from the central business district, CBD, the lot size, SIZE, and various characteristics of its neighborhood, NBHD, such as school quality. A mod of the factors affecting house prices can be written as follows:

$$P = f(CBD, SIZE, VIEW, NBHD) \quad (2)$$

This equation is called a **hedonic price function** or **implicit price function**.

The change in the price of a house that results from a unit change in a particular attribute (i.e., the siope) is called the hedonic price, implicit price, or rent differential of the attribute.

In a well-functioning market, the **hedonic price can naturally be interpreted as the additional cost of purchasing a house that is marginally better in terms of a particular attribute**.

For example, the hedonic price of scenic views, which we denote as r_V measures the **additional cost of buying a house with a slightly better** (higher-level) scenic view.

Sometimes hedonic prices are referred to as marginal hedonic prices or marginal implicit prices. Although these terms are technically more correct, we will not use them in order to make the explanation as easy to follow as possible.

Usualy analysts assume the hedonic price function has **a multiplicative functional form,** which **implies that house prices increase as the level of scenic view increases but at a decreasing rate.**

Assuming the hedonic pricing mode represented in equation (2) has a multiplicative functional form, we can write:

$$P = f(\beta_o CBD^{\beta_1} SIZE^{\beta_2} VIEW^{\beta_3} NBHD^{\beta_4} e^{e}) \qquad (3)$$

The parameters β are elasticities. They measure the proportional change in bouse prices that results from a proportional change in the associated attribute. We expect $B_1 < 0$ because house prices decline with distance to the CBD, but $B_2 > 0$ $B_{3>0}$ because $B_4 > 0$ house prices increase as SIZE, VIEW, and NBHD increase.

The hedonic price of a particular attribute is the slope of equation (2) with respect to that attribute. In general, the hedonic price of an attribute may be a function of all of the variables in the hedonic price equation.

For the multiplicative model in equation (3), the hedonic price of scenic views, r_V is :

$$r_V = \beta_3 \frac{P}{VIEW} > 0 \qquad (4)$$

In this model, the hedonic price of scenic views depends on the value of the parameter β_3 the price of the house, and the view from the house.

Thus, it varies from one obser vation (house) to another.

Note **that plotting this hedonic price against the level of scenic view provides a downward sloping curves which implies that the implicit price od scenic views declines as the lecvel if the view increases.**

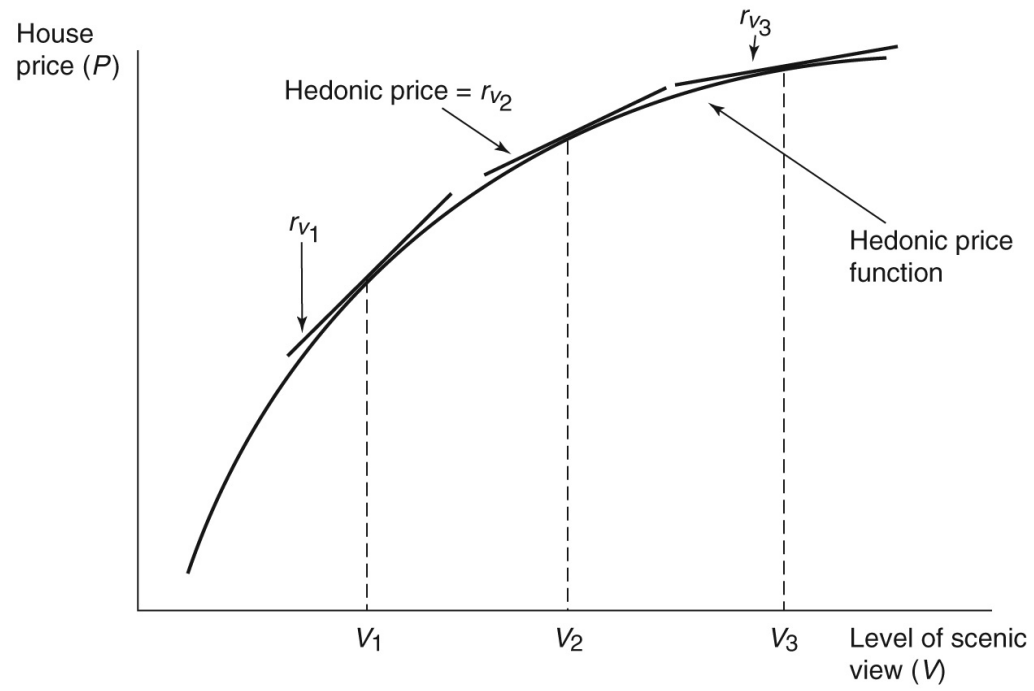
The preceedint points are illustrated n next figure.

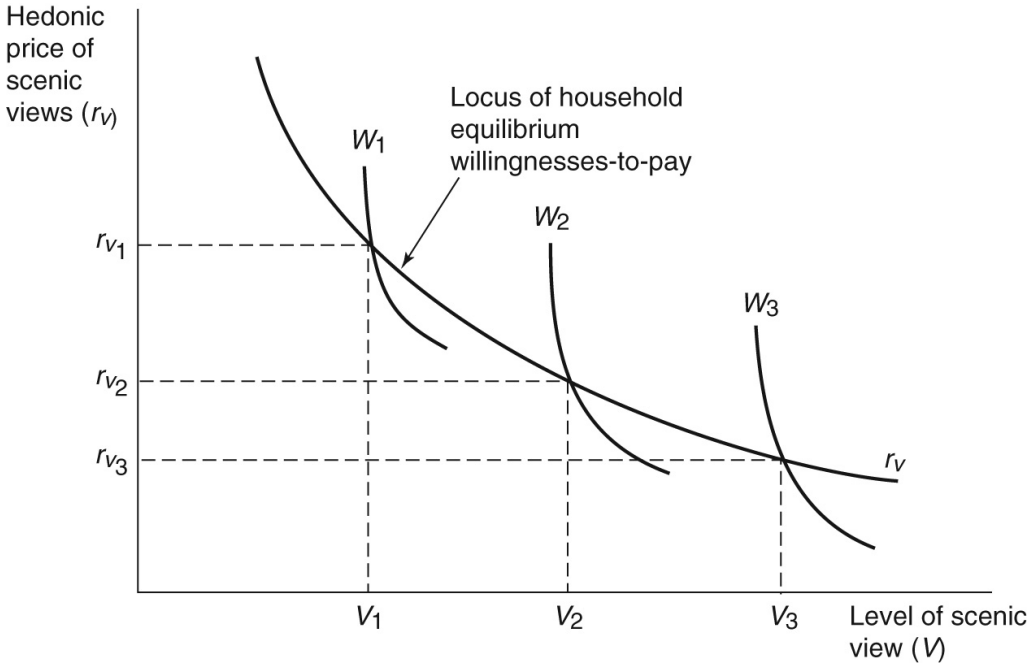
The top panel shows and illustrative **hedonic price function** with house prices increasing as the level of scenic view increases but at a decreasing rate.

The **slope of this curve, which equals the hedonic price of a scenic view decreases as the level of scenic view increase**.

The bottom panel shows more precisely the relationship between the hedonic price of scenic views (the slope of the curve in the top panel ant the level of scenic view.

In a well-functioning market utility maximising housholds **will purchase house so that their willing ness to pay for a marginal increase in a** attribute equals its hedonic price. **particular.**


House price (P)
r_{V3}
Hedonic price = r_{V2}
r_{V1}
Hedonic price function
V_1
V_2
V_3
Level of scenic view (V)


Hedonic price of scenic views (r_V)
Locus of household equilibrium willingnesses-to-pay
W_1
W_2
W_3
r_{V1}
r_{V2}
r_{V3}
r_V
V_1
V_2
V_3
Level of scenic view (V)

Consequently, in equilibriurn, the hedonic price of an attribute can be **interpreted as the willingness of households in increase in that attribute**.

The graph of the hedonic price, against the level of scenic view is shown in the lower panel of Fig1 al households have identical incarnes and tastes. This curve can t ho usehold in verse demancl curve for scenic views.

Yet, households **differ in their incarnes and taste**. Some are willing to pay a considerable amount of money for a scenic view: others are not.

This brings us to the second step of the hedonic pricing methdod. To account for different tastes and income one should estimate the following willingness-to-pay fonction (inve for scenic views:

$$r_W = W(VIEW, Y, Z) \tag{5}$$

where r_W, is estirnated from equation (4), Y is household income, ands Z is a vector of household characteristics that reflects tastes (e.g.. socioeconomic age. and family size).

Three **willingness-to-pay functions** denoted W_1, W_2, W_3 for the three different types of households are drawn in the lower panel.

Equilibria occur wherethese functions intersect the r_V function. Thus when socioeconomic characteristics differ, the r_W fonction is the locus of housholds elibrium willingnesses-to-pay for scenic views.

Using the methods described in a previous chapter it is straightforward (5) to calculate the change in consumer surplus to a household the level of scenic view. These changes in individual household can be aggregated across all households to obtain the total change in consumer surplus.

5.2 Usi ng Hedonic Models to Determine the VSL

The simple forrns of consumer purchase and labor market studies to value life that we described previouslv may result in biased estimates due to omitted selection problems.

For example, labor markets studies to value life that examine fatality risk (the risk of death) often omit potentially relevant variables such as injury risk (non fatal injury risk). Using the hedonic pricing method may reduce this problem.

For example a researcher might estimate the following non linear nic price odf fatality risk:

$$\ln(wagerate) = \beta_0 + \beta_1 \ln(fatalityrisk) + \beta_3 \ln(jobtnenure) + \beta_4 \ln(education)\beta_1 \ln(age) + e \quad (6)$$

The inclusion of injury risk job tenure education and age in the controls for variables that affect wages and would bias the estimated they were excluded.

Using the procedure demonstrated in the precedent section analyst can convert the estimate of β to a hedonic price of fatality risk and can then estimate individuals willingness-to-pay to avoid fataility risks.

5.3 Problems with Hedonic Models

In theory, the hedonic pricing method can be used to determine the shadow price of man y goods th at are not traded in well-developed markets such as externalities and pu blic goods.

In practice, there are many **potential problems** some of which were discussed earlier in the section on problems with simple consumer purchase and wage-risk studies and are not repeated here.

First, people must know and **understand the full implicaüons of the externality** or public good. For example, in order to use the hedonic pricing method to value pollution, families should know prior to the purchase of their house. The level of pollution to which it is exposed and should also know the effect of different pollution levels on th eir health. In the case of hedonic wage-risk studies, worke rs must correctly perceive the actuai risks.

W. P Jennings and A Kinderman observe that the rate of occupational fatalities in most industries bas fallen roughly 95 percent since 1920 and is now one-third of the rate of accidental deaths in the home. They argue that **the current fatality rates are so low and their individual causes so often random that statistical attempts to measure how fatalities affect wages are un likely to meet with success.**

Second it is important that the hedonic equations, such as equation (3) or equation (6), include conectly-measured variables **as opposed to more readily obtainable but incorrect proxies.**

For example house values may depencd on the quality of construction. As this variable is difficult to determine without inspection the researcher may use the year of construction as a proxy for quality.
In econometrics, this problem is referred to as the **errors in variables problem.**

Third if the hedonic pricing model **is linear**, then the hedonic price of each attribute **is constant which would make it impossible to estimate the inverse function, such as equation** (5).

Fourth markets should contain many different houses so that the families can find an **optimal package** that is mbination of attributes.
In other words there should be sufficient variety so that familyes can find a house that permit them to reach an equilibrium. This would be a problem if, for example, w pollution when only big houses are low pollution.

Sixt, the method assumes that market prices adjust immediately to changes in atrbutes and in all other factors that affect demand ans supply?

6. Travel cost methdod

Suppose that we want to estimate the value of a particular recreational site. We expect that the quantity of visits demanded by an individual, q, depends on its price,p, the price of substitutes, Ps' the person's income, Y, and variables that reflect the person's tastes, Z:

$$g = f(p, ps, Y, Z) \quad (7)$$

The clever insight of the TCM is that although admission fees are usually the same for all persons (indeed, they are often zero), the total cost faced by each persan varies because of differences in travel costs. Consequently, usage also varies, thereby allowing researchers to make inferences about the demand curve for the site.

The full price paid by visitors to a recreational site includes the opportunity cost of time spent traveling, the operating cost of vehicles used to travel, the

cost of accommo- dations for overnight stays while traveling or visiting, parking fees at the site, and the cost of admission. The sum of all of these costs gives the total cost of a visit to the site. This total cost is used as an explanatory variable in place of the admission price in a model similar to equation (7).

Estima ting such a model is conceptually straightforward. First, select a random sample of households within the market area of the site. These are the potential visi- tors. Second, survey these households to determine their numbers of visits to the site over some period of time, their costs involved in visiting the site, their costs of visiting substitute sites, their incarnes, and their other characteristics that may affect their demand. Third, specify a functional form for the demand schedule and estimate it using the survey data.

It is important to emphasize that when total cost replaces price in equation (7), this equa tion is not the usual demand curve that gives visits as a function of the price of admissi on. However, as we show next, such models can be used to derive the usual market demand curve and to estimate the average willingness- to- pay for a visit.

6.1 Zonal travel cost

With the *zonal travel cost method*, researchers survey actual visitors at a site rather than potential visitors. This is often more feasible and less expensive than surveying potential visitors. Also, the level of analysis shifts from the individual (or household) to the area, or zone, of origin of visitors, hence the name zonal travel cost method.

The zonal TCM requires the analyst to specif y the zones from which users of the site originate. Zones are easily formed by drawing concentric rings or iso- time lines around the site on a map. Ideally, households within a zone should face similar tra vel costs as well as have similar values of the other variables that would be included in an individual demand fonction, including similar prices of substitutes, similar incarnes, and similar tastes. If residents from different regions within a zone have quite different travel costs, then the zones should be redrawn. In practice, analysts often use local government jurisdictions as the zones because they facilitate the collection of data. Assuming a constant elasticity functional form leads to the following regression model:

$$\ln\left(\frac{V}{POP}\right) = f3o + /3i\, lnp + f32 lnps + [34\bar{y} + f35\bar{Z} + \varepsilon \quad (13.8$$

where V is the number of visits from a zone per period; POP is the population of the zone; and p , p , Y, and Z denote the average values of p, p,Y, and Z in each zone, respectively.

Note that the quantity demanded is expressed as a visit rate. An alternative specification is to estimate the quantity demanded in terms of the number of visits, V, but to include population, POP, on the right-hand side of the regression equation. Although both specifications are plausible, the specification in equation (8) is less likely to involve heteroscedasticity problems and is, therefore, more likely to be appropriately estimated by OLS.

Using estimates of the parameters of equation (8), it is possible to estimate the change in consumer surplus associated with a change in the admission price to a site, the total consumer surplus associated with the site at its current admission fee, and the average consumer surplus per visit to the site.

We illustrate how to do this using an example for a hypothetical recreational wilderness area, using the basic data presented in Table 1. This illustration assumes there are only five relevant zones from which people travel to the recreational site. To avoid unnecessary complications, we assume that demand depends directly only on total price, not on incarne, the prices of substi- tutes, or any other variable.

TABLE 13-1 Illustration of the Travel Cost Method

Zone	*Travel Time (hours)*	*Travel Distance (km)*	*Average Total Cost per Person ($)*	*Average Number of Visits per Person*	*Consumer Surplus per Person*	*Consumer Surplus per Zone ($ thousands)*	*Trips per Zone (thousands)*
A	0.5	2	20	15	525	5,250	150
B	1.0	30	30	13	390	3,900	130
C	2.0	90	65	6	75	1,500	120
D	3.0	140	80	3	15	150	30
E	3.5	150	90	1	0	0	10
Total						10,800	440

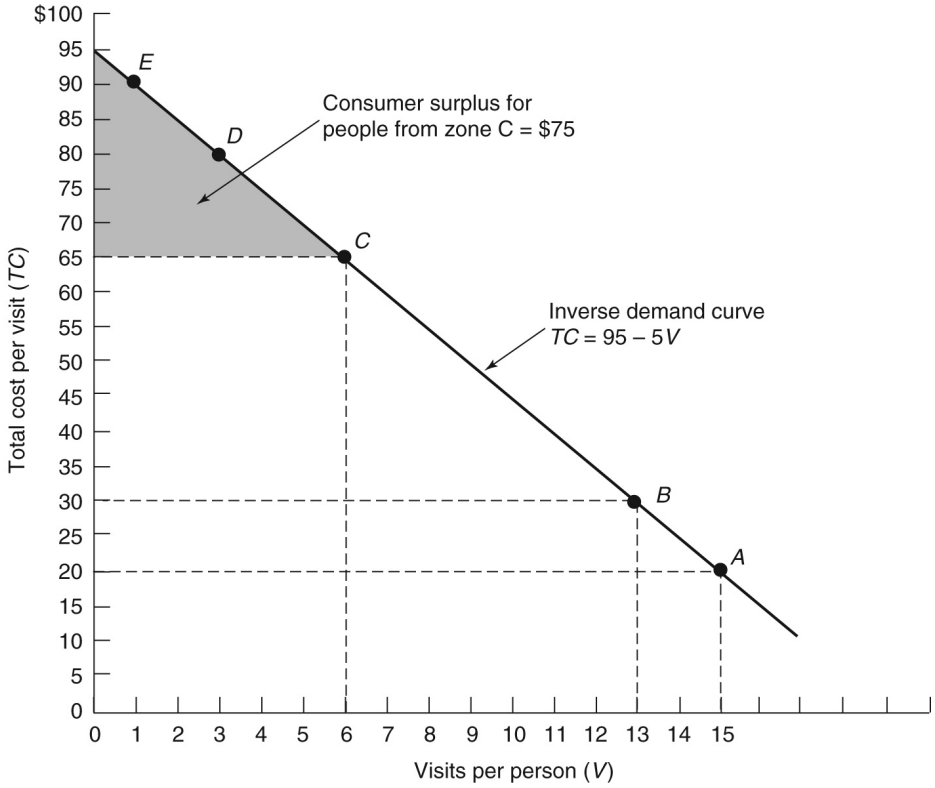
In this example, the value of time for residents from different zones varies due to different incarne levels in different zones, as well as different travel times. Zone A is adjacent to the recreational area. Residents from zone A can, on average, pack up their equipment, drive to the site, park, and walk to the entrance in approximately one-half hour. Assuming the opportunity cost of

their time is $9.40/hr and marginal vehicle oper- ating costs are 15 cents/km, their total travel costs are $10 per round trip. Adding the admission fee of $10 pcr day yields a total cost of $20 per visit. Local residents make 15 visits each year, on average. Zone B is about 30 km away, requiring two hours of total travel time (including driving, parking, walking, and loading and unloading vehicles) for a round trip. Assuming the value of time for residents of zone B is $5.50/hr and they travel individually, total costs per visit are $30. Zone B residents make 13 visits per year on average. Zone C is about 90 km away, requiring two hours of total travel time in each direction. Assuming the value of their time is $10.35/hr on average, and that travel costs are shared between two people in each vehicle, total costs per persan are approximately $65 per visit. Zone C residents make six visits per year on average. Zone D residents live on the other sicle of the metropolitan area and, on average, make three visits each year.

Assuming that their average wage rate is $8/hr and that two persons travel per vehicle, their per-person cost is $80 per visit. Zone E residents have to cross an international border. Though the distance is only slightly farther than from zone D, it takes almost one-half hour to get through customs and immigration. The average zone E wage is $8/hour. Assuming two persons per vehicle, the per-person cost is $90 per visit. On aver- age, visitors from zone E make only one visit per year.

The data for average total cost per person (TC) and average visits per person (V) are represented graphically in Figure 13-4.The equation TC = 95-5V fits the data for zones A through E perfectly. (In practice, ordinary least squares would be used to fit a line to data points that would not all lie exactly on the line.) This equation is the "representative" individual's inverse demand curve: It shows how much a typical visi- tor is willing to pay for a visit to the recreational area (specifically, $90 for the first visit , $85 for the second visit, . . . , $20 for the fifteenth visit).

Different individuals face different prices (costs) for their visits depending on their zone of origin. It is cheaper for those who live doser. Therefore, individuals' consumer surplus varies according to their zone of origin. The consumer surplus for a particular visit from a particular zone equals the difference between how much someone is willing to pay for that visit, given by the point on the "representative" individual's inverse.


$100
95
90
85
80
75
70
65
60
55
50
45
40
35
30
25
20
15
10
5
0
E
D
C
B
A
Consumer surplus for
people from zone C = $75
Inverse demand curve
TC = 95 – 5V
Total cost per visit (TC)
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
Visits per person (V)

demand curve, and how much the persan actually pays for a visit from that zone. As mentioned previously, "representative" visitors are willing to pay $90 for their first visit, $85 for the second, . . . $65 for their sixth.

People from zone C actually pay only $65 for each visit. Consequently, their consumer surplus equals $25 for the first visit , $20 for the second visit, $15 for the third visit, $10 for the fourth visit , $5 for the fifth visit, and $0 for the sixth visit.

The total consumer surplus for someone from zone C is obtained by summing the consumer surpluses associated with each visit across al! visits, which amounts to $75. This amount is represented by the area of the shaded triangle in next Figure. Similarly, the consumer surplus is $525 per persan for residents of zone A, $390 for residents of zone B, $15 for residents of zone D, and $0 for residents of zone E. These amounts are presented in the sixth column of next Table. Clearly, people who live closer to the recre- ational site enjoy more consumer surplus from it than people who live farther away.

From this information and knowledge of the populations of each zone, we can calculate the total consumer surplus per year and the average consumer surplus per visit for the site.

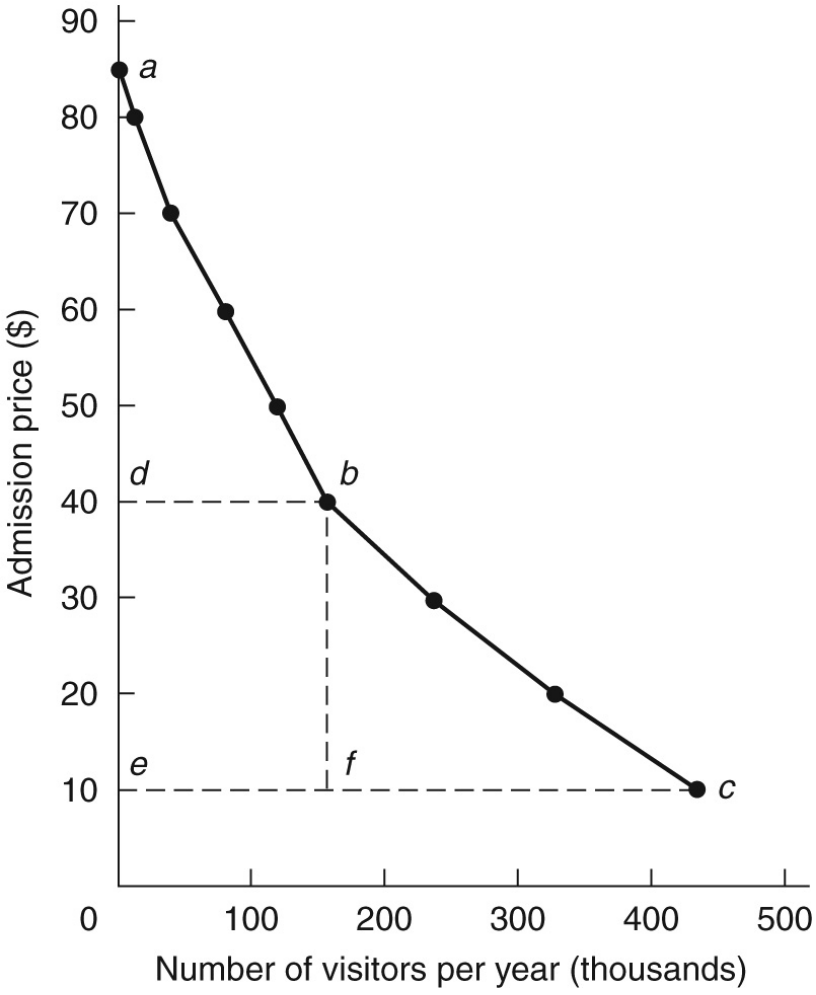
Suppose zones A, B, D, and E have populations of 10,000 people, while zone C has a population of 20,000 people. The consumer surplus per zone is obtained by multiplying the consumer surplus per person in a zone by the population of that zone, as shown in the fif th column in Table. Adding across all zones yields the total annual consumer surplus for the site of $10.8 million. Adding admission fees of $4.4 million indicates that the annual (gross) benefit of the site to all visi tors equals $15.2 million. If the government decided to use the site for some completely different purpose, such as logging, this would be a measure of the lost annual benefits.

The total number of visits to the recreational area is 440,000, as shown in the last column of Table. Dividing the total consumer surplus by the total number of visits gives an average consumer surplus per visit of $24.55. If we now add the admission fee of $10, then we obtain the average demand price per visit, which is the average maxi- mum amount a visitor would pay for a visit to the site. In this example, the average demand price is $34.55.

6.2 Estimating the Market Demand Curve

It is possible to construct the usual inverse market d emand curve from estimation of an equation similar to equation (8) where price is replaced with total cost. For illustra- tive purposes, we continue with the previous example where TC = 95 - SV. Our pur- pose is to derive an equation in which the admission fee is a function of the total number of visits to the site. This curve can then be used to estimate total consumer surplus in the usual way. Unfortunately, because each point on the demand curve has to be estimated separately, precise computation is not straightforward.

To begin, we know two points on the market demand curve. At an admission price of $10, the current admission fee, there are 440,000 visits, represented by point c in Figure 13-5. Now consider how high admission fees can be raised until demand is choked off (equals zero). We know from the representative individual 's inverse demand curve (TC = 95-SV) that the maximum willingness-to-pay (including all costs) is $95. Subtracting the travel cost of users from zone A (who have the lowest travel cost) implies that the maximum willingness-to-pay for admission is $95 - $10 = $85.


90
80
70
60
50
40
30
20
10
0
100
200
300
400
500
Admission price ($)
Number of visitors per year (thousands)
a
b
c
d
e
f

This is the intercept (choke price) of the inverse market demand curve and is repre- sented by point a in Figure.

We can find other points on the market demand curve by assuming that the admis- sion fee is increased or decreased and then predicting the visit rate from each zone at the new price. Suppose, for example, the admission fee were raised from $10 to $20, so that TC increased by $10 dollars. Given that the individual demand curve can be written as V = 19 - 0.2TC (the inverse of TC = 95 - SV), a $10 increase in TC would reduce the number of visits per person by two.Thus, if the admission price were $20, then the predicted number of visits would be 13 for zone A, 11for zone B, 4 for zone C, 1for zone D, and -1for zone E.

Because negative visits are not possible, we set the number of visits per person for zone E to zero. The total number of visits demanded at the new price is com- puted by multiplying the predicted visit rate for each zone by its population and summing these products (13 x 10,000 + 11 x 10,000 + 4 x 20,000 + 1x 10,000 = 330,000).

Thus, at a price of $20 we would expect 330,000 visits. This is a third point on the market demand curve. Other points on the market demand curve can be obtained in the same way. With a sufficient number of points, the mar ket demand curve can be sketched to any desired level of accuracy. The market demand curve in Figure 13-5 is computed on the basis of $10 price increments. The annual consumer surplus for the site is the area between the curve and the current admission fee from zero visits to 440,000 visits. Assuming for simplicity that the demand curve is linear between points a and b, and between points b and c, we estimate the annual consumer surplus of the site equals $12.6 million, and the annual (gross) benefit of the site is $17.0 million.28 Due to the linear approximation and the relatively few points on the demand curve, we slightly overestimate the benefits.

6.3 Limitations of the TCM

The usefulness of the TCM is limited in a number of ways. One limitation is that the TCM provides an estimate of the willingness-to-pay for the entire site rather than for specific features of a site. As we often wish to value changes in specific features of a site (e.g., improvements in the hiking trails), the basic TCM does not provide the needed information. However, if the residents of zones can choose from among a number of alternative recreational sites with

different attributes, then it may be possible to use the hedonic travel cost method to find attribute prices.29 This method treats the total cost of visiting a particular site from a particular zone as a fonction of both the distance from that zone to the site and various attributes of the site. Its application raises a number of issues beyond those previously discussed in the context of the basic hedonic pricing model. Therefore, before attempting to apply the hedonic travel cost method , we recommend consulting other sources.

Measuring the cost of a visit to the site may be difficult. Perhaps the most obvious problem is the estimation of the opportunity cost of travel time, which we have previously discussed.

Even defining and measuring travel costs raises some difficult issues. Sorne analysts include the time spent at the site, as well as the time spent travel- ing to and from it, as components of total price. If people from different zones spend the same amount of time at the site, and if the opportunity cost of their time is similar, then it does not matter whether the time spent at the site is included or not -both the height of the demand curve and total price shift by the same amount for each con- sumer so that estimates of consumer surplus remain unchanged. If, however, people from different zones have different opportunity costs for their time, or if they spend different amounts of time at the site, then including the cost of time spent at the site would change the price facing persons from different zones by different amounts and, thereby, change the slope of the estimated demand curve.

Another problem arises because recreation often requires investment in fairly spe- cialized equipment such as tents, sleeping bags, wet-weather gear, canoes, fishing rods, and even vehicles. The marginal cost of using such equipment should be included in total price. Yet, estimating the marginal cost of using capital goods is usually difficult. As with time spent at the site, however , these costs can be reasonably ignored if they are approximately constant for visitors from different zones.

Multiple-purpose trips also pose an analytical problem. People may visit the recre- ational site in the morning and, for example, go river rafting nearby in the afternoon. Sometimes analysts exclude visitors with multiple purposes from the data. lncluding visitors with multiple purposes is usually desirable if costs can be appropriately appor- tioned to the site being valued. If the apportionment is arbitrary, however, then it may be better to exclude multiple users.

A similar problem results because the journey itself may have value. The previous discussion assumes implicitly that the trip is undertaken exclusively to get to the recre- ation site and traveJ has no benefit per se. If the journey itself is part of the reason for the visit to the site, then the trip base multiple purposes. Therefore, part of the cost of the trip should be attributed to the journey, not the visit to the recreation site.Not doing so would lead to overestimation of site benefits.

A more fundamental problem is that the travel cost variable may be endogenous, not exogenous. One neighborhood characteristic some people consider when making their residential choices is its proximity to a recreational area. People who expect to make many visits to a recreational area may select a particular neighborhood (zone) partially on account of the low travel time from that neighborhood to the recreational area. If so, the number of trips to a particular recreational area and the price of these trips will be determined simultaneously. Under these circumstances equation (8) may not be identified, a problem which we will discuss later.

Another econometric problem is that the dependent variable in the estimated models is truncated. Truncation arises because the sample is drawn from only those who visit the site, not from the larger population that includes people who never visit the site. Application of ordinary least squares to the truncated sample would result in biased coefficients. However, there are more complicated estimation methods that overcome this problem.

There may also be an omitted variables problem. If the price of substitute recre- ational sites varies across zones or if tastes for recreation varies across zones, then the estimated coefficients may be biased if the mode] does not contrai for these variables. As previously discussed, bias results when an excluded variable is correlated with an included variable.

Finally, derivation of the market demand curve assumes that people respond to changes in price regardless of its composition. Thus, for example, people respond to, say, a $5 increase in the admission price in the same way as a $5 increase in travel cost. This presumes that people have a good understanding of the impact of changes in the prices of fuel, tires, and repairs on their marginal travel cost.

7. Defensive expenditures method

If you live in a smoggy city, then you will probably find that your windows often need cleaning. If you hire someone to clean your windows periodically, the cost of this action in response to the smog is termed a defensive expenditure -it is an amount spent to mitigate or even eliminate the effect of a negative externality. Suppose the city passes an ordinance that reduces the level of smog so that your windows do not get as dirty. You would now have to spend less on window cleaners. The reduction in defensive expenditures-the defensive expenditures avoided -has been suggested as a measure of the benefits of the city ordinance. Similarly, the costs of a policy change might be measured by the increase in defensive expenditures.

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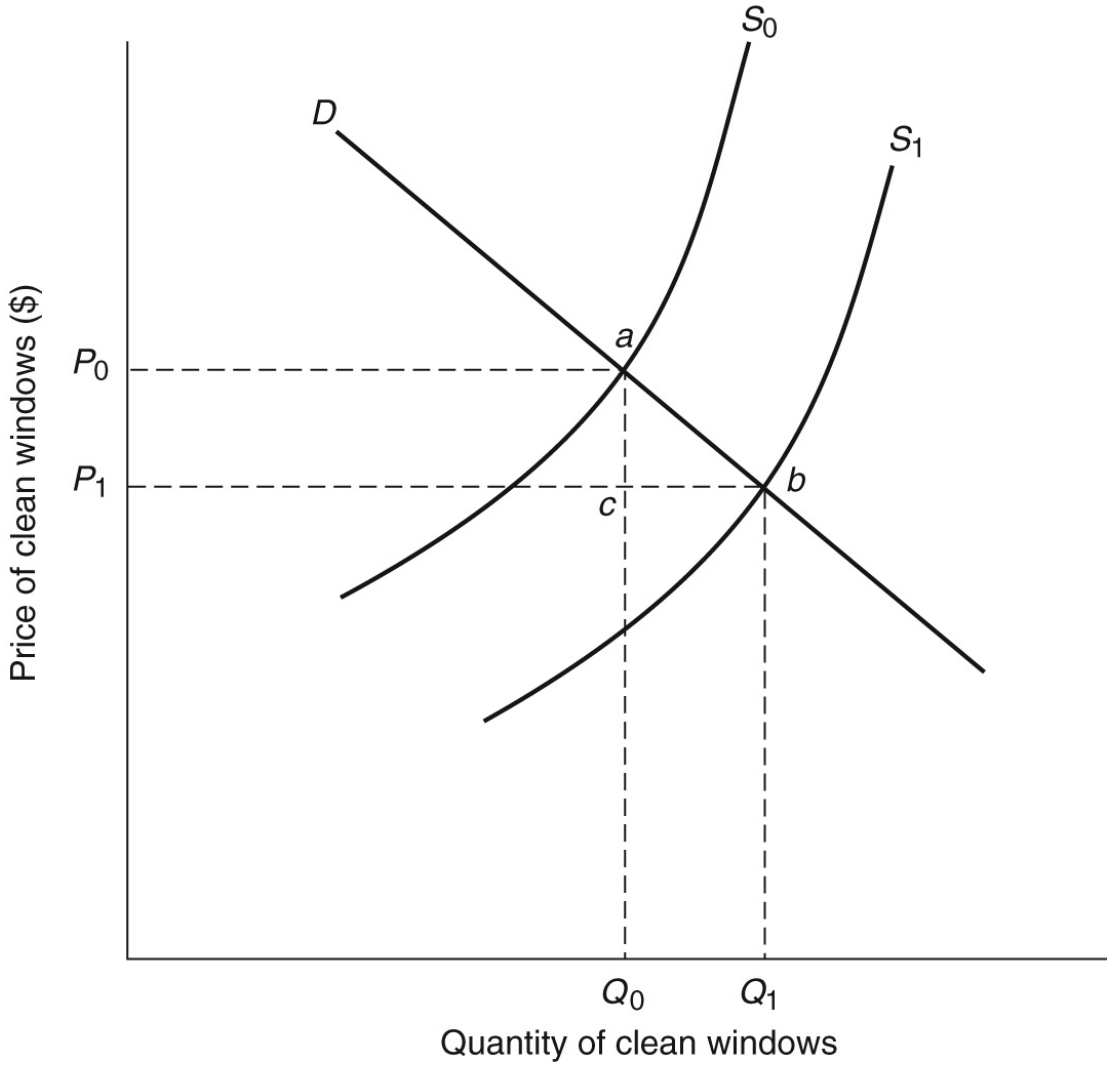
This method is an example of a broad class of production function methods. In these methods, the level of a public good or externality (e.g., smog) and other goods (window cleaners) are inputs to some production process (window cleaning). If the level of the public good or externality changes, then the levels of the other inputs can be changed in the opposite direction and still allow the quantity of output produced to remain the same. For example, when the negative externality of smog is reduced , Jess labor is required to produce the same number of clean windows. The change in expen- ditures on the substitute input (window cleaners) is used as a measure of the benefit of reduction of the public good or externality.

Suppose that the demand curve for clean windows is represented by the curve labeled D in next Figure. Let S0 represent the marginal cost of cleaning windows

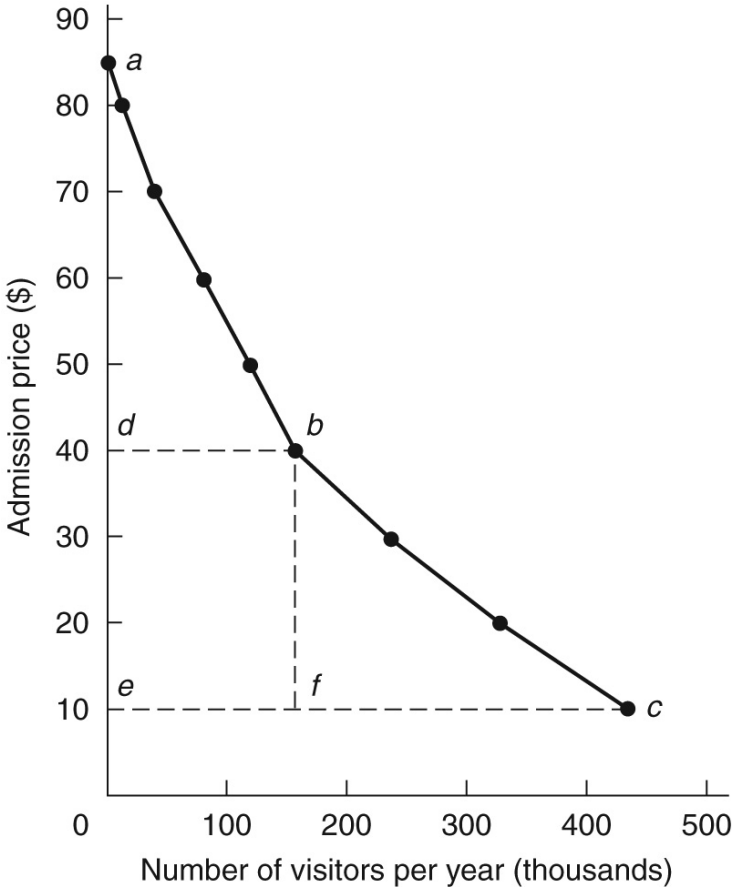

S_0
S_1
D
a
b
c
P_0
P_1
Q_0
Q_1
Price of clean windows ($)
Quantity of clean windows

initially, that is, prior to the new ordinance. The initial equilibrium price and quantity of clean windows are denoted by P0 and Q0, respectively. The effect of the new ordinance to restrict smog is to shift the marginal cost curve for clean windows down and to the right from S0 to S1: Because there is less smog, windows are easier to clean, so more windows can be cleaned for the same price. At the new equilibrium, the price of clean windows is P1 and the quantity of clean windows is Q1. The change in consumer surplus is represented by the area of the trapezoid P0abP 1•

If households continued to consume the same quantity of clean windows after the price shift as they did before the price shift, Q0, then the benefit of the ordinance would be represented by the rectangle P0acP 1.This would be the amount by which consumers reduce their defensive expenditure. Consumers, however , would not maintain their consumption levels at Q0, but would increase their consumption of clean windows to level Q1.

Individuals would spend area bQ1 Q0c on the purchase of QcQ0 additional units of clean windows at a price of P 1.The net change in spending on window cleaning services equals the area of rectangle bQ1Q0c minus the area of rectangle P0acP1.This net change in spending may be quite small. Indeed, if the demand curve were a constant elasticity demand curve, with an elasticity equal to 1, there would be no change in total expenditure on window cleaning services at all. Yet there are obviously positive benefits to consumers. In general, the reduced spending on defensive expenditures will underestimate the benefits of cleaner air or whatever benefit is being estimated.

There are at least four additional problems with the defensive expenditures method. First, it assumes implicitly that individuals quickly adjust to the new equilibrium. It may actually take some time for individuals to adjust their purchases and return to equilib- rium. Second, a defensive expenditure may not remedy the entire damage so that reduc- tions in this expenditure do not fully measure benefits. For example, expenditures on window cleaning do not "avoid" the whole problem of smog. Smog also leads to dirtier shirts and to health problems. Defensive expenditures avoided on these items should also be included. Nex exhibit illustrates that there ma y be many categories of defensive expenditures. It examines the costs of ground water degradation and includes



five categories of costs, not just the cost of new purchases of bottled water.

Third, the defensive expenditures may have benefits other than remedying damage. For example, the cleaning necessitated by the smog may result in cleaner windows than one would otherwise achieve.

Fourth, not ail of the defensive measures are purchased in markets. Sorne people clean their own windows, and reductions in their opportunity costs should also be included as benefits.

8. Conclusion

This chapter describes the major indirect market methods used in CBA for estimating shadow prices. Some methods are not discussed because we believe that they are too advanced for this book.

Perhaps most notably, we have not discussed the use of ran-dom utility models or probabilistic choice models to estimate demand, an approach that is quite important in the transportation area. Also, we do not discuss recent methods that estimate demand curves by combining survey data with data on observed behavior. Nevertheless, the methods covered here provide a rich set of tools for practical valuation of impacts.

SHADOW PRICES FROM SECONDARY SOURCES

Introduction

Lorsqu'on ne dispose pas de sources permettant d'évaluer la valeur d'une des composantes du projet, on doit recourir à des shadow prices Il s'agit des valeurs qui sont fixé de manière tutélaires par les agences gouvernementales ou de valeurs calculées dans d'autres pays ou par d'autres équipes d'évaluation et utilisées comme des "plug in"

Nous n'examinerons que les cas de la valeur de la vie humaine et du coût marginal des fonds publics tels qu'ils sont traités dans le rapport Quinet (2013) dans le cas français

La valeur de la vie humaine

Dans les calculs économiques, la référence d'une valeur de la vie humaine, qu'on qualifie ici de valeur de la vie statistique (VVS) pour éviter toute ambiguïté, devient incontournable dès lors qu'on cherche à apprécier l'impact d'une dépense, d'une réglementation, ou d'un investissement sur la santé

Dans les évaluations des projets d'investissement du secteur des transports, cette référence est indispensable par exemple pour apprécier les gains des investissements visant à réduire le risque d'accident sur les infrastructures C'est aussi le cas pour apprécier les impacts sur la santé de la pollution atmosphérique occasionnée par le secteur des transports

Ces valeurs doivent être comprises non comme une valeur de la vie humaine mais bien comme l'effort que la collectivité est prête à consentir pour réduire un risque de décès sur les infrastructures de transport, pour réduire le nombre de blessés graves ou encore pour diminuer l'impact sur la santé d'une exposition à la pollution atmosphérique

Les référentiels peuvent être obtenus en s'appuyant sur de nombreuses études qui reposent elles-mêmes sur des méthodes diverses Le référentiel actuel défini dans le rapport Boiteux (2001) peut être actualisé au regard de l'état de l'art et

des pratiques Ces avancées permettent de répondre en partie aux différents points restés en suspend lors des débats du précédent groupe de travail On notera principalement les travaux de synthèse menés dans le cadre d'HEATCO (*Developing Harmonised European Approaches for Transport Costing and Project Assessment*, 2006) et repris par les versions successives du Handbook (2007) ainsi que le tout dernier rapport en date publié par l'OCDE (2012) qui a le mérite non seulement de faire un état de l'art complet de la littérature et des pratiques mais également de proposer des méthodes pour construire des référentiels nationaux dans une perspective plus large que celle des transports

Les propositions du rapport Boiteux en matière de valorisation de la mortalité et de la morbidité

En 2001, il avait été décidé d'augmenter significativement le référentiel de l'administration française et de retenir un niveau de 1,5M€$_{2000}$ Cette approche donnait une prime aux méthodes qui se basaient sur le consentement à payer et s'écartait ainsi de travaux plus anciens basés sur le capital humain et sur les calculs de coûts (indemnisations, assurance, estimations des pertes subies par la collectivité ou l'individu et son entourage, etc) qui conduisaient à retenir des valeurs plus faibles

L'absence d'études particulières autour de la valorisation du blessé grave et léger avait conduit à retenir une proportion du référentiel respectivement de 10 % et 2 % sur la base des pratiques observées dans les autres administrations et des études internationales sur le sujet en actant une pondération plus favorable pour les blessés graves (15 %)

Par ailleurs, le rapport Boiteux fixa une règle d'évolution de cette valeur de référence (valeur 2000, valeur en termes réels (hors inflation) qui devait croître au rythme de la consommation par tête des ménages Cette règle cherche à traduire l'intuition selon laquelle le bien sécurité est d'autant plus valorisé dans la société que son niveau de vie est important

Enfin, cette référence servira dans la production de référentiels relatifs aux effets de la pollution atmosphérique sur la santé Elle sera ajustée pour tenir compte du fait que l'âge moyen du décédé n'était pas le même selon qu'on considérait les accidents de la route ou l'impact sur la santé d'une exposition de la population à la pollution

Les perspectives ouvertes par les rapports de synthèse européens et celui de l'OCDE

La question de la valorisation de la vie humaine dans les calculs économiques fait l'objet d'une littérature académique théorique et de travaux empiriques épars et très abondants Des travaux de synthèse[6] ont été entrepris ces dernières années : on peut citer le programme HEATCO (2005) qui deviendra la référence de nombreux autres dont le Handbook sur les coûts externes en 2008 Le récent rapport de l'OCDE de 2012 s'inscrit dans la même lignée et propose un travail de synthèse très ambitieux de la littérature bien au-delà du seul secteur des transports (856 études)[7]
En se basant sur ces résultats, le rapport de l'OCDE donne un cadrage général pour l'utilisation d'une valeur de la vie statistique pour l'OCDE ou pour l'UE 27 :
la valeur de la vie moyenne pour les adultes pour les pays de l'OCDE se situe entre 1,5 million et 4,5 millions USD (USD de 2005), avec une valeur de référence de 3 millions USD ;
la valeur de la vie moyenne pour l'UE-27, entre 1,8 et 5,4 millions USD de 2005, avec une valeur de référence de 3,6 millions USD

Pour déterminer une valeur de la vie statistique nationale de référence, le rapport OCDE recommande de procéder à un transfert des valeurs de référence d'un pays à l'autre en tenant compte du différentiel de revenu (PIB par habitant) entre les différents pays

Discussion des conclusions du rapport de l'OCDE et de la compatibilité avec les autres approches et données `

Le rapport de l'OCDE constitue une synthèse importante utile pour actualiser le référentiel construit dans le rapport Boiteux La qualité méthodologique de la démarche et l'ampleur de l'analyse en fait un élément de référence Il convient néanmoins d'étudier les conclusions principales chiffrées à la lumière de l'ensemble de la littérature sur la valeur de la vie statistique, notamment les travaux qui se basent sur d'autres approches et plus particulièrement celles basées sur l'analyse des préférences révélées

6 Les méta-analyses sont nombreuses : Liu et al (1997), Miller (2000) Bowland et Beghin (2001), Mrozek et Taylor (2002), Vicusi et Aldy (2003), de Blaeij et al (2003), et Bellavance, Dionne et Lebeau (2009)
7Toutes les données utilisées dans les analyses sont librement accessibles à l'adresse wwwoecdorg/env/politiques/vvs

Les ordres de grandeurs de la valeur de référence

Pour ce qui concerne les valeurs de référence pour la VVS proposée dans le rapport OCDE, les conclusions suggèrent d'utiliser une VVS de référence autour de 3 millions d'euros (2005) Cette valeur significativement plus élevée que celle proposée dans le rapport Boiteux [1,5 million d'euros, en euros 2000, 1,75 (2005)] semble plus compatible avec les valeurs empiriques obtenues récemment avec des approches différentes (voir par exemple les survols de Viscusi et Aldy 2004, Robinson et Hammitt 2010 et Andersson et Treich 2011) Les agences de régulation américaines recommandent d'utiliser des valeurs plutôt supérieures, entre $1 et $10 millions pour *l'Office and Management Budget*, 2003) et une valeur moyenne autour de $7 millions ($ 2007) pour l'*Environmental Protection Agency*

La règle de transfert

Le rapport de l'OCDE reste assez réservé à toute pondération, mais pour obtenir des valeurs nationales de référence il propose d'ajuster la valeur moyenne OCDE sur la base du revenu moyen national en utilisant le rapport des PIB des pays élevés à la puissance d'une élasticité revenu de la VVS de 0,8 %

Cette règle a le mérite d'être simple et opératoire ; elle s'appuie à la fois sur des constatations empiriques nombreuses et sur des considérations théoriques solides (Hammitt et Robinson 2011)

Les pondérations de la référence

Le rapport OCDE reste très réservé sur l'introduction de correction sur les référentiels proposés Cette position prudente renvoie à des débats importants dans la communauté scientifique

Il existe en effet de nombreux autres facteurs pouvant affecter la VVS, incluant l'âge, l'exposition au risque, la santé, la perception des risques, le type de risque ou l'altruisme

Concernant l'effet de l'âge : l'effet théorique est ambigu Cet effet dépend de la consommation qui dépend elle-même du taux d'escompte, de l'épargne, de la retraite etc Les résultats empiriques diffèrent, certains rapportent un effet en

forme de U-inversé (Aldy et Viscusi 2007), alors que d'autres études indiquent que la VVS décroît avec l'âge ou ne varie pas (Andersson et Treich 2011)

Il en est de même pour l'effet de l'exposition au risque La théorie prédit un effet positif, mais les résultats empiriques sont moins concluants

Les travaux d'économie comportementale et les analyses statistiques mettent en avant des effets de contexte Si l'on se réfère à la théorie standard de l'espérance d'utilité basée sur les axiomes classiques de rationalité, le consentement à payer pour une réduction de risque ne devrait dépendre que du changement de probabilité de décès, et pas de la cause de ce changement de probabilité

Concernant l'altruisme, il existe de nombreuses études théoriques et empiriques qui traitent de son impact sur la VVS Plusieurs études empiriques ont montré par exemple que la VVS est moins élevée quand la réduction de risque est individuelle plutôt que collective, par exemple quand celle-ci concerne toute la famille, ou les enfants Cependant, les résultats théoriques montrent qu'il n'y a pas de sens à ajuster l'analyse coût-bénéfice pour l'altruisme pur, sauf effet de paternalisme

Au total, sur la base de ces résultats relatifs aux autres effets possibles sur la VVS que celui du revenu, il semble difficile d'identifier des effets significatifs, robustes ou incontestables En conséquence, et dans l'attente de publications futures, il semble prudent à ce jour de ne pas faire de recommandation spécifique quant à l'ajustement de la VVS pour ces autres facteurs relatifs aux caractéristiques du risque ou de la population

Prendre en compte la qualité de la vie

La valeur de la vie statistique reste très insuffisante pour intégrer correctement dans les évaluations socio-économiques les enjeux relatifs au risque santé et pour mesurer la valeur des actions que peut mener la puissance publique pour réduire celui-ci

Le référentiel présenté jusqu'ici de permet de saisir le risque de décès mais n'appréhende pas correctement des situations très diverses où ce risque décès concerne des populations (jeunes ou agées) et surtout mésestime tout le volet morbidité important dans le secteur des transports

Cette réalité amène à poser la question de l'introduction des outils conçus et développés dans le secteur de la santé de manière à mieux appréhender les effets sur la mortalité (années de vie) d'une part, et sur la morbidité et la qualité de vie d'autre part

Basculer d'une valeur statistique de la vie humaine, à la valeur de l'année de vie

Les travaux engagés sur ces questions restent encore peu développés pour fonder une valeur monétaire de référence sachant qu'il faut pouvoir par ailleurs assurer une cohérence avec la valeur statistique de la vie

Une première manière de procéder est de considérer que la valeur de l'année de vie est constante sur la période de vie restante d'une personne La VAV et la VVS sont alors liées par la relation suivante :

$$VVS = \sum_{t}^{T} VAV(1+\delta)^{-t}$$

où T est le nombre d'années de vie restantes attendues, δ est le taux d'actualisation Cette approche permet de prendre en compte l'âge des personnes dont la vie est affectée par la politique considérée

C'est la méthode retenue par le rapport de l'OCDE, c'est celle qui avait été pratiquement retenue dans le rapport Boiteux pour le calcul des valeurs santé dans le dossier de la pollution atmosphérique

Cette approche est discutable compte tenu des hypothèses à retenir mais constitue un cadre opératoire clair pour disposer d'une telle référence à défaut d'autres études directes qui devraient être engagées

Intégration de la qualité de vie : définition d'un QALY

La qualité de la vie est appréhendée dans le secteur de la santé avec un outil spécifique : le QALY[8] (*quality-adjusted life-year*) Cet indicateur permet de

(8) On utilise également les DALYs qui sont des indicateurs dans lesquels la pondération de l'état de santé se fait sur la sévérité du dommage et non sur la qualité de vie Le DALYs est un indicateur qui agrège à la durée de vie un état de morbidité Ces scores ne sont pas des

pondérer la durée de vie par des scores de préférence quand la qualité de la vie liée à la santé a été identifiée comme une conséquence importante de la décision Ces perspectives ont fait l'objet de nombreux débats académiques

Un QALY est une unité de mesure de la durée de vie pondérée par la qualité de vie liée à la santé, cette dernière étant valorisée par un score de préférence généralement obtenu sur la population générale

Ces scores doivent être fondés sur les préférences de la population générale et ils sont mesurés sur une échelle d'intervalle qui assigne le score 1 à la parfaite santé et le score 0 au décès[9] Le nombre de QALYs est calculé en pondérant les durées passées dans les états de santé par les scores de préférence associés à ces états

De nombreuses agences de régulation et organismes internationaux [10] recommandent l'utilisation d'indices tels que le QALY (*European Chemicals Agency*, 2008; *Institute Panel of Medecine*, 2006 ; NICE (*National Institute for Health and Clinical Excellence*), 2004 ; etc)

Toute la difficulté consiste à construire ces scores Plusieurs instruments ont été conçus et font référence comme le *Health Index Mark* (HUI3) et l'Euroqol EQ-5D La HAS recommande par exemple dans son guide méthodologique d'utiliser dans les analyses médico-économiques un système de classification d'états de santé pour lequel il existe des scores validés en France, tel que l'EQ-5D ou le HUI3 D'autres instruments existent (QWB, SF6D), mais ils n'ont pas été validés en France Ces scores doivent être adaptés aux caractéristiques qui sont à prendre en compte dans l'évaluation

L'articulation du QALY avec l'analyse coût avantage ne va pas de soi L'indice QALY mesure en effet des bénéfices sanitaires et il est utilisé dans des analyses coûts efficacité (effort à consentir pour gagner un QALY) Or, pour pouvoir comparer ces bénéfices sanitaires aux coûts monétaires associés aux programmes générant ces bénéfices, il faudrait associer au QALY une valeur

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scores de préférence et ne reposent pas sur la théorie de l'utilité et du choix social comme le QALY Les DALYs servent à mesurer le fardeau de la maladie ou d'un handicap

(9) Pour la plupart, les systèmes de scorage couramment utilisés aujourd'hui dans l'ACU associent un score négatif à certains états de santé quand ils sont considérés comme pires que la mort

(10) WHO (*World Health Organization*) utilise le Daly (indicateur d'espérance de vie corrigée de l'incapacité)

monétaire Ceci pose des problèmes théoriques et de mesure statistique délicats compte tenu de la grande variabilité des résultats

Il y a principalement deux approches qui peuvent être complémentaires pour apprécier la valeur du QALY soit directement par des enquêtes dans lesquelles on cherche à mesurer ce que les personnes sont prêtes à payer pour un QALY supplémentaire, soit utiliser la valeur de la vie statistique comme référence

Ces difficultés ne doivent pas éliminer la prise en compte de la réalité des coûts de la morbidité qui peuvent dans certains cas (accidents graves) avoir des effets personnels et collectifs très importants Le rapport Boiteux avait proposé de prendre en compte un pourcentage de 15 % de la valeur de référence de la valeur statistique de la vie humaine Cette règle simple doit être au minimum reprise Des études sur les coûts de la morbidité doivent être engagées

On notera que la *National Highway Traffic Safety Administration* (NHTSA) a développé dans cette perspective un indice FCI (*Functional Capacity Index*) pour mesurer les pertes de qualité de vie provenant d'accidents automobiles

Résumé

Une valeur unique de référence intersectorielle : Même si certaines modulations peuvent être légitimes l'unicité de la référence garantit une cohérence des efforts entre les différents secteurs d'intervention En outre, la valeur de la vie humaine est typiquement une valeur tutélaire, qui doit intégrer le caractère de service public disponible également pour tous de la santé, et l'idée que l'effort public pour réduire un risque sur la santé devrait être le même quel que soit le secteur et quel que soit l'individu concerné Il est donc proposé d'actualiser la valeur de référence de la VVS à 3 m€, valeur unique, compatible avec les données internationales pour les pays développés La règle d'évolution de ce référentiel dans le temps retenue dans le rapport Boiteux doit être maintenue

Pondération et intégration du risque : Bien que certains travaux mettent en évidence un lien entre VVS et risque, ces résultats n'apparaissent pas comme suffisamment robustes pour s'engager dans la différentiation du référentiel Dès lors il est proposé d'abandonner la distinction VP/TC qui avait été retenue par le rapport Boiteux et qui était essentiellement justifiée par les différents partages du risque observés dans les modes de transport Les travaux doit être poursuivis pour mieux appréhender la relation qui existe entre le risque et la valeur statistique de la vie humaine (structure temporelle du risque, perception

du risque, ampleur du risque, risques publics et privé (pour autrui versus pour soi)

Effet de l'âge et valeur de l'année de vie gagné : Lorsque la question de l'âge se pose (risque de décès associé à des populations très jeunes ou très âgées) il est suggéré d'utiliser la valeur de l'année de vie gagnée plutôt que la VVS Dans ce cas, il est recommandé d'utiliser la formule standard et de retenir 120 000 euros par année de vie gagnée (valeur obtenue en supposant une valeur de la VVS de 3 m € et un taux d'actualisation de 4 %)

Les coûts de la morbidité induits par les blessures : Ces coûts ne sont pas aujourd'hui pris en compte Il convient donc d'engager des travaux pour déterminer des ordres de grandeur validés sur les principaux coûts de la morbidité dans le secteur des transports Ces coûts doivent être ajoutés au calcul économique en sus de la VVS Dans le cas des accidents de transport, on retiendra pour les blessés graves le ratio de 15 % par rapport à la VVS

Introduction du Qaly : il n'existe pas d'outil directement transposable en France pour calculer une valeur du Qaly Il est proposé d'engager des études pour construire ce référentiel, même si celui-ci peut être obtenu de manière complémentaire par transposition de la valeur de référence (VVS) Par ailleurs le transfert £ 30 000 (2005) de la valeur anglaise sur la base des mêmes règles de transfert proposé par l'OCDE conduirait à titre provisoire aux fourchettes suivantes : [33 000 € -40 000 €]

Étude coût utilité : il est souhaitable sur les projets pour lesquels l'impact sur la santé est important (déterminant) d'établir des ratios coût utilité dans les études de manière à isoler l'effet santé sur les autres dimensions du projet

Le coût d'opportunite des fonds publics (COFP) : un concept bien etabli mais peu d'estimations empiriques propres à la France

Dans une description extrêmement simplifiée de l'économie, la satisfaction socio-économique serait maximale (« optimum de premier rang ») si chaque consommateur arbitrait librement entre son temps de loisir et ses revenus salariaux et répartissait librement ses revenus (salariaux et non salariaux) entre consommation de biens marchands et souscription au financement d'un bien

public L'ensemble des souscriptions de tous les consommateurs déterminerait le niveau optimal de ce bien public

Cet optimum pourrait être atteint si la puissance publique, maître d'ouvrage du bien public, savait prélever auprès de chaque consommateur un impôt forfaitaire égal au consentement à payer de celui-ci

Règle de calcul

Cependant, dans l'économie réelle, la méconnaissance des consentements à payer de chaque individu ainsi que la nécessaire simplification des barèmes fiscaux impliquent que les prélèvements obligatoires en vigueur[11] modifient le « pouvoir d'achat du salaire horaire » et éloignent les choix individuels (en matière de consommation et de temps de travail souhaité) de la situation optimale

Plus précisément, lorsque la puissance publique prélève 1 € supplémentaire, il en résulte sur le bien-être socio-économique un impact dont l'évaluation monétarisée est égale à $(1 + \lambda)$ €, « $1 + \lambda$ » étant **le coût marginal ou coût d'opportunité des fonds publics** (COFP)

Pour qu'un projet dégage un bénéfice socio-économique positif, il faudra donc que, pour l'apport de chaque euro d'argent public financé par prélèvement obligatoire, ce projet produise un avantage socio-économique monétarisé (actualisé) au moins égal à $(1 + \lambda)$

S'il est généralement admis que le paramètre $(1 + \lambda)$ est compris dans un intervalle allant de 1 à 1,5, son estimation empirique nécessite d'avoir recours à des modèles complexes et, pour autant, dépendants d'hypothèses fortes J Maurice et Q Roquigny notent dans leur revue de la littérature (voir Tome 2) que le dernier article académique relatif à l'estimation du COFP pour la France concerne les travaux de Beaud (2008[12])
Cet auteur aboutit à un COFP moyen de 1,2 En absence de plus amples recherches spécifiques à la France et sous condition de prendre correctement en compte l'effet de rareté des fonds publics (voir plus bas), il est donc recommandé de retenir pour le COFP la valeur $\lambda = 1{,}2$

(11) Qu'ils soient forfaitaires et « mal ajustés » ou non forfaitaires
(12) Beaud (2008), "*Le coût social marginal des fonds publics en France*", Annales d'économie et de statistique, n° 90

Enfin, dans le cadre des évaluations coûts-avantages, la Commission recommande les pratiques suivantes :

le COFP doit s'appliquer aussi bien aux flux de dépenses publiques qu'aux flux de recettes publiques, en ce sens que les recettes constituent des prélèvements évités ;

en règle générale, il n'y a pas lieu de distinguer, dans l'évaluation coûts-avantages du projet, la valeur du COFP selon l'origine des fonds publics (en recette ou en dépense[13])

Toutefois, dans le cas où il serait instauré un prélèvement obligatoire spécifique au projet, l'analyse socio-économique devrait alors porter simultanément sur l'évaluation coûts-avantages du projet et sur ledit prélèvement, pour laquelle un COFP spécifique devrait être estimé ;

Chaque projet doit être optimisé (variante, dimensionnement, année de réalisation) de façon à maximiser la VAN-SE à l'origine des temps

Une fois pris en compte le COFP, tous les projets dont la VAN-SE optimisée se révèle positive devraient être réalisés, car investir un euro supplémentaire dans ces projets créerait une valeur collective supérieure à la destruction de valeur provenant du prélèvement obligatoire de cet euro Au fur et à mesure de l'investissement public, le rendement marginal de l'euro investi diminuerait tandis que la désutilité marginal de l'euro prélevé augmenterait À l'optimum, création de valeur de l'euro marginal investi et destruction de valeur de l'euro marginal prélevé devraient être exactement égaux à la valeur d'équilibre du COFP, qui serait donc endogène

Le recours à un coût fictif de rareté des fonds publics, en cas d'enveloppe budgétaire insuffisante

Cependant, dans la réalité, on constate que la taille des enveloppes annuelles de fonds publics disponibles pour financer des projets d'infrastructures est relativement exogène et, souvent, que celles-ci ne permettent pas de financer la

(13) Par exemple, si des recettes de taxes « Pigouviennes » (ie visant à internaliser dans le prix TTC le coût des externalités négatives engendrées par la consommation d'une unité de bien) sont utilisées pour financer des projets d'infrastructures, il n'y a néanmoins pas lieu de leur affecter un COFP particulier En effet, même si ces taxes ont par construction un COFP proche de zéro, elles ont le caractère d'un prix qui est indépendant de la réalisation de projets d'infrastructures

liste complète des projets dont la VAN-SE (après prise en compte du COFP) est positive
Un tel rationnement discrétionnaire des fonds publics, décidé par la puissance publique, peut en effet intervenir dans diverses situations macroéconomiques telles que les périodes de surchauffe du cycle conjoncturel ou de consolidation budgétaire, comme celle qui est menée actuellement au sein de la zone euro

En présence de contraintes sur les prélèvements obligatoires disponibles, il convient de déterminer, au sein de la liste complète des projets socio économiquement rentables, la liste et la date de réalisation des projets qui maximiseraient leur VAN-SE cumulée tout en respectant les contraintes annuelles de financement public Pour ce faire, plusieurs méthodes sont envisageables :

Méthode centralisée

Il s'agirait, en supposant connue la chronique des enveloppes disponibles de fonds publics, de collecter la liste de tous les projets candidats et de leur appliquer un logiciel de programmation linéaire sous contrainte, qui, comme l'ont préconisé et testé Quinet et Sauvant (2007), sélectionnerait les projets à réaliser et fournirait en outre leurs caractéristiques optimales, y compris leur date de réalisation

Méthode décentralisée

on parviendrait, comme l'a montré Maurice (2007), au même résultat que la méthode centralisée précédente si la puissance publique annonçait une chronique annuelle notée « φ_t » de prix fictifs de rareté des fonds publics[14] (PFRFP), en demandant à chaque maître d'ouvrage de calculer lui-même la VAN-SE de son projet en multipliant tout euro net de dépense publique de l'année t par le facteur $(1 + \lambda + \varphi_t)$, d'optimiser (variante, dimensionnement, date de réalisation) cette VAN-SE et de réaliser le projet si et seulement si sa VAN-SE optimisée est positive (ou nulle)
Ce facteur $(1 + \lambda + \varphi_t)$ peut être appelé « *coût combiné d'opportunité et de rareté des fonds publics* », ou plus simplement « *coût combiné des fonds*

(14) φ_t est le « multiplicateur de Lagrange » associé à la contrainte budgétaire de l'année t Le programme centralisé préconisé par Quinet et Sauvant fournit directement cette chronique

publics (CCFP) » Il apparaît que c'est la somme du COFP et du PFRFP qui compte, et non la précision de la décomposition entre les deux termes

Méthode hybride en deux étapes

Cependant, au processus centralisé comme au processus décentralisé s'opposent plusieurs obstacles :

les contraintes budgétaires annuelles ne sont connues que de manière très imparfaite, surtout sur l'horizon de temps utilisé dans les évaluations de projet ;

par ailleurs, le choix de programmation optimale et la chronique de PFRFP dépendent de la liste des projets examinés, liste qui peut évoluer avec le temps

Dans ces conditions, on peut envisager une méthode hybride en deux étapes, qui éviterait d'annoncer *a priori* la chronique des enveloppes annuelles de fonds publics ou celle des coûts fictifs de rareté des fonds publics

Dans une première étape, au niveau décentralisé, il s'agirait de tenir compte seulement du COFP (en majorant par $1+\lambda$ les dépenses publiques nettes du projet) et d'optimiser chaque projet (variante, dimensionnement, date de réalisation)
Dans une deuxième étape, les projets issus de la première étape seraient rassemblés à l'échelon central qui leur appliquerait le logiciel Quinet-Sauvant de programmation sous contrainte des enveloppes annuelles de fonds publics disponibles
Cet exercice devrait être fait dans la transparence vis-à-vis de l'échelon décentralisé et vis-à-vis des parties concernées (administrations locales et centrales, partenaires sociaux, etc)

Dans une autre formulation plus simple de cette méthode, le calcul décentralisé serait à faire en tenant compte, non du seul COFP, mais d'un CCFP, en incorporant, à titre provisionnel, une certaine valeur du prix fictif de rareté des fonds publics, qui – pour simplifier – serait constante dans le temps et notée φ
Chaque euro public net dépensé devrait ainsi être multiplié par le CCFP $(1+\lambda+\varphi)$, sur la base duquel chaque projet devrait être optimisé (variante, dimensionnement, année de réalisation), un projet étant à réaliser si et seulement si sa VAN-SE optimisée est positive (ou nulle)

On note qu'avec ces hypothèses simplificatrices, la date optimale de réalisation d'un projet est fournie par la règle simple selon laquelle, à cette date, le taux de rentabilité immédiate (en incorporant le CCFP) est égal au taux d'actualisation[15]

La Commission propose de retenir, pour ses avantages pratiques et en l'absence actuelle d'organisme chargé de la programmation centrale, la méthode hybride simple, en préconisant d'utiliser dans la première étape décentralisée, à titre provisionnel, un coût combiné des fonds publics constant, estimé sur la base de $\lambda = 0{,}2$ et $\varphi = 0{,}2$, soit $(1+\lambda+\varphi)=1{,}4$

Les indicateurs de choix

La situation présente des finances publiques est particulièrement problématique, mais elle n'est pas inédite
Comme J Maurice et Q Roquigny l'ont rappelé (voir Tome 2), la programmation des projets avait déjà fait l'objet de réflexions et de préconisations approfondies dans des contributions précédentes, toutefois sans avoir systématiquement fait l'objet de consensus

En France, la pratique jusqu'ici recommandée se référait au rapport Lebègue[16] (2005), qui préconise de hiérarchiser les projets par ordre décroissant du ratio « *Bénéfice socio-économique net actualisé (ou VAN), tenant compte du COFP, par euro public dépensé* », et de ne retenir que ceux dont la somme cumulée des dépenses publiques est compatible avec l'enveloppe des financements publics disponibles

Il est apparu à la Commission que cette préconisation s'avère imprécise car elle suppose que le ratio « VAN-SE sur euro public dépensé » est constant dans le temps, ce qui n'est pas correct à partir du moment où la valeur de la VAN-SE d'un projet dépend de sa date de réalisation[17] et, souvent, de celles de certains autres projets

(15) La préconisation du rapport Lebègue consistant à classer les projets par ordre décroissant du ratio VAN-SE par euro public dépensé est imprécise car elle ne dit rien sur la date optimale de réalisation du projet, qu'il importe de déterminer
(16) Rapport du Commissariat général du Plan (2005), « *Le prix du temps et la décision publique* », présidé par D Lebègue
(17) À titre d'exemple, un projet d'une durée de vie limitée et dont l'objectif premier serait de permettre des économies d'émissions de CO_2 n'aurait pas été déclaré comme rentable

La date optimale de réalisation du projet convient d'être déterminée Par ailleurs, divers travaux se sont développés dans le prolongement de ce rapport, notamment au regard des évolutions intervenues depuis dans le financement des projets publics, ce qui justifiait une revue de la littérature récente

L'ouvrage « *Le calcul économique dans le processus de choix collectif des investissements de transport* », (Prédit, Economica) propose une revue de cette problématique visant à hiérarchiser un ensemble de projets de façon à maximiser la VAN-SE de cet ensemble, sous la contrainte d'un rationnement des fonds publics

Dans cet ouvrage, Quinet et Sauvant (2007) puis Maurice (2007) démontrent que *(i)* si les interrelations entre projets sont correctement pris en compte[18] et *(ii)* si les bénéfices actualisés de la VAN-SE sont effectivement modélisés comme étant variables selon la date de mise en service des projets, alors trois constats majeurs peuvent être obtenus :

comme nous l'explicitons dans la partie précédente sur le PFRFP, l'ordre optimal de réalisation des projets est celui qui est donné, de manière équivalente, soit par la méthode centralisée soit par la méthode décentralisée ;

on constate alors que l'ordre optimal de réalisation des projets est différent de ce qui proviendrait du simple usage d'un seul des autres indicateurs usuels de rentabilité (VAN, TRI, VAN/fonds publics, taux de rentabilité immédiate, etc)

Néanmoins, certains indicateurs apparaissent meilleurs que d'autres En particulier, l'écart à l'optimum est croissant lorsque l'on considère successivement le taux de rentabilité immédiate socio-économique (meilleur *proxy*), le taux de rentabilité interne socio-économique, le ratio VAN/euros publics dépensés, puis le taux de rentabilité immédiate financière, chacun calculé en tenant compte du coefficient $(1 + \lambda + \varphi_t)$ appliqué aux dépenses publiques nettes ;

enfin, si l'on fait l'hypothèse simplificatrice que la chronique de PFRFP φ_t est constante dans le temps, ce que la Commission recommande en l'absence d'organisme central chargé de la programmation ($\varphi_t = \varphi = 0{,}2$, chaque année), alors la date optimale de réalisation du projet optimisé (en variante et

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lorsque la valeur tutélaire de la tonne de CO_2 évitée était basse voire inexistante et le sera d'autant plus s'il est prévu que cette valeur croisse dans le temps

(18) Des projets peuvent être (en partie ou totalement) complémentaires, substituables ou indépendants

en dimensionnement) est généralement fournie par la règle simple selon laquelle, à cette date, le taux de rentabilité immédiate (ie le rapport entre les bénéfices socio-économiques nets de l'année de mise en service et le coût d'investissement, en incorporant le CCFP) est égal au taux d'actualisation[19]

Après détermination de cette date optimale de réalisation, si à une date donnée la contrainte sur les fonds publics est en réalité plus prégnante que ce que le prévoyait l'hypothèse de constance dans le temps de la chronique de PFRFP φ_t, c'est seulement à ce moment-là que les projets réalisés en priorité devront être ceux dont le ratio VAN-SE (pour une réalisation à cette date) sur euros publics dépensés est le plus élevé mais cette dernière règles n'est qu'approximative ; les cas, probablement de plus en plus fréquents, où les avantages d'un projet, d'abord croissants, sont décroissants à partir d'un certain temps, et ceux où les avantages dépendent de l'année de mise en service ou sont liés à la réalisation d'autres opérations méritent une attention particulière (voir Tome II)

Conclusion

(19) Sous ces hypothèses simplificatrices, on constate que l'on revient au constat qu'avaient fait dès 1959, Laure et Abraham (1959) Ce résultat assure que la VAN-SE du projet est non seulement positive, mais aussi maximale En conséquence, dès lors que la rentabilité immédiate d'un projet a dépassé le taux d'actualisation, et si les fonds publics qu'il requiert sont disponibles, il faut le réaliser le plus rapidement possible Notons cependant que ce résultat suppose l'hypothèse non négligeable que les bénéfices socio-économiques des projets sont non-décroissants dans le temps Sans cette hypothèse, la règle de détermination de la date optimale de réalisation des projets devient plus complexe

RISK AND UNCERTAINTY

I - INTRODUCTION

There is a classical distinction between **risk** and **uncertainty** developed by Knight in 1921.

Risk is defined "as a *measurable uncertainty*: risk goes with probabilities while uncertainty goes with *unknown probabilities"*.

II – Risk

Let's start from M. Dorfman's example, given in 1972[20]. It's a situation where you have to make a decision choice. The decision choice involves the extent to which to fill the reservoir. If the flood does not come, the outcome will be greater if one spills more. If there is a flood, net benefits are greater if one spill less. If one spills all, there is no flood protection left and the net benefits are the same wither there is a flood or not.

The probability of the flood occurring is judged to be 0.4, which lean that 1 minus 0,4 (0,6) is the no flood probability.

2.1 - Expected value versus utility

The expected value

The expected value is the sum of possible outcomes weighted by their probabilities. It has the meaning of an average outcome, that is the value one would observe as the outcome on the average, if the project were to be carried out a large number of times.

Table 1. Expected value of outcome

Decision	Flood	No flood	Expected value of outcomes
Spill 1/3	130	400	**292**=0,4*130 + 0,6*400
Spill 2/3	140	260	212
Spill all	80	80	80
Probabilities	0,4	0,6	1

Considering the option to spill one third in the reservoir.

Example :

The EV is (0,4)$130+0,6($400=$292.

[20] Dorfman's M. (1972)

In diagram EV appears on the horizontal income axis and is denoted by $\bar{Y}$. If the probability of the flood occurring were 1; the EV would be \$130.

If the flood had a probability 0, the EV would be \$400. As the flood is not certain, $\bar{y}$ is located between \$130 and \$400.

The $\bar{y}$ of \$292 is nearer to \$400 because the relative probability is greater than the flood will not occur.

Using EV is one way of deciding among uncertainty outcome. The decision rule would be to choose the option with the highest EV. The EV is \$292 for the one third spill. This is **highest** than either of the other two options (\$212, \$80). Thus the one third spill option would be chosen if the objective were to maximise the EV.

Expected utility

An alternative way of considering outcomes **is in terms of utility** values of the dollar figures.

Next table shows the corresponding utility values that Dorfman assigned to each dollar outcome.

The **expected utility** EU is defined in an analogous way to the EV.

It is the sum of possible utility outcome weighted by their probabilities.

The EU appears on the vertical axis of the next diagram and is denoted by U.

Thus for the one spill option the EU is: (0,4)0,30+(0,6)1.15=0,81

Using expected utility is an alternative way of deciding among alternative.

As the one third spill option has an expected utility greater than the other two (0,81 is larger than 0,61 et -0,23); this would be the most preferred option when one tries to maximise the EU.

Table 2. Expected utility

Decision	Flood	No flood	Expected value of utility
Spill 1/3	0,30	1,15	**0,81**
Spill 2/3	0,37	0,90	0,68
Spill all	0,23	-0,23	-0,23
Probabilities	0,40	0,60	1

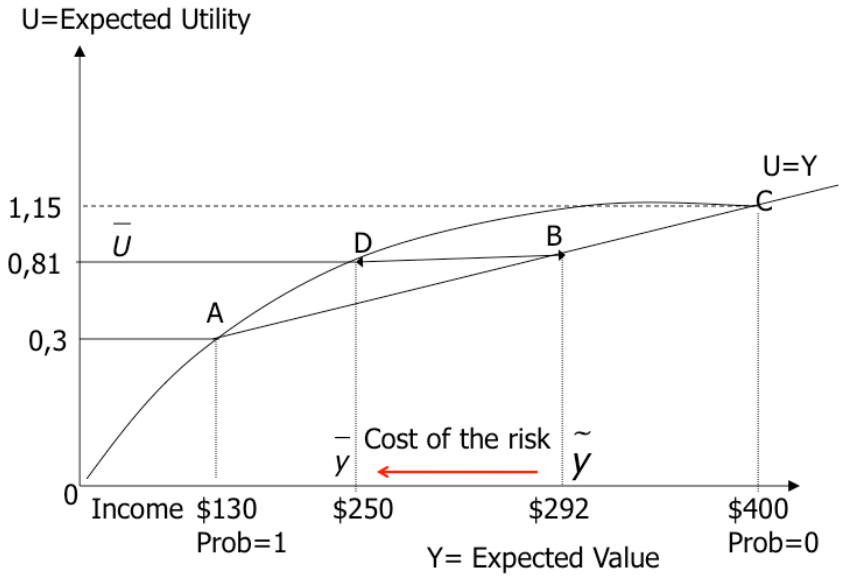
If an outcome is to be socially optima, the aim must be to maximize utility not to maximize income.

There would be no difference in the two criteria if there were a simple, proportional relationship between income and utility.

The straight line in the diagram depict such a linear relationship.

But usually, one assumes that there is a *diminishing marginal utility of income (that is, the more income one has, the less the additional satisfaction)*.

The utility curve ADC in the next diagram is drawn with a diminishing marginal utility of income property (it is concave from above and convex from below). All other concepts that are to follow help clarify the essential difference between the linear and the non-linear case



Graph 1. Risk aversion

The relation between utility and income is drawn as the curve ADC. This shows the risk aversion. Risk neutrality is depicted by the straight line ABC. The cost of the risk is the horizontal distance DB between these two relations at the expected utility level 0,81, being the difference between the EV level of income $292 and a certainty equivalent income $250.

2.2 – The certain equivalent and the cost of risk

We call a **certain equivalent income** the level of a sure income that gives the same level of utility as a lottery with the same expected utility.

One can see the reservoir project as a lottery.

With the first option we "win" if the flood doesn't occur and the utility value 1,15 is obtained. The lottery is lost when the flood goes and the utility value 0,3 results. The certain equivalent should have to convert the set of uncertain outcome to a figure known with certainty.

The line ABC shows all the combination of 0,3 utility and 130 outcome that corresponds to each probability values of the lottery.

When the probability is 0,4 (which means that the value 1,15 occurs with o probability 0,6 and the value 0,3 occurs with a probability 0,4) we obtain the point B (this was how the EV value of 0,81 was calculated).

Point A would be when the probability of flood occurrence was 1. C would be when the probability was 0.

On the graphic, we have a line ADC that shows the utility level for any level of certain income. This curve ADC is above ABC because individuals prefer to have 292 with certainty than a lottery with an expected value of 292.

They are indifferent between the expected value of income of a 292 (B) lottery and the utility of certain income of 250 (D).

292-250 is the cost of the risk. DB describes the risk adverse-ship. Because curve ADB is above line ABC, the certain equivalent of point B is valued less than the expected value.

To obtain the same level of satisfaction as B (EV of 0,81) one must move to D on the certain utility curve.

Thus 250 is the certain equivalent of expected value of 292.

The cost of risk quantifies the difference between the two relations ADC and ABC. **K is defined as the difference between a project expected value and its certainty equivalent** income:

$$k = \bar{Y} - \bar{\bar{Y}} = \mathrm{K} = 250 - 292 = 42$$

K is the cost of risk. People are ready to give up 42 dollars if they could obtain 250 for certain rather to face the risky project with an expected value of 292.

If K is equal to 0 they are risk neutral.
If K is positive they are risk adverse.

If K is positive they are risk lovers.

III - DEALING WITH RISK

Is the fact there is uncertainty a good reason to modify the discount rate?

The net present value of a project is minus the cost plus benefit. If you deal with more than one period you have to discount the benefit:

$$NPV = -CO + \frac{B}{(1+i+\rho)} \qquad (1)$$

Where I is the discount rate and ρ is the risk premium.

If the project costs 100 today and make 100 tomorrow the project is not good. Usually we assume that the long time interest rate is the second best alternative so i (the discount rate) is assumed as equal to the long time interest rate.

Do we think that we have to add a risk premium to the function (ρ)?

3.1 - How to assess a cost of risk

The cost of risk K is the difference between the expected value of benefit B and the certainty equivalent B*. Thus we can obtain the present certainty equivalent value:

$$PCEV = -CO + \frac{(B-K)}{(1+i)} \qquad (2)$$

Instead of valuing K one can obtain a numerical equivalent for this function by valuing the risk premium ρ.

If B=1,2 Co=1 K=0,1 and i=0,1, then the PCEV would equal to 340.

If B=1,2 Co=1 i=0,1 we can provide that ρ=0,1 (by the NPV function).

3.2 – The Arrow-Lind theorem

We know that there is uncertainty and that this is a good reason to add a risk premium to discount future benefit to public policy evaluation.

The theory says that there is a good reason not to put the risk premium.

The Arrow-Lind theorem says that we should not use a risk premium under two assumptions:

- The **return from the public project must be individually independent of national income**. The public project should not have correlation with the private sector. If there is a positive correlation, $\rho>0$ is required. If there is a negative correlation $\rho<0$ is required. Public projects are dedicated to the all society so there is a pooling mechanism for risk. We assume that the mix is risk neutral (risk lovers plus risk adverse). If the public project is correlated with a private sector then

some people will be affected by the public project (and only this group). If there is no correlation, the theorem applies and you don't need a premium.

- The **returns of the public projects must be spread out over a large number of individuals**. The larger it is the better the pooling mechanism works.

The validity of the theorem depends on two assumptions.

- The fist assumption is particularly hard to justify. Even if the production function is such that the project itself gives a return unrelated to income in its absence, the fact that the government taxes income in the absence of the project ensure some correlation. For, in order to finance the public project tax will have to be adjusted (The Foldes-Rees (1977) theorem sys exactly this).
- The second assumption implies that the group variance will fall as the number increases. But hen externalities and public good exists (the n on rival characteristic is present) as they do with most public investment, the risk per person is not reduced when the number of individuals involved is increased (this argument is due to James 1975).

From the point of view of this text, the key criticism of the theorem involves **its neglected of distributional considerations**. Project should favour groups that would be poor in the absence of the project. A negative correlation is important a negative risk premium should be used to lower the discount rate.

3.3 – Adjusting the discount rate for risk

The fist question to ask is whether any adjustment needs to be made to the social discount rate because of risk?

The answer is clear with an **individualistic framework**. For, if private individuals adjust for risk due to risk aversion social decision based on individual preference **must also adjust** for risks.

The conclusion would be otherwise if, when **aggregating,** individuals risks cancel out (strictly, disappear in the limit). But the two conditions necessary for this result (Arrow-Lind Theorem) **are unlike to exist**. The expected value of benefits needs to **be reduced by the cost of risk**, which implies to use a positive risk premium.

The nest question is **whether public sector** should make the same cost of risk adjustment as the private sector?

The answer in general, the public sector should not make the same risk adjustment. We saw that what was important in the formulation of risk was the covariance, between a particular project and the state of the economy in the absence of the project. One should expect (for all reasons explained) that the public sector would undertake different projects from the private sector. Hence the covariance would be different and so would the risk adjustment.

Finally what do the previous section say about the common practise of adding risk premium to the risk discount rate in an ad hoc fashion?

Firstly, especially when the public sector has distributional objectives, there may be a negative covariance between public project and the economy in the absence of such projects. Here it is appropriate to reduce the discount rate rather than raise it.

Secondly there is precise way of determining just how large the adjustment to the discount rate should be (Zerbe and Dively, 1994). Not just any adjustment is appropriate.

Thirdly, precise adjustment can be made only in the context of a two periods model. The common practice adds a risk premium to the discount rate for each and every period. This can be correct only if uncertainty increase over time. In general, this is not a correct assumption.

4 – CONCLUSION

The common practice is to add a risk premium but you have to discuss how important this premium has to be. Most of the time bad analysts are saying the "there is a 10% risk than benefit occur in 90%". They put a 10% premium and they kill the project. There is no reason to put % premium than there is equal x% risk.

The most common case of risk premium occurs when you are dealing with environment risks. The second common case is the one of health treatment (example of cancer).

EVALUATION OF PUBLIC POLICIES

A preliminary definition of the scope

Evaluating public policies is a technical challenge as well as an institutional difficulty This first definitions would allow to understand to what sort of object a public policy is to be compared

The evaluation of projects is to be distinguished from evaluation of public policies
Because a project is easier to define, it is much simpler to evaluate On the contrary, a public policy is made of several public actions that may seem in coordination one with another

In fact, “public policies” are often a group of poorly coordinated actions In France, for example, the preventive and repressive anti-drug policies are conducted separately
However the MILDT set up a plan for a better coordination of the governmental actions, it only made them appear a bit more consistent

The assessor will face many pitfalls, of which :
the fact that correlation and causality are two different concept which are to be distinguished, in particular in case of a policy and its alleged consequences
The assessor must take account of reverse causation but also of the many interactions the policy may have with numerous other determinants
The assessor must stay aware at all times that the beneficiary of a policy might not be the intended one; that the policy might have multiple consequences, including falling outside the initial scope
Several statistic technics will remedy to these issues In general it is crucial to focus on what would have occurred in the absence of this policy

In case a real experimentation cannot be led by the researchers themselves, the discontinuities of public policies stand for the basis of an evaluation This would be, for example, a policy implemented progressively in stages or a policy been applied depending on critical thresholds In the latter case the assessor is able to compare individuals to companies

A credible evaluation requires a strict and rigorous protocol, likely established

beforehand, making an evaluation difficult to implement institutionally

This protocol should guaranty the independence of the assessors as well as their full access to the data
Such a protocol should also include an interdisciplinary debate on the hypothesis and results of the evaluation
Finally, the assessors should be free to publish their results as to discuss them with other experts, in France or abroad

In practice, the evaluation of a policy should not be led by the administration in charge of the implementation
Administrative and technic expertise are essential complements in order to understand the detailed rules of the policy and its possible interactions with other previously implemented policies They shall be combined therefore not substituted

External assessors must be nominated through a transparent process being unrelated to the administration in charge This would promote multiple approaches and independence whilst preventing any complicity with the sponsors

For their part, the assessors must strictly observe data confidentiality and be absolutely honest and transparent about their conflicts of interest

Finally, a credible evaluation is based on a three fundamental actors: the coordinator (*Parlement, Cour des Comptes, Inspection générale des finances*, etc), the related administrations and independant experts

These elements are within a government's reach, as long as it's determined to sort out its public policies

Setting up a credible evaluation takes time It is though worthy, knowing that the resulting reliable and independent diagnostic will save much time at the stage of decision making

Introduction

The modernization of public action, announced on the 18th of December 2012, plan to evaluate every public policies throughout a five year period

In fact, public action has been muddled by the accumulation of measures, concealing outdated policies (the initial aim having been reached), ineffective policies (aims half reached or out of the scope) and diverted policies (serving hidden aims)

The all package is costly for the public revenue office and lacks of democratic transparency

Therefore, each policy should be evaluated one at a time

The evaluation of public policies can be tricky An evaluation that would not be based on a strictly rigorous protocol can be biased and easily discredited Yet, correct evaluations are within a government's reach, as long as it's determined to sort out its public policies

The following is presenting first the classic traps of evaluation then the existing methods to avoid them in order to offer a credible evaluation of public policies with an additional scope on the required statistical data Finally, the characteristics of a good evaluation are described as follows: it should associate different level of expertise within the evaluation's protocols to assure the assessors' plurality and independence but also it should assure diffusion of the work as well as the possibility to discuss afterwards its hypothesis and results

Traps in evaluation

The variation of the indicators giving the effectiveness of a policy is not enough to evaluate it This is why what follows presents the traps of evaluation

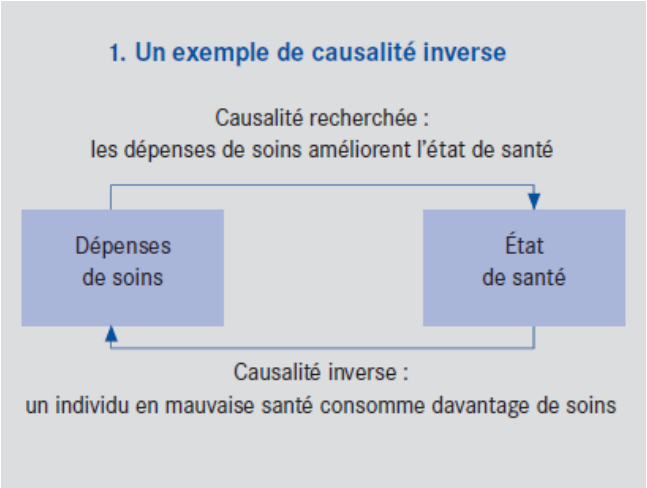
How to define the consequences of a policy

The first difficult step of the evaluation is to identify the causal link between a policy and its alleged consequences

Let's suppose we are trying to evaluate how health spending influence the state of health of a population Within a population, the simple correlation would be negative because those spending more have usually a worse health

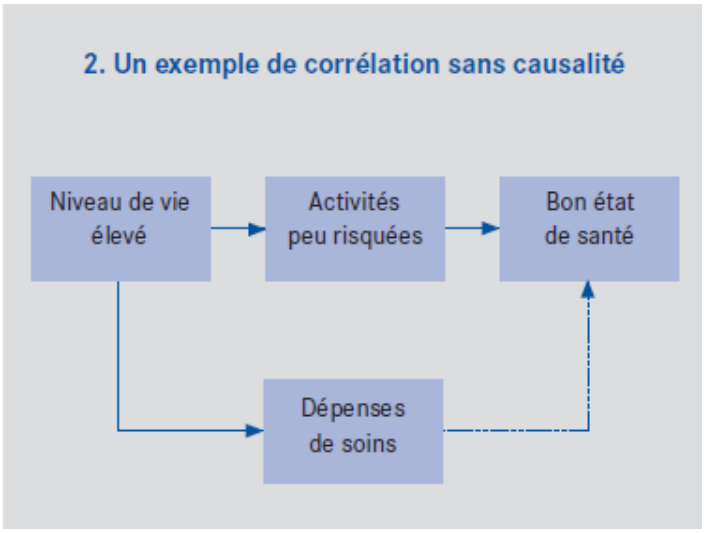
Here is a case of reverse causality from the state of health to health spending

which is unable to give any information about the alleged influence from spending on a population's health (see below figure 1)



Other potential determinants stand in the way of a clear identification of a causal link between health spending and state of health, from which is the standard of living In general, wealthy individuals spend more for their health and are, in fact; healthier for having less risky activities and jobs than the working class, for example

In such a case, the link between health spending and state of health does not correspond to any sort of causality (see below figure 2)



As a consequence, in order to measure the influence of care spending on the

state of health, it should be observed the different states of health of an individual, depending on the amount he or she spends for his or her health

Indeed, is would be a mistake to try measuring this relation by a comparison between the group of larger consumer of care and the group of the smaller consumers of care

Since an individual cannot consume simultaneously a lot and a little of care, the evaluation of the causal link is to be based on numerous individuals from which is carefully observed every potential determinant on his or he state of health, care spending excluded

In 2008[21], Martin and al lead an experiment estimating care spending and the need for care separately Their results show a positive causal link: increasing spending in cancer research and cardiovascular disease research is actually saving lives

The estimations show that, in average, cure for cancer allow to save one year of lifetime for each £13,100 spent while regarding the cardiovascular disease it's one year saved per £8,000 spent

The same traps are to be found when evaluating policies in support of return to employment Let's put it bluntly: those having benefit from this support have undergone a longer period before returning to employment than those who have not benefit from these measures

In such a case it is important to keep in mind that the administrative staff of the French Pole of Employment can attribute this special support regarding to different criterion For example, they can offer this support to the most destitute people or, on the contrary, offer it to the people who will the most likely to return quickly to employment The latter is more likely to occur in case the administrative staff earn bonuses for each unemployed returning to employment under their supervision

This is the example of what is called a "selection bias": the supported individuals are not chosen randomly within the group of unemployed people Likewise, in the previous case, people spending a lot in care products are not

[21] Martin S, N Rice et P Smith (2008) : « Does Health Care Spending Improve Health Outcomes? Evidence from English Programme Budgeting Data », *Journal of Health Economics,* n° 27, pp 826-842

randomly chosen among a population but are in a worse general state of health than all the other individuals

What repercussion is to expect?

The second main issue in evaluating public policies regards the repercussions of a measure, its central interrogation being whether the final beneficiary is, or not, the firstly intended
This second main issue is common in taxation, subvention and transfer of funds' matter

The theory of taxation repercussion shows that, in fact, taxation is not fully supported by the taxpayers The taxpayers can transfer this load to other type of individuals The same goes with subvention in order that the initially intended beneficiaries could not be, in fact, the real and final beneficiaries of the measure

Let's take the example of the housing allowances In 2009, these allowances were about a quarter of the total households' allowances Assuming the real and final beneficiaries of these allowances would be the beneficiary households, then the housing allowances would be contributing to reduce inequalities in standard of living for more than a fifth of the total inequalities reduced thanks to the French system[22] of taxation and redistribution

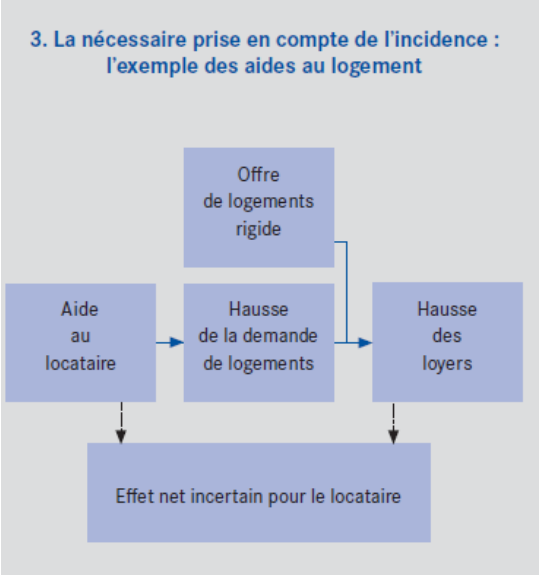
The latter scenario is contested by Fack (2005)[23] who estimates that, in fact, between 50 and 80 percent of this allowance profits to landlords through the rise of rents due to market mechanism and its offer-versus-demand law Indeed, the housing offer being quite static in the short-run, the greater amount of available money for paying a rent caused the general price of rents to go up Consequently, part of the housing allowance initially distributed to the poorest households have been partly absorbed by landlords

This example emphasize the impossibility of evaluating a policy based on the sole TAUX DE RECOURS or number of initially intended beneficiary

[22] Chanchole M et G Lalanne (2011) : *Photographie du système socio-fiscal et de sa progressivité*, Rapport particulier pour le Conseil des prélèvements obligatoires
[23] Fack G (2005) : « Pourquoi les ménages à bas revenus paient-ils des loyers de plus en plus élevés ? L'incidence des aides au logement en France (1973- 2002) », *Économie et Statistique*, n° 381-382

households Evaluate the repercussion of housing allowances without taking into account their impact on rents would result in far too optimistic conclusions (see below figure 3)

In addition, the repercussion effect as explained above, can worsen the situation of people initially excluded from the measure This would be the position of households not receiving the housing allowance therefore fully suffering the rise of rents but also the position of the people financing this measure though their taxes



Multiple effects

A third issue of the evaluation of policies regards the possible multiple effects a measure causes
Those multiple effects may occur within the intended scope For example, to implement a care excess can be an efficient remedy against pharmacological abuses but also can lead to not resorting to pharmacological support when it would have been relevant to do so (see below)

Another possibility is multiple effects occurring outside of the intended scope of the political action For example, a rise in taxation of corporate benefits could result in a drop of the rate of return of the capital but in a drop of wages[24]
The main issue and risk is to neglect those accidental effects because there are

[24] Voir Arulampalam W, MP Devereux et G Maffini (2010): « The Direct Incidence of Corporate Income Tax on Wages », *IZA Working Paper*, n° 5293

occurring outside of the investigation scope or do not regard the relevant determinant of the study or even could occur in a discipline in which the assessors lack of competence

This is why, in order to understand all the possible outcomes of a public policy, it is important for the assessors to bring within their group as much pluridisciplinarity and variety of opinion as possible This, to avoid to limit the analysis to the firstly intended scope

The implementation

Finally, the way of implementing a policy can have great impact on its efficiency It may be tempting to reject a policy for being inefficient when it fact its failure is due to an unfortunate environment or bad conditions

In France, for example, the measure consisting of pricing each medical procedure at the hospital (THA), did not result as expected This failure was not due to a misconception of the main issues involved but to an over detailed classification of medical procedures as well as a mismatch with other measures[25]

In order to solve these issues, an experiment should be led beforehand on a smaller scale It should help to identify the relevant, sometimes unexpected, determinants having a significant impact on the success of the measure (see below

This beforehand experiment does not exempt from the requirement of having an afterwards global evaluation of the new measure This is even a first step toward the final evaluation, giving the assessors the opportunity to build a protocol they could reuse for the afterwards evaluation

The current method is to have one type of actor, administrative or expert, working at one specific stage of the process of the implementation of the measure, without actually working together They should be both involved at every step of the project and be given the opportunity of discussing legal and administrative issues together

[25] Voir Saint-Paul G (2012) : *Réflexions sur l'organisation du système de santé*, Rapport du CAE, n° 103, la Documentation française et le « Commentaire » de B Dormont dans le même volume

En particulier, il convient d'harmoniser les contraintes juridiques et administratives dans le respect des mécanismes économiques visés en faisant dialoguer les administrations avec les experts, et non, comme c'est le cas actuellement, en faisant intervenir séquentiellement les différentes étapes de la décision

The multiple effects of a policy

During the 70's, reseachers have set up an experiement in California: they offered health insurance contracts to a sample of the population These contracts were different regarding the part still charged to the insured and having or not an excess

They observed this sample for a period going up to five years They concluded that partly charging people is an efficient process in regard of reducing the pharmacological abuses therefore to restrict useless care spending

However, they also conclude to a perverse effect in partly charging the insured: the most destitute households tend to restrict their medical care in cases they should not

Then they focused on households at the 20 per cent bottom regarding their income and suffering from hypertension They concluded to a significant difference in blood pressure between people having an integral provision in their health insurance contract and those having a contract partly charging them for their care spending

This is a perfect example of what has been explained above Such a measure, partly charging care spending to the insured in order to prevent pharmacological abuses, cannot be evaluated as fully successful without taking into account the perverse effect it involves Indeed, the hypertension has a great impact on the probability of occurrence of serious cardiovascular diseases and, even though the policy is a success regarding its first objective that is reducing pharmacological abuses, it cannot be evaluated as successful knowing that it worsen the health situation of the most destitute, even though regarding to the initial and intended

Operational factors of public policy making

When leading an experiment aiming to increase the use of additional health care cover with help of health voucher, researchers had difficulty with the protocol influencing the results of the experiment The population examined had been invited to a preliminary informational meeting which, researchers said, contributed to discourage the participants

However, this unexpected and paradoxical result did not biased the conclusion of this study thanks to a rigorous protocol Researchers[26], in collaboration with the « Caisse primaire d'assurance maladie de Lille », built their protocol such as to vary conditions and to randomly distribute people into different groups, some having a health voucher and a preliminary informational meeting, other having none, others having only one of both

Results show that having a preliminary informational meeting discourage the use of the health voucher According to researchers, this would be because the meeting being facultative, whose who could not assist felt illegitimate to use the health voucher
Here is an example of a very positive process spoiled by its implementation

Evaluation methods

A good evaluation should be set up before the implementation of the public policy in question for three motives:

First, it is necessary to rely on an anticipation of the future impacts but also, if possible, on a rigorous experimentation

Second, the implementation's details must be well defined

Third, the way to evaluate the measure afterwards should have been settled beforehand The earlier is defined the method to be used, the more precise the final evaluation will be

The ideal, though impossible, evaluation consists in the comparison between the situation resulting of the new policy and the hypothetical situation that

[26] Guthmuller S, F Jusot et J Wittwer (2011): « Improving Take-up of Health Insurance Program: A Social Experiment in France », *Cahiers de la Chaire Santé*, n° 11, Université Paris-Dauphine

would have resulted from not implementing this policy, all else being equal This ideal but impossible hypothetic situation is called "contrefactuelle[27]"

La situation issue de la politique publique est observable, ce qui n'est pas le cas du « contrefactuel» La difficulté de l'évaluation est donc de reconstituer ce qui se serait passé en l'absence de la politique publique : il faut construire théoriquement ou empiriquement cette situation ou bien constituer un groupe de référence – le «contrefactuel»

L'expérience aléatoire

Comme on l'a vu, une difficulté majeure de l'évaluation est liée au fait que les individus ou les entreprises visés par une politique publique ne sont pas tirés au hasard dans la population : ils sont, par exemple, en moins bonne santé, ou plus éloignés de l'emploi que la moyenne

Une manière de contourner ce problème est de réaliser une expérience aléatoire: on tire au sort un groupe d'individus ou d'entreprises qui se verra appliquer une politique, tandis qu'un autre groupe constituera le groupe de contrôle
Le tirage aléatoire sur une population suffisamment importante permet de s'assurer que les groupes de contrôle et de traitement sont comparables: ce ne sont pas des caractéristiques individuelles qui ont permis d'obtenir le traitement

L'expérimentation citée en est une expérience aléatoire: les expérimentateurs ont proposé une assurance gratuite à un large panel de ménages californiens Les participants n'ont pas eu le loisir de choisir le type du contrat d'assurance qui leur était offert Celui-ci, et en particulier le fait qu'il s'agissait d'une assurance totale ou laissant un reste à charge, était tiré au sort

Une expérimentation aléatoire peut s'avérer coûteuse, même si la précision des résultats et les économies budgétaires qu'ils peuvent permettre en font souvent un investissement rentable

Le coût et la complexité de l'expérience aléatoire sont à la hauteur des résultats qu'elle peut apporter C'est ainsi que l'expérience aléatoire mentionnée au,

[27] Cet idéal est celui de la médecine où l'on teste une thérapie à partir de deux groupes d'individus comparables dont un seul se voit appliquer la thérapie

réalisée dans les années 1970, sert encore aujourd'hui de référence alors même que les comportements se sont modifiés depuis cette époque

Par ailleurs, l'expérience aléatoire soulève dans certains cas des problèmes éthiques[28] Certains domaines sont peu propices à l'expérience aléatoire pour des raisons d'équité il est par exemple inconcevable (et anticonstitutionnel) d'étudier l'effet d'une réforme fiscale en soumettant au hasard divers contribuables à des impôts différents, d'autres parce qu'ils peuvent exposer des sujets vulnérables

Si l'expérience aléatoire pure peut se révéler difficile et parfois coûteuse, des formes approchées donnent aussi des résultats très satisfaisants Il s'agit, au moment où une politique publique est décidée, de ne pas la mettre en place d'un seul bloc sur tout le territoire mais d'échelonner sa mise en œuvre en plusieurs vagues, par exemple par groupes de départements

Il convient alors de choisir les départements de chaque vague de manière à ce que chacune soit la plus comparable possible aux autres Ce type d'expérimentation avait été prévu pour le remplacement du Revenu minimum d'insertion (RMI) par le Revenu de solidarité active (RSA)

Le dispositif a d'abord été appliqué dans l'Eure, puis dans 25, 34 et enfin 40 départements avant d'être généralisé à l'ensemble du territoire Cependant, l'expérimentation n'a pas été effectuée avec suffisamment de constance et les évaluations n'ont pas été à la hauteur des attentes

L'expérience aléatoire peut donner des résultats très fiables à condition d'avoir été préparée à l'avance, soit par la définition de groupes tests, soit par la mise en place séquentielle de la politique Lorsque cela n'a pas été le cas, il faut envisager d'autres méthodes d'évaluation

L'expérience naturelle

L'expérience « naturelle »[29] consiste à comparer des groupes d'individus (ou d'entreprises) qui se trouvent séparés de manière non intentionnelle en termes

[28] Voir sur ce sujet l'avis du Comité d'éthique du CNRS (COMETS) sur l'expérimentation sociale: http://wwwcnrsfr/comets/IMG/pdf/07-experimentationsociale-20100119-2pdf

[29] Le qualificatif « naturelle » ne désigne pas nécessairement un lien avec la nature mais un caractère simplement non intentionnel

d'accès à la politique considérée Les individus exclus du bénéfice de la politique publique servent de « contrefactuel » aux bénéficiaires effectifs

La difficulté de l'évaluation en expérience naturelle est la validité du «contrefactuel», c'est-à-dire la comparabilité des groupes de traitement et de contrôle : une similitude apparente des groupes comparés n'exclut pas la présence de biais dans l'évaluation

De nombreuses techniques économétriques ont de ce fait été développées pour s'assurer de la comparabilité des groupes de traitement et de contrôle La partie qui suit, intitulée présente certaines de ces techniques

Les limites des expériences aléatoires et naturelles

Les techniques décrites plus haut sont relativement récentes et leurs capacités explicatives sont robustes En revanche, leurs qualités prédictives sont contestées au motif que les comportements sont dépendants de l'environnement socio- économique sans cesse mouvant

Ainsi, les comportements peuvent différer entre la réaction à une expérimentation à petite échelle et la réaction à la mise en place réelle d'une politique, du fait que cette dernière modifie plus profondément le cadre économique

Par exemple, l'expérience aléatoire de la RAND *corporation* (voir) examine l'effet d'une assurance sur les consommations de soins d'un faible nombre de sujets

Si l'on considère une assurance publique de plus grande ampleur comme Medicare[30], on peut trouver une augmentation des dépenses de soins bien plus importante: le fait que l'assurance touche plus de personnes et augmente substantiellement les ressources financières du secteur induit une réaction du côté de l'offre de soins, la construction de nouveaux hôpitaux et une augmentation de la recherche médicale

Des méthodes mêlant l'estimation en expérience naturelle et des modélisations

[30] Finkelstein A (2007) : « The Aggregate Effects of Health Insurance: Evidence from the Introduction of Medicare », *The Quarterly Journal of Economics*, n° 122, pp 1-37

plus globales sont en cours de développement pour corriger ce handicap[31]

La nécessité de données fiables

Pour réaliser les évaluations, il est impératif de disposer de bases de données à la fois exhaustives et fiables Les chercheurs ont rarement les moyens de réaliser eux-mêmes des enquêtes Heureusement, les données nécessaires existent déjà pour la plupart dans différentes bases administratives Il est donc important de mettre en place des institutions et des procédures afin que les chercheurs puissent exploiter ces données tout en préservant les droits des individus et des entreprises dont les informations sont consignées dans ces bases Des protocoles sûrs existent déjà, comme l'accès sécurisé aux données (ASD), nécessitant un accord par étude de la part de la Commission du secret statistique

Cependant, deux lacunes se font encore cruellement sentir :
La première est que de nombreuses données restent inaccessibles, notamment celles d'assurance-maladie et les données fiscales Or, celles-ci sont primordiales à nombre d'évaluations, et ce pour plusieurs raisons :
Tout d'abord, les politiques fiscales sont nombreuses et encore peu évaluées par manque de données Un accès aux données fiscales permettrait un grand progrès concernant ce type de politiques
De plus, du fait de leur richesse, les données fiscales peuvent être mobilisées pour évaluer des politiques non fiscales Il faut ainsi permettre le travail des évaluateurs sur ces bases tout en garantissant le secret fiscal aux contribuables
Cela passe par des protections telles que l'ASD et par l'anonymisation des bases, tout en préservant un codage des observations pour garder la possibilité de constituer des panels Ceci est aisé techniquement et peu coûteux
La deuxième lacune concerne la possibilité d'apparier les fichiers administratifs ou d'enquêtes En effet, mêmes si l'ensemble des informations contenues dans les bases de données accessibles aux évaluateurs s'élargissait, celles-ci ne seraient pas toujours utilisables
Pour étudier le comportement des mères en termes d'offre de travail, par exemple, il est nécessaire d'avoir des informations sur les enfants d'une femme, ce que l'on trouve dans une base de données, et sur sa participation au marché du travail, ce que l'on trouve dans une autre Si l'on n'est pas capable

[31] Attanasio O, C Meghir et A Santiago (2012) : « Education Choices in Mexico: Using a Structural Model and a Randomized Experiment to Evaluate PROGRESA », *Review of Economic Studies*, n° 79, pp 37-66

d'apparier les bases, les informations contenues dans chaque base se révéleront inutiles
Il existe des moyens simples, fiables et peu coûteux de réaliser les appariements tout en respectant l'anonymat des données

Comment comparer différentes politiques publiques ?

L'évaluation d'une politique publique peut conduire à une conclusion tranchée : la politique est inefficace au regard de l'objectif assigné, voire elle est contre-productive Souvent, cependant, le jugement est plus nuancé : la politique est efficace, mais elle semble coûteuse au regard des résultats obtenus

Pour arbitrer avec d'autres politiques, notamment celles qui agissent dans des champs différents de l'action publique, il faut alors convertir ses bénéfices dans une métrique qui les rende comparable à la fois aux coûts et aux bénéfices des autres politiques publiques

En pratique, il faut affecter une valeur monétaire à des bénéfices non monétaires comme la qualité de l'air, la longévité ou la santé Ceci peut choquer de prime abord, mais constitue le seul moyen de rendre explicites les critères utilisés pour la décision publique

Ces valeurs monétaires peuvent être définies de manière tutélaire, comme cela a souvent été le cas en matière de sécurité routière Toutefois, il est préférable de chercher à repérer les préférences des individus à partir des enquêtes où ils expriment leur disposition à payer pour une amélioration de la qualité de l'eau par exemple[32]

Les méthodes économétriques dans le cadre des expériences naturelles

La double différence

Ne pouvant comparer des individus identiques dans deux mondes différents

[32] Un point très important est la façon dont on synthétise les dispositions à payer des individus De nombreux travaux, en environnement, mais aussi en santé, montrent que les décisions publiques peuvent être fortement modifi ées selon les pondérations retenues Voir Anthoff D, C Hepburn, RSJ Tol (2009) : « Equity Weighting and the Marginal Damage Costs of Climate Change », *Ecological Economics*, n° 68, pp 836-849 ; Fleurbaey M, S Luchini, E Schokkaert et C Van de Voorde (2013), « Evaluation des politiques de santé : pour une prise en compte équitable des intérêts des populations », *Économie et Statistique*, à paraître

(avec et sans la politique publique), il faut se contenter de comparer les individus traités avant et après leur traitement (on est alors sujet aux biais de conjoncture) ou les individus traités et non traités après le traitement des premiers (on est alors sujet aux biais de sélection) Le principe de l'évaluation en double différence consiste à associer les deux approches

On rassemble les individus dans un groupe de traitement (ceux dont la situation est censée avoir été modifiée par la politique publique) et un groupe de contrôle (ceux dont la situation n'a pas été modifiée) On compare ensuite l'évolution de ces deux groupes, le groupe de contrôle servant de contrefactuel au groupe de traitement

Le relèvement de plafond de la réduction d'impôt pour l'emploi à domicile décidé en 2002 peut servir d'exemple Une simple comparaison des déclarations d'emplois à domicile avant et après ce relèvement pourrait faire croire à une efficacité substantielle de la mesure

Cependant, celle-ci est intervenue en plein développement de ces services et le relèvement de plafond a été concomitant d'autres mesures d'incitations (baisses de cotisations sociales), de simplifications administratives (chèque emploi service simplifié) et de l'entrée des entreprises dans un marché alors quasi exclusivement composé de travailleurs individuels

La prise en compte d'un contrefactuel (en l'occurrence les ménages non touchés parce que situés précédemment en dessous de l'ancien plafond ou au-dessus du nouveau plafond) permet d'isoler l'effet spécifique de la mesure puisque les membres du groupe de contrôle sont tout autant que ceux du groupe de traitement touchés par les autres mesures incitatives

On trouve alors que le relèvement de plafond a effectivement augmenté la demande de services à domicile mais n'est responsable que marginalement du développement de ce secteur[33]

Des méthodes d'assortiment peuvent améliorer encore l'évaluation Elles consistent à repérer des individus semblables à l'intérieur des groupes de contrôle et de traitement La comparaison des évolutions des variables d'intérêt ne se fait alors plus globalement entre les groupes de contrôle et de traitement,

[33]Carbonnier C (2010) : « Réduction et crédit d'impôt pour l'emploi d'un salarié à domicile, conséquences incitatives et redistributives », *Économie et Statistique*, n° 427-428, pp 67-100

mais individuellement entre les sous-ensembles assortis tirés de ces groupes

La régression autour d'une discontinuité

Une autre méthode consiste à repérer une discontinuité dans le droit au traitement et à ne réaliser l'évaluation qu'à ce niveau : c'est le principe de régression autour d'une discontinuité Fack et Grenet (2010) ont utilisé cette méthode pour estimer la disposition à payer pour l'éducation, à partir d'une discontinuité de la carte scolaire[34]

Le prix d'un logement au mètre carré dépend du quartier et de la qualité du logement ; il est relativement stable à localisation et qualité égales Ainsi, en appariant des appartements de qualité identique, de part et d'autre d'une même rue – donc dans des quartiers identiques – mais dont l'adresse envoie les enfants dans des écoles différentes du fait de la carte scolaire, ils parviennent à mesurer le supplément de prix que sont prêts à payer les parents pour envoyer leurs enfants dans une école plutôt que dans une autre

Le principe de la régression autour d'une discontinuité consiste ainsi à comparer non plus l'ensemble des individus traités ou non, mais seulement ceux très proches du seuil décidant de l'assignation entre les deux groupes En supposant que les caractéristiques des individus sont continues, les individus tout proches du seuil d'un côté (et ainsi non traités) sont identiques et donc comparables aux individus très proches du seuil de l'autre côté (et donc traités)

Un autre exemple est l'usage qui a été fait par Piketty et Valdenaire (2006) des seuils d'ouverture de classes pour estimer l'impact de la taille des classes sur la réussite scolaire[35] La taille des classes n'est pas déterminée au hasard : elle n'est pas la même en ville et en zone rurale, et au sein d'une même école les enfants ne sont pas répartis au hasard dans les classes Ainsi il est difficile de déterminer l'impact de la taille des classes sur la réussite scolaire

Les deux auteurs exploitent la règle selon laquelle une classe de CE1 ne peut

[34]Fack G et J Grenet (2010) : « When do Better Schools Raise Housing Prices? Evidence from Paris Public and Private Schools », *Journal of Public Economics*, n° 94, pp 59-77

[35]Piketty T et M Valdenaire (2006) : « L'impact de la taille des classes sur la réussite scolaire dans les écoles, collèges et lycées français Estimations à partir du panel primaire 1997 et du panel secondaire 1995 », *Les Dossiers Enseignement Scolaire*, n° 173, ministère de l'Éducation nationale

dépasser 30 élèves : lorsqu'un nouvel élève arrive (événement aléatoire) dans une cohorte de 30 élèves, il se crée une classe supplémentaire, et les écoliers apprennent donc dans des classes de 15 ou 16 élèves Cet événement crée une discontinuité qui peut être exploitée pour mesurer l'impact de la taille des classes sur les résultats scolaires

La méthode des variables instrumentales

Une dernière méthode consiste à trouver une variable dite « instrumentale » pour délimiter les groupes de contrôle et de traitement Il s'agit d'une variable fortement corrélée avec le fait d'être « traité » (par la politique publique), mais sans influence directe sur le paramètre d'intérêt (le résultat de la politique) et non manipulable par les individus

Cette méthode a été utilisée pour estimer l'impact de la maternité sur la participation au marché du travail, ce qui est utile pour calibrer des politiques d'encouragement à l'activité des mères

Le problème ici est que le choix du nombre d'enfants est influencé par le statut de la mère sur le marché du travail (emploi, chômage, inactivité) Pour contourner ce problème, Angrist et Evans (1998)[36] ont séparé un groupe homogène de femmes ayant au moins deux enfants selon que les deux premiers enfants sont de même sexe ou de sexes différents

Il n'y a *a priori* aucune influence directe de cette variable « instrumentale » binaire (même sexe, sexes différents) sur la participation des femmes au marché du travail

En revanche, les femmes dont les deux premiers enfants sont de même sexe ont plus souvent que les autres un troisième enfant, et ce pour des raisons exogènes et non du fait de caractéristiques individuelles différentes ni de leur statut sur le marché du travail

Les auteurs ont alors observé que les femmes dont les deux premiers enfants sont de même sexe participent significativement moins au marché du travail que les femmes avec deux enfants de sexes différents, ce qu'ils ont interprété

[36]Angrist J et W Evans (1998) : « Children and Their Parents' Labor Supply: Evidence from Exogenous Variation in Family Size », *TheAmerican Economic Review*, n° 88, pp 450-477

comme l'effet causal du fait d'avoir un troisième enfant

Les structures de l'évaluation

L'évaluation des politiques publiques n'est pas qu'une affaire de données et d'expertise technique Les politiques qui sont évaluées sont souvent complexes et elles opèrent généralement une redistribution au sein de la société Ces caractéristiques imposent d'organiser l'évaluation avec beaucoup de rigueur aux différents niveaux d'expertise

Expertise technique et expertise administrative

Si l'expertise technique est indispensable pour déjouer les pièges de l'évaluation mentionnés plus haut, on ne saurait se passer de l'expertise administrative sur la mise en œuvre concrète des politiques et le fonctionnement des établissements publics ou administrations qui les gèrent

L'expertise administrative permet non seulement de construire la stratégie d'identification et les scénarios contrefactuels, mais également de discerner, dans les résultats, ce qui relève du principe général de la politique et ce qui est le fait de sa mise en œuvre concrète

Ces deux types d'expertises – technique et administrative – doivent collaborer non seulement au cours de la phase d'évaluation proprement dite, mais également et surtout en amont, si possible avant la mise en œuvre de la politique évaluée Cela doit permettre d'adapter certaines modalités de la loi pour la rendre plus précisément évaluable

C'est également au cours de cette phase de coordination *a priori* que peut se décider, suivant les possibilités légales, une mise en œuvre échelonnée de la mesure afin de construire dès avant l'évaluation un contrefactuel pertinent

Enfin, cette coordination *a priori* pourrait permettre d'éviter les défauts de mise en œuvre susceptibles de rendre inefficace une politique publique en principe bénéfique

L'indépendance des évaluateurs

Aussi rigoureuse soit-elle, une évaluation reste sujette à incertitude scientifique : les résultats sont conditionnels à la validité des méthodes (choix du

contrefactuel, généralisation des résultats…)

Or, pour que l'évaluation des politiques publiques soit utile, il importe que ses résultats soient crédibles : que les hypothèses soient présentées de manière transparente, sans que l'on puisse soupçonner que certaines ont été cachées

La transparence et la crédibilité nécessitent l'indépendance des évaluateurs La difficulté est alors de faire collaborer les partenaires institutionnels et scientifiques tout en préservant l'indépendance de l'évaluation

Il existe des conflits d'intérêts évidents lorsque l'évaluation est réalisée par les administrations, ministères, directions ou établissements publics en charge de concevoir ou d'appliquer une politique publique Une même institution ne peut être à la fois juge et partie

Ce n'est cependant pas le seul problème d'indépendance et il faut veiller à ne pas créer une dépendance de fait au cours du processus de désignation des évaluateurs, ou en bloquant la publication des résultats

Le temps de l'évaluation n'est pas le temps du politique Plusieurs raisons imposent cette divergence de calendrier
Tout d'abord, la plupart des méthodes d'évaluation nécessitent des données longitudinales Il faut donc attendre de réunir suffisamment de données pour s'assurer de la validité de l'évaluation
De plus, l'évaluation elle-même prend du temps, de la nomination des évaluateurs à la discussion de résultats, en passant par les choix méthodologiques et le travail statistique Dans ce domaine, la précipitation est bien souvent l'ennemie de la précision et de l'exhaustivité En particulier, les hypothèses doivent être soumises à une critique approfondie des pairs

Cette méthode de validation *a posteriori* des résultats, qui est la méthode proprement scientifique, ne doit pas être négligée dans le cas de l'évaluation des politiques publiques[37] Précipiter une évaluation revient à en réduire la crédibilité, ce qui rend plus difficile (et potentiellement plus longue) la décision publique

[37] Cette phase de discussion par les pairs garantit l'indépendance du choix de la méthode ; elle facilite aussi une séparation claire entre l'évaluation et la décision politique Voir l'avis du Comité d'éthique du CNRS, *op cit*

La diffusion des résultats

La liberté de diffusion des résultats est une condition clé de l'indépendance des évaluateurs En particulier, l'accès aux données ne doit pas être conditionné à un droit de regard par l'administration dépositaire des données

Toute pratique allant à l'encontre de cette liberté de diffusion, en mettant une pression sur l'évaluateur quant à ses résultats, contreviendrait à la nécessité d'indépendance de celui-ci, outre le fait qu'elle exclurait tout débat scientifique sur la méthode et les résultats

La diffusion des résultats doit s'accompagner d'une confrontation avec d'autres évaluations issues, le cas échéant, d'autres champs disciplinaires (cf infra)

Cette confrontation doit s'opérer à la fois par la publication des différents résultats et de leurs critiques, mais également par l'organisation de débats, voire de conférences de consensus

Ceci, afin de permettre une meilleure information des citoyens et une meilleure compréhension des divers effets d'une politique publique

À cette fin, des méthodes de hiérarchisation de la robustesse des résultats peuvent être mobilisées (preuve scientifiquement établie, présomption scientifique, faible niveau de preuve…)

Pluralité des évaluateurs et interdisciplinarité

Une même politique publique ayant souvent des effets multiples, il est nécessaire de disposer de plusieurs évaluations correspondant à différentes approches, disciplines ou sensibilités

Le Crédit d'impôt compétitivité emploi (CICE, loi n° 2012-1510 du 29 décembre 2012) fournit un exemple dans ce sens Quand il s'agira d'évaluer ce dispositif, de nombreuses variables d'intérêt seront envisageables
En premier lieu, une étude d'impact sur la position commerciale de la France vis-à-vis de l'étranger paraît l'évidence, tout comme une étude de l'impact sur l'emploi en termes quantitatifs

Mais d'autres évaluateurs pourront s'intéresser à d'autres problématiques, comme l'impact de la politique sur la structure des qualifications, sur les carrières au sein de l'industrie ou sur les conditions de travail
On pourra aussi évaluer l'impact sur le financement de la protection sociale d'un point de vue plus général**,** et sur son acceptabilité

Cet exemple illustre l'importance du pluralisme non seulement dans l'évaluation *a posteriori*, mais également dans sa préparation *a priori*
La phase de coordination en amont doit permettre de définir les variables d'intérêt dont on souhaite mesurer l'évolution du fait de la politique étudiée, et permettre que chacune des conséquences du dispositif soit évaluée

Il importe donc que cette coordination *ex ante* soit pluraliste en termes de méthodes, de disciplines et de sensibilités Ce pluralisme *ex ante* est plus complexe à mettre en place que le pluralisme *ex post*, notamment parce que ce dernier peut être obtenu par la juxtaposition d'évaluations émanant de groupes d'experts différents

La phase de coordination initiale étant forcément unique, l'attention pour que le pluralisme existe doit être d'autant plus soutenue dès cette étape

Le triptyque de l'évaluation

Contrairement à d'autres pays développés, la France a peu d'expérience en matière d'évaluation des politiques publiques au sens où nous l'avons défini dans cette Note

Une bonne évaluation devrait s'appuyer sur un triptyque formé d'un coordonnateur, des administrations concernées et d'experts indépendants :

la coordination de l'évaluation doit être assurée par une institution extérieure au pouvoir exécutif

La logique démocratique voudrait que ce soit le Parlement qui ait la charge de commanditer ces évaluations Cela imposerait de lui en donner la capacité technique, c'est-à-dire du personnel pour coordonner réellement la mise en place de l'évaluation, son appréciation et sa diffusion auprès des parlementaires et du grand public La Cour des comptes est un autre candidat, avec suffisamment de poids institutionnel pour commanditer des évaluations

indépendantes [38]

Quel que soit le choix du commanditaire institutionnel, celui-ci devra coordonner la préparation de l'évaluation, s'assurer que la pluralité des approches est bien respectée**,** et contrôler que toutes les mesures aptes à faciliter les évaluations ont bien été prises (en particulier l'accès aux données) Il devra également organiser la confrontation et la diffusion des résultats

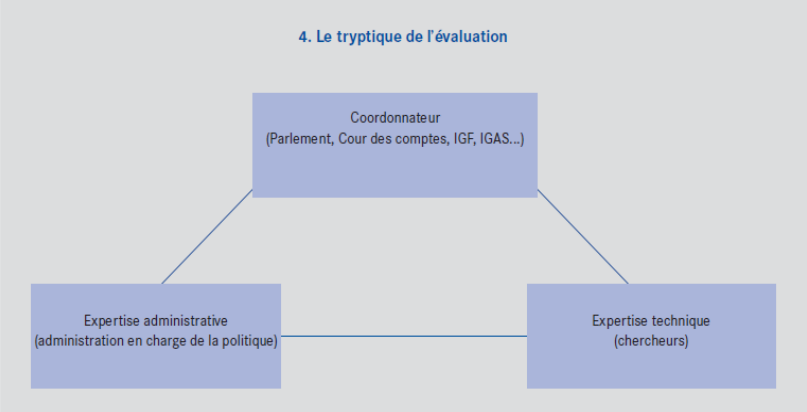
Le choix des organismes évaluateurs devrait se faire par le biais d'appels d'offres publics et être effectué de façon transparente ;

les administrations concernées doivent apporter leur expertise institutionnelle La collaboration avec les évaluateurs doit se faire sans pression, sous la surveillance des organismes commanditaires Les services statistiques des ministères ont des compétences techniques en matière d'évaluation, en plus de leurs compétences institutionnelles Ils peuvent alors organiser des évaluations parallèles aux évaluations indépendantes et participer utilement aux débats sur les résultats
Mais ils doivent faciliter la réalisation de l'évaluation indépendante, notamment en ouvrant un accès complet et éclairé aux données ;

les experts doivent apporter leur compétence scientifique en tant qu'évaluateurs Leur indépendance doit être assurée, entre autres, par leur rotation, de manière à éviter toute captation en fonction des résultats passés d'évaluations

Les experts doivent se soumettre aux contraintes liées au secret statistique et être transparents quant à leurs activités annexes pouvant engendrer des conflits d'intérêts Il est primordial qu'ils collaborent avec les autres disciplines, notamment dans les phases préparatoires et celles de diffusion des résultats

[38] Le coordonnateur peut aussi être issu de l'administration du moment que ce n'est pas l'administration en charge de la politique évaluée On pense ici à l'Inspection générale des finances et à l'Inspection générale des affaires sociales



Exemples d'organisation de l'évaluation à l'étranger

Différentes structures ont été mises en place pour coordonner l'évaluation des politiques publiques à l'étranger

Une comparaison éclairante est celle de l'Institute for Fiscal Studies (IFS) au Royaume-Uni et du Government Accountability Office (GAO) aux États-Unis[39] Le GAO n'est pas indépendant par nature, ni porté initialement vers l'évaluation Il dépend directement de l'État fédéral et sa mission à sa création en 1921 était l'audit des finances des agences gouvernementales

L'audit est très différent de l'évaluation des politiques publiques, mais au cours du temps, cette institution a vu ses compétences s'élargir De nombreux chercheurs en sciences sociales, ainsi que des collaborations avec des universitaires, sont venus compléter les capacités principalement juridiques du GAO

Son objectif est d'informer le Congrès et les citoyens sur les actions du gouvernement, afin de permettre au Congrès d'effectuer au mieux son rôle législatif, et de pouvoir si besoin s'opposer de manière éclairée au pouvoir exécutif Il le fait notamment en contrôlant les évaluations ministérielles selon des critères scientifiques (validité des contrefactuels) et institutionnels (séparation du commanditaire et de l'évaluateur, indépendance de ce dernier, publication automatique des résultats)

Afin d'assurer son indépendance, le GAO est dirigé par le « contrôleur général

[39] Pour une discussion approfondie, voir Ferracci M et É Wasmer (2011) : *État moderne, État effi cace*, Odile Jacob

des États-Unis » dont le mandat est long (15 ans), incompressible et non renouvelable

La transposition au cas français ne serait toutefois pas aisée, et rien n'assure qu'un tel dispositif serait tout autant indépendant Le Royaume-Uni, qui possède comme la France un exécutif fort s'appuyant sur une puissante administration, a mis en place un tout autre système

Ainsi l'IFS, qui a un statut d'association non gouvernementale, est indépendant par nature Afin d'éviter la dépendance envers des intérêts constitués, le financement repose sur une multiplicité de subventions d'institutions et d'entreprises

La seule subvention essentielle provient de l'Economic and Social Research Council (ESRC), l'agence publique chargée de financer la recherche en sciences sociales dans le pays La compétence scientifique est assurée par le recrutement de chercheurs en sciences sociales et des collaborations de long terme avec des universitaires

Les missions sont principalement centrées sur l'évaluation des politiques publiques et l'explication des dispositifs dont la complexité nuit à la transparence Les résultats servent à conseiller les membres du Parlement, voire du Gouvernement, ainsi que divers groupes de la société civile Enfin, l'IFS s'impose une mission importante vis-à-vis du grand public, avec des publications didactiques dans les médias

L'Australie présente également un cas riche d'enseignements Regrettant que le contrôle des dépenses prenne le pas sur l'évaluation des performances, le gouvernement australien a tenu à inculquer à ses ministères une véritable culture de l'évaluation à partir de la fin des années 1980

Chaque ministère devait remettre au ministère des Finances un plan d'évaluation annuel, permettant d'évaluer l'intégralité de ses politiques tous les trois à cinq ans Les résultats étaient rendus publics Le ministère des finances, et surtout l'Australian National Audit Office (ANAO) contrôlaient ces pratiques d'évaluations En particulier, l'ANAO servait à la fois d'organe de conseil en évaluation et évaluait lui-même la qualité des évaluations

Il en a résulté une évaluation effective des politiques et une importante prise en compte des résultats dans les propositions de politiques nouvelles

Cependant, l'ANAO a constaté, dans son rapport de 1997 [40] que la communication autour des méthodes et des résultats des évaluations menées par les ministères en charge des politiques était insuffisante

Conclusion

Si elle nécessite de combiner une expertise technique, une expertise administrative et une organisation rigoureuse garantissant indépendance et pluralisme, l'évaluation des politiques publiques n'en est pas moins à la portée d'un gouvernement désireux de faire le tri dans ses politiques

Il faut cependant souligner trois conditions *sine qua non* de réussite et de crédibilité de l'évaluation : l'accès aux données, le temps de l'expertise, la publication des résultats

Ces conditions ne doivent pas être considérées comme des contraintes, mais plutôt comme les ingrédients clés d'une évaluation crédible, sur laquelle le processus de décision pourra réellement s'appuyer en toute transparence

[40] ANAO (Australian National Audit Office) (1997-1998): « Program Evaluation in the Australian Public Service » *AGPS, Performance Audit Report*, n° 3