

# PARETO CONCEPTS

# THE PROJECT

Consider something much less ambitious than complete agreement on what we mean by good policy

Identify limited instances of unequivocally good policy

- ▶ Makes some people better off and no one worse off

# UTILITY FUNCTIONS

Each individual's preferences can be represented with a **utility function**

The utility function,  $U_i$ , represents person  $i$ 's preferences if:

1. If person  $i$  prefers a policy  $x$  to another policy  $y$ , then  
$$U_i(x) > U_i(y)$$
2. If person  $i$  is indifferent between  $x$  and  $y$ , then  
$$U_i(x) = U_i(y)$$

# PARETO DOMINANCE

A policy  $x$  *Pareto dominates* another policy  $y$  if two conditions are satisfied:

1. No one strictly prefers  $y$  to  $x$ —that is, for all  $i$ ,  
 $U_i(x) \geq U_i(y)$ .
2. At least one person strictly prefers  $x$  to  $y$ —that is, for at least one  $i$ ,  $U_i(x) > U_i(y)$ .

If one policy Pareto dominates another, everyone should be able to agree that policy is better

# PARETO IMPROVEMENT

The move from a policy  $y$  to an alternative policy  $x$  is a *Pareto improvement* if  $x$  Pareto dominates  $y$ .

From any reasonable welfarist perspective, a policy change that is a Pareto improvement is unambiguously good

# PARETO EFFICIENCY

A policy  $x$  is *Pareto efficient* if no other policy Pareto dominates it.

A policy  $x$  is *Pareto inefficient* if at least one other policy Pareto dominates it.

Pareto efficiency is important for two reasons

1. The set of policies from which there is no unambiguously good policy move
2. We know a lot about how to achieve Pareto efficiency

# PARETO EFFICIENCY AND PARETO IMPROVEMENTS

$$U_1(x) = 5 \quad U_1(y) = 2 \quad U_1(z) = 4$$

$$U_2(x) = 1 \quad U_2(y) = 3 \quad U_2(z) = 7$$

$$U_3(x) = 4 \quad U_3(y) = 1 \quad U_3(z) = 1$$

- ▶ What are the Pareto efficient policies?
- ▶ Is there a Pareto improvement from  $x, y, z$ ?

# PARETO EFFICIENCY AND PARETO IMPROVEMENTS<sup>2</sup>

$$U_1(x) = 3 \quad U_1(y) = 4 \quad U_1(z) = 4$$

$$U_2(x) = 3 \quad U_2(y) = 4 \quad U_2(z) = 1$$

$$U_3(x) = 3 \quad U_3(y) = 4 \quad U_3(z) = 2$$

- ▶ What are the Pareto efficient policies?
- ▶ Is there a Pareto improvement from  $x, y, z$ ?



# PARETO EFFICIENCY AND PARETO IMPROVEMENTS<sup>3</sup>

$$U_1(x) = 1 \quad U_1(y) = 2 \quad U_1(z) = 3$$

$$U_2(x) = 3 \quad U_2(y) = 2 \quad U_2(z) = 0$$

$$U_3(x) = -2 \quad U_3(y) = 4 \quad U_3(z) = 0$$

- ▶ What are the Pareto efficient policies?
- ▶ Is there a Pareto improvement from  $x, y, z$ ?

# PARETO EFFICIENCY AND PARETO IMPROVEMENTS<sup>4</sup>

$$U_1(x) = 3 \quad U_1(y) = 4 \quad U_1(z) = 5$$

$$U_2(x) = 3 \quad U_2(y) = 4 \quad U_2(z) = 1$$

$$U_3(x) = 3 \quad U_3(y) = 4 \quad U_3(z) = 2$$

- ▶ What are the Pareto efficient policies?
- ▶ Is there a Pareto improvement from  $x, y, z$ ?

# EFFICIENCY VS. IMPROVEMENT

$$U_1(x) = 5 \quad U_1(y) = 2 \quad U_1(z) = 4$$

$$U_2(x) = 1 \quad U_2(y) = 3 \quad U_2(z) = 7$$

$$U_3(x) = 4 \quad U_3(y) = 1 \quad U_3(z) = 1$$

- ▶  $y$  is not Pareto efficient
- ▶  $x$  and  $z$  are Pareto efficient
- ▶ Move from  $y$  to  $x$  *not* Pareto improvement

# MOVING FROM PARETO INEFFICIENT TO EFFICIENT POLICY NEED NOT CREATE PARETO IMPROVEMENT

We care about achieving Pareto improvements

We know how to achieve Pareto efficiency

Let's see if we can build a bridge between Pareto efficiency  
and Pareto improvements

This involves addressing distributional concerns

# A MODEL OF POLICY

A policy has two components

- ▶ An action
- ▶ A transfer scheme

Think of the action as the policy lever to be pulled

- ▶ Free trade, high stakes testing, carbon tax, sanctions

The transfer scheme is a redistribution of money

# FORMALIZING THE MODEL

Society has  $n$  people

$A$  is the set of possible actions

$t = (t_1, t_2, \dots, t_n)$  is a transfer scheme

- ▶ Individual transfers can be positive or negative
- ▶ Transfer schemes must have *balanced budgets*

$$\sum_{i=1}^n t_i = 0$$

A policy is a pair  $(a, t)$

# INDIVIDUAL PREFERENCES OVER ACTION-TRANSFER PAIRS

A person  $i$ 's preferences over policies,  $(a, t)$ , are given by that person's utility function,  $U_i(a, t)$

If person  $i$  prefers  $(a, t)$  to  $(a', t')$ , then  $U_i(a, t) > U_i(a', t')$

If person  $i$  is indifferent between  $(a, t)$  and  $(a', t')$ , then  $U_i(a, t) = U_i(a', t')$

## AN EXAMPLE

Consider a society made up of two people: The Mayor ( $M$ ) and the Teacher's Union ( $T$ )

There are two actions under consideration

- ▶ Using test scores to evaluate teacher performance and determine pay, called *Pay for Performance* ( $PP$ )
- ▶ Paying teachers solely based on education and seniority, called *Seniority Pay* ( $SP$ )



## EXAMPLE, CONTINUED

The Mayor prefers pay for performance

$$U_M(PP, (0, 0)) = 10 \quad U_M(SP, (0, 0)) = 2$$

The Teacher's Union prefers seniority pay

$$U_T(PP, (0, 0)) = 1 \quad U_T(SP, (0, 0)) = 6$$

## EXAMPLE, CONTINUED<sup>2</sup>

It may be possible to get both to agree to a move to performance pay by transferring money to the teachers (e.g., raising the average salary)

Enough of a transfer might compensate the teachers union for the utility loss from adopting performance pay

$$U_M(PP, (-10,000,000, 10,000,000)) = 5$$

$$U_T(PP, (-10,000,000, 10,000,000)) = 7$$

# QUASI-LINEAR PREFERENCES

Suppose you can separate person  $i$ 's utility from a policy  $(a, t)$  into two components

- ▶ Payoff from action  $a$  is  $v_i(a)$
- ▶ Payoff from transfer  $t_i$  is simply  $t_i$

$$U_i(a, t) = v_i(a) + t_i$$

Two important assumptions

- ▶ Payoffs from money are linear, so money = utility
- ▶ Additive separability of transfers and policy

## THE QL MODEL SPLITS POLICY PROBLEMS INTO 2 COMPONENTS

1. **Efficiency:** Use action to maximize total utility.
2. **Distribution:** Use transfers to compensate any losers.

*Congress created Trade Adjustment Assistance (TAA) in the Trade Expansion Act of 1962 to help workers and firms adjust to dislocation that may be caused by increased trade liberalization. It is justified now, as it was then, on grounds that the government has an obligation to help the 'losers' of policy-driven trade opening.*

*—Congressional Research Service*

# UNDER QL, UTILITARIANISM CARES ONLY ABOUT SUM OF THE $v_i$ 'S

Under utilitarianism, prefer  $(x, t)$  to  $(y, t')$  if and only if

$$U_1(x, t) + U_2(x, t) > U_1(y, t') + U_2(y, t')$$

$$v_1(x) + t_1 + v_2(x) + t_2 > v_1(y) + t'_1 + v_2(y) + t'_2$$

Balanced budgets implies  $t_1 + t_2 = t'_1 + t'_2 = 0$ :

$$v_1(x) + v_2(x) > v_1(y) + v_2(y)$$

With QL preferences, transfers don't matter for utilitarianism, only the action matters

# A UTILITARIAN OPTIMUM

Say that an action is a *utilitarian optimum* if no other action leads to a higher sum of the  $v_i$ 's

# UNDER QL, A POLICY CAN ONLY BE PARETO EFFICIENT IF IT INVOLVES A UTILITARIAN OPTIMUM

A Pareto efficient policy is one that is not Pareto dominated

Suppose there is a policy  $(x, t)$  such that there is some other  $y \neq x$  with  $\sum_{i=1}^n v_i(x) < \sum_{i=1}^n v_i(y)$

Under QL, if all budget balanced transfer schemes are possible,  $(x, t)$  cannot be Pareto efficient

- ▶ Switch action to  $y$  and then choose transfers to make up the difference to any losers
- ▶ There is still utility “left over”

UNDER QL, ANY POLICY INVOLVING A  
UTILITARIAN OPTIMUM ACTION IS  
PARETO EFFICIENT

Once at a utilitarian optimum, there is no way to create more utility

Any policy change either reduces the total amount of utility or, at best, redistributes it

This must make at least one person worse off



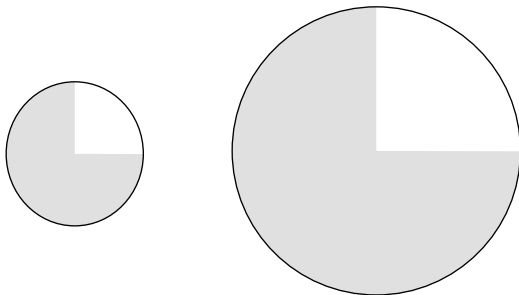
# AN EXAMPLE WITH TWO ACTIONS

Think about the sum of the  $v_i$ 's as the amount of “utility pie”

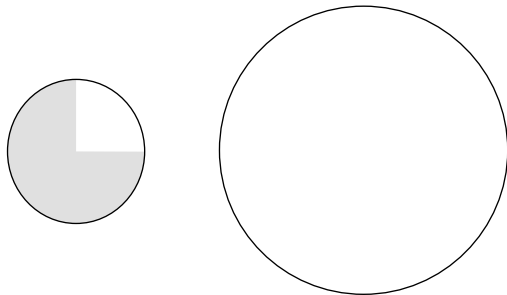
Suppose one action yields a small pie the other yields a large pie

Can use transfers to create any division of the pie you like

ANY DIVISION OF A SMALL PIE IS  
PARETO INEFFICIENT, ANY DIVISION OF  
A LARGE PIE IS PARETO EFFICIENT



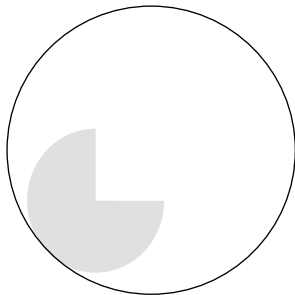
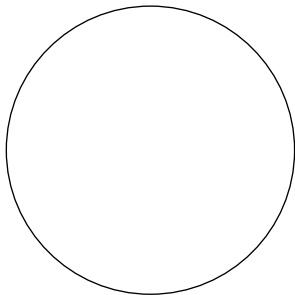
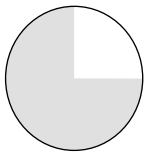
MOVING FROM PARETO INEFFICIENT  
TO EFFICIENT POLICY DOESN'T IMPLY  
PARETO IMPROVEMENT

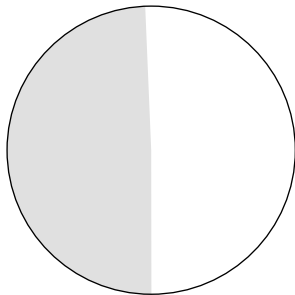
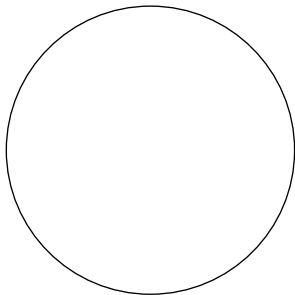
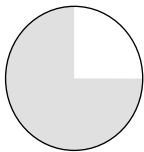


# CREATING A PARETO IMPROVEMENT

If we choose transfers correctly we can always create a Pareto improvement after we move to Pareto efficiency

More total utility, so can compensate any distributional losers from action change





# AN EXAMPLE

2 actions: Free Trade ( $FT$ ) or Protectionism ( $P$ )

2 People: Capital ( $C$ ) and Labor ( $L$ )

$$v_C(FT) = 12 \quad v_C(P) = 4$$

$$v_L(FT) = 2 \quad v_L(P) = 9$$

Free trade is the utilitarian optimum

## EXAMPLE, CONTINUED

Suppose status quo is  $(P, t_C = 0, t_L = 0)$

- ▶ Not Pareto efficient

Pareto improving change:  $(FT, t_C = -7.5, t_L = 7.5)$

Use transfers to compensate Labor for the utility loss associated with free trade



# THE BRIDGE

Pareto efficiency on its own need not be normatively compelling

We have built a bridge that allows us to first achieve Pareto efficiency and then solve distributional problems to achieve Pareto improvements

This bridge leans on two critical assumptions

1. Correct transfers will be chosen
2. Quasi-linear preferences

# MANY FACTORS MIGHT GET IN THE WAY OF MAKING TRANSFERS

Technological constraints

- ▶ Collecting transfers is hard or expensive

Informational constraints

- ▶ Who are the winners and losers?

Economic constraints

- ▶ Transfers may induce other kinds of inefficiency

Political constraints

- ▶ What if losers lack power?

# IF PREFERENCES AREN'T QL, THE NEAT SEPARATION INTO TWO PARTS BECOMES PROBLEMATIC

Money is not equal to utility

Transferring money from one person to another need not imply transferring an equal amount of utility

Suppose the action hurts those who value money very little

- ▶ Have to transfer a lot of money to make up for utility loss
- ▶ Take the money from people who value it a lot
- ▶ See Example 3.4.1 in the book

# BE CAUTIOUS ABOUT USING COST-BENEFIT AS A NORMATIVE CRITERION FOR GOOD POLICY

In cost-benefit, we ask something like whether a proposal, on net, increases total utility relative to status quo

A policy that fails cost-benefit can't be a Pareto improvement

A policy that passes cost-benefit need not be a Pareto improvement

# ARE PARETO IMPROVEMENTS REALLY UNCONTROVERSIAL?

We've slipped in a welfarist consequentialism

- ▶ This is not as bad as having slipped in consequentialism about wealth

Pareto improvements are unequivocally good if the only thing we care about is utility

There are perfectly sensible normative frameworks that would reject some policies that raise everyone's utility

- ▶ Values beyond welfare

# TAKE AWAYS

A policy change that is a Pareto improvement is (maybe) unambiguously good

We know a lot about how to achieve Pareto efficiency, but a move to efficiency need not be unambiguously good

QL model suggests thinking about achieving Pareto improvements in two steps.

1. Take policy action that improves efficiency (size of pie).
2. Compensate any 'losers' with transfers.

# TAKEWAYS<sup>2</sup>

There are important caveats

- ▶ Will transfers be made?
- ▶ Since preferences aren't actually QL, how justified am I in separating efficiency and distribution?

Sometimes you might want to pursue policies that are not Pareto improvements

- ▶ Distributional effects, political effects
- ▶ You are on more tenuous normative grounds

# WHERE WE ARE GOING?

Are there really any Pareto improvements to be had?

Social dilemmas

- ▶ Fundamental facts about human interactions that create opportunities for good policy
- ▶ We'll need to learn some game theory

Governance dilemmas

- ▶ The government is not a Pareto improving machine