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EDITORIAL

# Biological welfare economics: a natural science critique of normative economics

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**Abstract**
Welfare economics analyzes societal well-being based on individual levels of self-evaluated happiness or "utility." All human emotions, including what economists label as utility, are evolutionary creations, shaped by natural selection for the sole purpose of altering individuals' behavior in ways that maximize their relative reproductive success. Because of the evolutionary origins and nature of human motivations, welfare economics has little to say about societal well-being. While welfare economics is not useful for normative statements, it nonetheless provides a measure of the difficulties in implementing policy.

**Keywords** Welfare economics · Pareto optimality · Welfare theorems · Natural Selection · Evolution · Genetic mismatch

## 1 Welfare economics and a good society

Plato argued that the ideal society should be ruled by "Philosopher Kings." Utilitarian Jeremy Bentham, on the other hand, argued for "the most good for the most people." Numerous other scholars articulate alternative versions of the ideal society—often mutually incompatible with each other.

What criteria then should be used to evaluate whether a society is doing well, or at least moving in a positive direction? And what framework should we use to analyze public policy and assess its success? For economists, the answer is welfare economics.

Economics is divided into two subfields. Positive economics predicts what people *will do*. Normative economics analyzes what people *should do*—both for their own happiness and for societal well-being. Welfare economics is normative for the entire society.

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The foundation of welfare economics is the preferences of individuals, assumed to have a set of physics-like properties. Human happiness can be converted to dollars, added, subtracted, and discounted, to evaluate total well-being.

This, of course, begs the question: Where do preferences come from? For economists, preferences are taken as given; having originated from some undiscussed source. Regardless of that source, economics assumes all individuals have likes and dislikes, and that they know how to make themselves as happy as possible.

It has been well-established by the life sciences, however, that preferences in humans (and all animals) are biological creations, forged by natural selection. Moreover, because of the evolutionary origins of preferences and their biological implementation, preferences do not have the properties assumed by economics.

We argue that the discrepancy between the *assumed* version of human nature and *actual* human nature is non-trivial and renders welfare economics invalid and unhelpful in its goal of assessing societal well-being. Welfare economic analysis does play a role, however, in the positive aspect of economics by establishing a framework for predicting the costs of implementing interventional policy.

This paper describes four salient situations related to welfare economics. We begin with a summary of standard welfare economics. We then describe the most relevant aspects of the evolutionary view of preferences. We continue by contrasting the conclusions of standard welfare economics with those drawn from the natural sciences. And we conclude with a summary of the road forward for welfare economics.

Be forewarned, while this analysis reveals—and proposes corrections for—fatal flaws in the foundations of welfare economics, the life sciences do not (and cannot) provide a replacement.

Here are four situations that are relevant to individual, and thus, societal happiness.

- *Pain* Consider a behavior that leads to intense pain, as revealed by the following quotations (Uusitalo, 2021):

  > I wanted to die. … I desired suicide so passionately that it blinded me from everything else.
  >
  > It is unbelievable how the amount of pain can keep growing and multiplying even though you think you have already experienced the worst possible pain.
  >
  > The amount of pain was completely unbearable, there was no way I could survive it alive. I started looking at the windows, but I knew that someone would stop me if I tried to jump. I wanted to escape. I feared I would lose my mind.

  Should an optimal society act to reduce the prevalence of a behavior that creates such pain?

- *Pleasure* Conversely, consider a behavior that leads to intense pleasure.

  > "I want to feel like this for the rest of my life … all my problems seemed to melt away. All my troubles disappeared" (Ravitz, 2018).
  >
  > "It blasted me into space" (Zajdow, 2010).

> "The most pleasurable feeling of pure relaxation … It was like a full body orgasm times ten that kept going on and on" (anonymous).

Should an optimal society encourage a behavior that creates such pleasure?

- *Free lunch for some* Imagine a scenario where one-half of a country's population is given extra resources—including food, cars, and appliances—and nothing is taken from the other half of the population.

  Should an optimal society welcome such increases in resources?

- *Sinking countries* Global temperatures have been increasing, causing sea levels to rise. For many countries, the sea level rise will result in coastal areas being covered by water. For other countries, however, the consequence of a warmer planet is complete extinction. Consider Tuvalu:

  > Tuvalu is a Pacific island country with a population in 2023 of approximately 12,000 people. Rising sea levels are predicted to obliterate all the land of the country, forcing all the inhabitants to emigrate. The date of complete inundation is estimated to occur between 2040 and 2070, depending on the rate of global increase in temperature.

  Should an optimal global society allow Tuvalu to be covered with water?

We will examine each of these situations, first with standard welfare economics and then from an evolutionary/biological perspective. This article has one significant difference from previous works in the series. In most Ordinaries articles, we contrast a biological approach to both neoclassical and behavioral economic approaches. In the case of welfare economics, there are a few papers on incorporating behavioral insights, but no agreed upon framework to address in this paper (see, for example, Bernheim & Rangel, 2009; Sunstein, 2020).

In this article, we critique modern welfare economics from a natural science perspective, using the same approach used in previous Ordinaries articles (Burnham & Phelan, 2019, 2020a, 2020b, 2020c, 2021a, 2021b, 2021c, 2022a, 2022b, 2022c):

> The Ordinaries column will interpret economic behavior from the perspective of evolutionary biology. From this view of life, the anomalies of behavioral economics will disappear into a coherent biological framework that incorporates elements of neoclassical maximization.

## 2 Welfare economics without the natural sciences

### 2.1 Free exchange between people leads to an optimal society

"Capitalism is optimal" is the one sentence summary of welfare economics. With a limited set of assumptions and exclusions, the role of government in creating an ideal society is to do exactly **nothing**.

We summarize welfare economics in this section. This is standard normative economics, and is described in every economics textbook.

The first and second fundamental welfare theorems provide the foundation of welfare economics. The first fundamental welfare theorem states that competitive markets are optimal. The welfare theorem uses the 'Pareto' criterion to define optimality. This is a weak criterion that does not exclude even some outcomes that seem very bad. The second fundamental welfare theorem states that any optimal society can be achieved with minimal policy intervention of a particular type.

The welfare theorems provide support for market-based economies with limited policy intervention. The proofs of the welfare theorems are fairly mathematical. Intuitively, however, the proof in broad strokes is straightforward.

> First, every individual is assumed to be rational and able to make good choices. Given their preferences and wealth, each person will make themselves as happy as possible. So, left alone each person will optimize.
>
> Second, if there are opportunities for people to cooperate and improve themselves, they are assumed to make those improvements.

In other words, people will make themselves as happy as possible and make all mutually-advantageous exchanges with other people. Without any intervention by the government of any kind, free exchange will lead to an optimal society.

### 2.2 Pareto optimality

Welfare economics uses the notion of optimality defined by Vilfredo Pareto. In a somewhat subtle definition, optimality is defined by a lack of a particular ('Pareto') type of possible improvement. An outcome is optimal if the situation does not allow for a 'Pareto improvement.'

A Pareto improvement is a psychological free lunch that makes some people better off without harming anyone else. With a Pareto improvement, some people are made happier by the change, while no one is made less happy. Thus, an optimal society makes all of the possible Pareto improvements. And a society is Pareto optimal if there are no possible Pareto improvements.

Two aspects of Pareto optimality are central. First, the criterion is based on self-assessed happiness, not any objectively, externally observable or quantifiable measure. Consider a thought experiment in which an intervention can costlessly extend one person's life without any impact on any other material aspect of the world.

Is this a Pareto improvement? Not necessarily. Perhaps the person's son-in-law will inherit the estate upon death—and cares more about money than the survival of his father-in-law. In that case, the life extension benefits one person, yet harms another. Consequently, it is not a Pareto improvement.

Second, the assessment of improvement is entirely internal. So even the person whose life is extended may feel harmed by the intervention. If, for example, the person whose life might be extended is in hospice, in pain, and seeking to be euthanized, they may be harmed by life extension. In fact, nothing this extreme is even necessary. If a person simply feels that they want to live a 'natural' life, they may feel harmed by any intervention.

Let us examine these notions in a bit more detail.

### 2.3 The first fundamental welfare theorem (FFWT)

The first fundamental welfare theorem states that, with some assumptions, the laissez-faire market equilibrium is Pareto optimal (Arrow, 1951; Arrow & Debreu, 1954; Debreu, 1959). The proof in these papers is technical, but the logic is straightforward.

What is a proof that free-exchange leads to Pareto optimality?

Assume that the world is not Pareto optimal. By definition then, there is at least one Pareto improvement—some action will improve the outcome of one or more people and not harm anyone else. Without government intervention, the people who will be improved will make the changes. Thus, all the Pareto improvements will be made by the parties directly, and the outcome will be Pareto optimal.

Not to trivialize the framework, but consider a person who is sick and would gladly pay to buy medicine from a pharmaceutical company at a price that is profitable for the company. Thus, a Pareto improvement is to buy the medicine. The person becomes healthier and the company richer. The company is owned by shareholders who each become richer. No one else is directly involved.

Does free exchange naturally undertake all Pareto improvements? Yes, according to standard economics. In this case, as long as the patient knows about the medicine and can make its purchase, then the Pareto improvement is made without any government intervention.

This example generalizes. The entities that can make a Pareto improvement communicate and make the necessary exchanges. This continues until all Pareto improvements are made. Once all Pareto improvements are made, the outcome is Pareto optimal.

*Q.E.D*. The first fundamental welfare theorem. All market equilibria are Pareto optimal.

Let us summarize the first fundamental welfare theorem. People are good at making decisions. Given their wealth and situation, they make the correct choices so as to be as happy as possible. If some set of exchanges between people make everyone happier, those exchanges will take place.

These informal proofs also provide insight into the assumptions of the FFWT. The three main assumptions of the FFWT are: access to information, ability to coordinate with others, and a lack of negative impact on other people ('externalities' in the economics lexicon).

In our medical example, the patient needs to have information about the drug. Next, the drug company and the patient must be able to contact each other and make the exchange. Finally, no one else can be impacted by the exchange. For example, if the drug factory releases pollution when making the drug, and the pollution hurts other people, then the drug sale is not a Pareto improvement.

So, in lay terms, the first fundamental welfare theorem states that free exchange, a.k.a. laissez-faire capitalism, produces an optimal society. The justifications for governmental policy interventions are: (i) enable information exchange, (ii) coordinate activity, or (iii) manage or take into account externalities—the impacts on other people. Finally, even in the presence of externalities, Coase (1960) argues that free exchange can lead to Pareto optimality.

### 2.4 Pareto optimality is not optimal

Pareto optimality may sound great, but a wide range of societies that many people would judge to be bad meet the criterion.

Consider the most unequal distribution of wealth. For example, a society where a royal leader or dictator possesses almost all of the wealth, while every other person is on the verge of starvation. Is such an unequal society something that most people would like? Absolutely not. Such a society, however, can be Pareto optimal.

Surely, you might argue, a society with one extremely rich person and everyone else on the verge of death cannot be optimal. However, recall that Pareto improvements must not inflict any self-perceived loss of happiness on anyone. If the incredibly rich dictator feels hurt by losing a scrap, and having it given to hungry people, the transfer is not a Pareto improvement.

Here is the reaction of one extremely rich organism to the loss of a small goblet stolen from a massive pile of treasure.

> He missed the cup! Thieves! Fire! Murder! Such a thing had not happened since first he came to the Mountain! His rage passes description—the sort of rage that is only seen when rich folk that have more than they can enjoy suddenly lose something that they have long had but have never before used or wanted. His fire belched forth, the hall smoked, he shook the mountain-roots. … To hunt the whole mountain till he had caught the thief and had torn and trampled him was his one thought.

The rich 'organism' is 'Smaug the magnificent,' the dragon in JRR Tolkien's *The Hobbit*. Although this is fiction, one can imagine similar anger from any of the world's billionaires at the redistribution of some modest part of their treasure.

In fact, one doesn't have to imagine. It is possible to feed a person—who would otherwise starve to death—for their entire life as little as $50,000. So a person with $10 billion could spend $1 billion to save tens of thousands of lives. When an oligarch buys a yacht, they make the Smaug-like statement that their own luxury is worth more to them than many lives.

Pareto is not willing to intervene and judge that life-saving food is more important than a billionaire's bauble. (This perspective is well-described within economics. See, for example, Coles et al., 1986).

In summary, Pareto optimality is a very, very weak criterion by which to judge a society's optimality. Many Pareto optimal outcomes are far from optimal.

### 2.5 The second fundamental welfare theorem (SFWT)

Pareto optimality is central to the fundamental welfare theorems. Pareto seems like an intuitively good idea. We might not like every Pareto optimal society, but shouldn't we want every society to be Pareto optimal? This simply says that we should take all the psychological free lunches that are possible.

As noted, however, the Pareto criterion classifies many outcomes as optimal, even some that are extremely unequal. If free exchange leads to an outcome that is both

Pareto optimal and bad, does this provide justification for policy intervention? Perhaps not, argues the second fundamental welfare theorem.

The second fundamental welfare theorem states that any Pareto optimal society still can be achieved by competitive, free-market, laissez-faire exchange after some transfers of wealth.

The first theorem says free exchange takes the world to Pareto optimality. The second theorem says that if society wants to pick among the various Pareto outcomes, then this can be accomplished with minimal intervention. So society can have its free markets and social justice.

For example, let us assume that a society decided that it wanted complete equality in wealth. The SFWT says this is possible in two steps. First, move around the existing assets. And, second, allow free market, laissez-faire competitive exchange.

How do we achieve equality? At first thought, it might seem that current wealth should be divided equally. If the people in the society are different, however, and have different abilities to increase wealth, then the starting point cannot be equal.

For example, assume one person in the society is on life support, unable to move, talk, or open their eyes. Another person is extremely well-trained with highly productive ability and a genetic mutation that allows them to work 20 h a day.

Harrison Bergeron is the protagonist in Kurt Vonegut's story of the same name. Bergeron lives in a society that seeks equal outcomes. Because Bergeron is highly-gifted, society has decided that he must be handicapped to ensure his outcome is no better than that of others. Accordingly, Bergeron is equipped with glasses that impede his vision, headphones that blare music, and he must carry 300 lbs of metal. All to ensure an equal outcome.

The second fundamental welfare theorem argues that an equal outcome society, or any other society, can be produced by transferring wealth. The overly productive Harrison Bergerons would not need to be physically handicapped under the assumptions of the second welfare theorem, they would just start with less wealth or in debt. Conversely, less productive people, or those unable to work would start with more.

Once the redistributions are completed, the second fundamental welfare theorem argues that, like the first fundamental welfare theorem, there is no need for additional public policy. Just laissez-faire, free market exchange.

### 2.6 Welfare economic exceptions to the welfare theorems

There are three primary exceptions to the welfare theorems. If any of these conditions are met, then free exchange does not necessarily lead to Pareto optimality.

**Exception #1: lack of perfect information**

People must know about the opportunities to improve their happiness in order to make the exchanges. Consider two people who live on opposite sides of the world—who happen to be each other's perfect soul mate. Once together, each day

would be unlimited joy for both. Without information, they will not meet, however, and are on the path to a lonely life unless they become aware of each other's existence.

**Exception #2: barriers to coordination**

Some Pareto improvements require people to coordinate action. A barrier to coordination will prevent Pareto improvements and the outcome will not be optimal. For example, everyone who lives near a rainforest might want the forest to be harvested in a sustainable fashion. To achieve this outcome, however, requires some way to coordinate restraint. If the people are not able to cooperate, then it may be in the interest of some to over-harvest, destroying the common resource.

**Exception #3: externalities**

Externalities—situations in which other people are impacted by an exchange—prevent free exchange from leading to Pareto optimality. The classic example of a negative externality is pollution. A company that creates health-harming pollution as a side-effect of their business practice will have incentive to produce more pollution than the optimal amount for the society. Conversely, education often generates positive externalities. Thus, without intervention the world may produce less education than is optimal for society.

Interventions are justified within welfare economics by analyzing the impact of lack of perfect information, barriers to coordination, and externalities.

### 2.7 Consumer & producer surplus

Because of the exceptions that may impede Pareto improvements, policy interventions can be useful. Policy analyses use the concept of 'Kaldor-Hicks potential Pareto improvement' to evaluate such interventions (Hicks, 1939; Kaldor, 1939).

Surplus—or "getting extra"—is a central notion within welfare economics, and to the idea of a potential Pareto improvement. A producer obtains a surplus if they can sell a product or service for more than it costs to produce. A car that costs $40,000 to make and sells for $60,000 creates a 'producer surplus' of $20,000—a profit.

Consumer surplus is defined as the difference between what a consumer would pay and what they have to pay. The buyer of the car can obtain surplus in the exact same transaction if the car is worth more to them than the purchase price. If the buyer would pay up to $70,000, for example, then a purchase for $60,000 creates $10,000 of surplus for the buyer.

Overall, a car that costs $40,000 to make and is worth $70,000 to the buyer creates a total gain of $30,000 of surplus for the producer and the consumer. The division of the gain depends on the price.

These concepts of surplus are incorporated in policy analysis using the Kaldor-Hicks criterion. Consider again the example of harvesting a forest. Without protection, the forest may be overharvested and destroyed. But how can we quantify the impact of protecting the forest? An economic analysis estimates the negative impact on those who would have benefitted from the harvesting, and the positive impact on those who get value from the forest's existence.

If the benefits of protection exceed the costs, then there is a *potential* Pareto improvement in which the beneficiaries of forest protection pay logging companies to stop logging. This may, however, only be an improvement in theory. It will not occur if there is no path to extracting the money from the beneficiaries and/or no way to identify those who are harvesting the forest.

The argument that free trade is good rests within this idea of a potential Pareto improvement. Currently, for example, the US government charges a large tariff on companies importing pickup trucks.

What would be the impact of removing the tariff? There would be increased sales of foreign trucks, U.S. workers would lose jobs, U.S. producers would lose profits, non-U.S. workers at the foreign truck-manufacturing firms would get jobs, and those non-U.S. truck producers would make more money. Because the standard analysis argues that the non-U.S. workers' and producers' gains exceed the U.S. worker and producer losses, removing the tariff is a potential Pareto improvement.

### 2.8 Producer surplus is visible: consumer surplus is ephemeral

Kaldor-Hicks-based policy analysis adds up producer and consumer surplus. It is vital (which is not to say feasible) that the psychological surplus obtained by consumers can be quantified in the same way as the profits of producers. Without this ability, no summation is possible.

Consumer surplus and producer surplus are treated identically by welfare economics. The dollar amount of consumer surplus of various individuals is summed, averaged, discounted, and quantified in exactly the same manner as financial profits.

While companies and individuals are treated identically by welfare economics, there are, in fact, significant differences. Consider JP Morgan, the company and the person. As of 31 December 2022, JP Morgan the company shows 'retained earnings' of $296 billion. This $296 billion is the current value of all the profit over time after adjusting for dividends and other payouts to shareholders. Profit is equal to producer surplus. And this surplus is visible in the financial statements and bank accounts of organizations.

John Pierpont Morgan, the person, was a rich and successful financier. His banking empire went through various stages, and part of it is now JP Morgan the company. But although we know how to calculate and find the producer surplus of JP Morgan the company, what about the consumer surplus of JP Morgan the human?

JP Morgan enjoyed a luxurious lifestyle. He owned large homes, and he loved fine foods and cigars. In particular, he had a taste for one type of Cuban cigars, called Meridiana Kohinoors. Consider the consumer surplus JP Morgan obtained from smoking his cigars. Because he had vast amounts of wealth, he could pay large amounts. Yet he could buy his cigars for the same price as anyone else.

John Pierpont Morgan, it can be reasonably assumed, enjoyed enormous consumer surplus. He may have been willing to pay a thousand dollars or more for each cigar that he bought for just one dollar. JP Morgan presumably enjoyed vast consumer surplus in many other areas as well: steaks, houses, horse rides, etc.

Where can we find the consumer surplus generated by the behavior of John Pierpont Morgan, the person? While he was alive, the surplus was enjoyed contemporaneously with each puff on the cigar and each bite of perfectly-cooked steak. Years later, such surplus may have existed in a fine memory and a wry smile, "The best steak I ever ate was in my private Pullman car after shooting a few plains buffaloes out the window and leaving them to rot." Presumably, any trace of JP Morgan's consumer surplus ended with his death.

### 2.9 Summary of welfare economics

The brief summary of welfare economics is simple and straightforward.

- Competitive markets, with no policy intervention, will lead to optimal outcomes. People know what they want, they make good decisions, and they complete all the mutually-advantageous exchanges that are possible. If society decides it prefers one particular outcome, that outcome can be achieved via a wealth tax and a free market.
- There are well-defined exceptions to the welfare theorems: If there is a lack of complete information, barriers to coordination of improvements, or externalities, then the laissez-faire outcome might not be optimal.
- When any of these exceptions impede the achievement of optimal outcomes, interventions that are Pareto improvements should be undertaken. Policies that create both losers and winners are not Pareto improvements. However, such interventions that create winners and losers can be evaluated with the Kaldor-Hicks criterion. And if the dollar value of the benefits exceeds the dollar value of the costs, then an intervention is a potential Pareto improvement.
- Producer and Consumer surplus are quantified and manipulated to create a single numerical score, representing the impact of a policy. While producer and consumer surplus are treated similarly as dollar values by welfare economic analyses, their assessment and instantiation in the world is *very* different, and asymmetric in important ways. Producer surplus is persistent and publicly seen in financial statements. Consumer surplus, on the other hand, is ephemeral, dynamic, and contained solely within the brain of the consumer.

## 3 Biological insights into preferences

Likes and dislikes—that is preferences—are the foundation of welfare economics. Welfare analysis calculates producer and consumer surplus, which are treated identically. However, consumer surplus exists inside the brains of individuals, while producer surplus is more concrete in that it can be seen on financial statements.

Welfare economics converts pleasure inside a consumer's brain into dollar equivalents by estimating the surplus—the difference between the perceived value by the individual and the market price. This consumer surplus is then added up over time,

risk, and individuals, to calculate the total consumer surplus, or change in surplus, due to a policy intervention.

So all of welfare economics flows from preferences. Where, then, is the source of preferences? Economists argue that the origin of preferences is irrelevant. As long as preferences obey certain mathematical properties, the manipulations (or the choice of making no manipulations) of welfare economics are justified.

For welfare economics to work, preferences need to have physical-like attributes akin to mass. Our surpluses must be stable over time and across outcomes. This means, for example, that the joy of a new car must be the same before and after the purchase. Furthermore, the attainment of goals is assumed to create happiness, whereas pain is to be avoided.

One of the most quoted lines in biology is Dobzhanksy's (1964, 1973) "nothing in biology makes sense except in the light of evolution." It follows from this that nothing in preferences—and, by extension, in economics—generally makes sense except in the light of evolution. Why is this?

Human emotions are biological phenomena shaped by natural selection to influence behavior so as to maximize an individual's reproductive success relative to other individuals. As such, preferences—their existence, the situations in which they manifest, and the molecular and physiological consequences of their manifestation—obey an evolutionary logic. And, as it turns out, the evolutionary logic dictates that preferences do **not** exhibit the physical-like properties assumed by economics.

The recognition of evolution's significance for fields beyond biology was articulated, improbably, by Pope John Paul II. In a message to the Pontifical Academy of Sciences in 1996, he said:

> Today … new knowledge has led to the recognition of the theory of evolution as more than a hypothesis. It is indeed remarkable that this theory has been progressively accepted by researchers, following a series of discoveries in various fields of knowledge. The convergence, neither sought nor fabricated, of the results of work that was conducted independently is in itself a significant argument in favor of the theory.

Consider the impact of a bad foundation on the (now leaning) Tower of Pisa. The tower was built in the twelfth century. Because the soil was not stable, and because the tower itself had a small and weak foundation, the leaning began even before the Tower was completed.

Welfare economics, similarly, has a fundamentally-flawed foundation, in the form of an incorrect version of human nature. As we will articulate, preferences—in humans and other animal species—are not stable. Moreover, they do not necessarily even lead to happiness. The consequence of this flawed foundation for welfare economics is even worse than the leaning tower of Pisa, which still exists. **None of the conclusions of welfare economics survive when based on a more accurate version of human nature**.

In this section, we discuss the biological basis of happiness and then consider four aspects of happiness that are paradoxical to standard economic views, but predicted by evolutionary theory.

### 3.1 Happiness is an incentive system to produce genetic replication

"Happiness is a genetic incentive system" is the title of Ordinaries 3 (Burnham & Phelan, 2020b). We will summarize that article briefly in a moment, but its essence is conveyed best by thinking about pain rather than happiness.

Pain is, by its very definition, unpleasant. Standard economic views assume that people behave so as to maximize happiness. This, presumably, includes minimizing pain. It is interesting, then, to contemplate this question: "What if a person could completely avoid pain, at least physical pain?" Would a life free of physical pain be fantastic?

This is not simply a thought experiment. The answer—we know with certainty—is: absolutely not. This is because some people, in fact, have a life free of physical pain. The condition is called congenital insensitivity to pain (CIP).

People with CIP do not feel pain from being cut, having nails driven through their hands, or burning their flesh on hot stoves (Schon et al., 2020). Eight different clinical manifestations of CIP have been described and investigated in genetic, molecular, and physiological detail. CIP is caused by a variety of genetic configurations, and in each of these the standard pain neurological pathways are disrupted.

On initial consideration, a pain-free life might seem appealing: you could work harder, run farther, and generally feel better. Maybe that's why the second-best selling group of over-the-counter drugs is "oral analgesics." Painkillers. The Consumer Healthcare Products Association reports that this category produces more than $4 billion in revenue each year. But would a completely pain-free world *really* be a better world? Think again.

Consider the case of Gabby Gingras (Phelan, 2021). She was born with a form of CIP called "hereditary sensory autonomic neuropathy Type 5." The result of this genetic condition for Gabby is that pain sensations cannot reach her brain. She did not cry when she received vaccinations as a baby; she didn't even seem to notice. Initially, this seemed like a blessing.

By the time Gabby was a toddler, however, her inability to feel pain was revealed to be a crippling curse. She inadvertently damaged her eyes—permanently scratching one of her corneas—by poking her fingers into them. Chewing on plastic toys, she cracked most of her teeth before doctors could take the protective step of wiring her jaw closed.

Gabby's condition makes it brutally clear that no matter how unpleasant pain is to experience, it also has a very large benefit. Perceiving pain alerts us to the need to extricate ourselves from dangerous situations. In doing so, those unpleasant sensations can prevent much greater suffering in the long run.

This is a fundamental element underlying the adaptive significance of the nervous system, as described in biology textbooks:

> The survival of organisms depends on their awareness of the world and their ability to avoid physically harmful situations. Our nervous system accomplishes these tasks by letting us see, hear, feel, taste, smell, remember (and forget!), think about, act on, and react to various events and stimuli around us. Present

> in all multicellular animals other than sponges (and not found in plants), a nervous system is a network of cells that collects information about an organism's internal and external environments, processes that information, and sends signals to effectors, the muscles and glands that are capable of responding to the information (Phelan, 2021).

People who do not feel pain live in constant peril of injury or death, and are poorly equipped to make behavioral choices that ensure their survival. It should not come as a surprise that most people born with CIP die before three years of age, and very few live past 25 (Lear, 2011).

The evolutionary logic of pain is straightforward. Pain is not just unpleasant by definition, it is unpleasant by design. It is an evolutionary adaptation—a product of natural selection—that evolved to discourage us from taking behaviors that are costly.

Among our human and pre-human ancestors, there was variation in the pain mechanisms and the relative pain produced by different behaviors. Selection favored the pain mechanisms, and the gene sequences that encoded them, because those pain-sensitivity genes led to behaviors with the highest relative reproductive success.

In short, pain evolved under selective pressure to maximize reproductive success. We feel pain. It causes us to alter our behavior to reduce the pain. We survive better as a result of the actions we take. And, consequently, we (more than the individuals who do not feel pain) are alive to reproduce—and pass on to our offspring the genetic instructions that enable us to feel (and prefer to escape) pain.

Natural selection is neither complex nor mysterious. It is simply a numerical outcome. The genetic instructions—for building bodies, producing behaviors, generating emotions, and creating preferences—that lead to maximum rates of reproduction (relative to other genetic instructions), are those that come to predominate in a species.

Pleasure—and the mechanisms that generate the pleasurable sensations—similarly evolved to enhance reproductive success. For some sources of pleasure, the link to reproductive success is straightforward. Food, sex, and the acquisition of resources all have direct and obvious connections to enhanced reproduction.

Ancestral humans who behaved in ways that caused them to have few or no resources, did not eat, did not survive, and—consequently—had no sex. They are not our ancestors. The genetic instructions that led to their relatively lower rates of reproduction end up having little or no "market share" in the species.

Ordinaries 3 is a comprehensive discussion of the evolution of happiness and its main characteristics that are important for economics. As we note above, however, we can summarize that article succinctly as: 'happiness is a genetic incentive system.'

The natural sciences explore happiness from multiple views of causation, using the framework of Tinbergen (1963, 1968). Tinbergen's framework is useful because it differentiates between proximate and ultimate explanations for the existence of happiness.

The proximate, or mechanistic, cause of happiness is the release of dopamine in the brain's pleasure centers. When you eat food, you feel good. This is solely because of the dopamine receptors in your brain binding with dopamine that adjacent cells have released. The ultimate, or evolutionary, cause of happiness is the previously articulated

incentive system to produce behavior that maximizes the relative rate of replication of the genes that create the pleasure pathways.

Consider that as we get hungrier, humans get higher levels of dopamine activity from the same quantity and type of food (Roseberry, 2015). The evolutionary logic is clear. With increasing hunger, the value of a calorie of food (from the perspective of an individual's survival and reproduction, or fitness) increases.

In order to give us the appropriate incentive to find and consume food, our brain is built to generate a significantly greater reward when food has more fitness value. It is not necessary for humans to articulate, "the marginal value of a gram of protein is very high so I should find some chicken," or even to be consciously aware of this. We need only heed the drive for food.

Economics is based on the individual pursuit of happiness. Yet economics has no explicit (or implicit) link to the evolutionary foundations of preferences. This is a problem.

Recalling Dobzhansky's assertion from above, is it possible that welfare economics can make sense without the light of evolution? In other words, is it possible that with an atheoretic approach, economics has stumbled upon the correct view of human happiness, or one that is at least close enough to be useful? Our answer is no.

The implicit assumptions about preferences embedded in—and at the very core of—both neoclassical and behavioral economics are wrong. Furthermore, the difference between the assumed version of human nature and the true version is sufficiently large as to impact every aspect of economics, including welfare economics.

We next summarize four areas particularly relevant for welfare economics, for which actual human preferences have characteristics that differ from those assumed by economics.

### 3.2 The hedonic treadmill is adaptive

Derived from the Greek word for pleasure, hedonic is an adjective meaning the feeling of pleasure. The "hedonic treadmill" is an apt metaphor for the reality that life's ups and downs have big impacts on short-term happiness, yet people eventually return to their personal baseline. Viewed over years and decades, happiness is relatively stable for an individual—more akin to adult height, for example, than wealth.

Some years ago, one of us was discussing the hedonic treadmill with the chair of a Harvard department. The chair was somewhat incredulous, "You mean that a person who is paralyzed from a car accident returns to their pre-accident happiness level?" "Yes," we responded. "And so do people who win massive lotteries."

The chair had all of the academic accolades. Ph.D. from Harvard, dozens of publications, academic fame, and success. He also had a very serious demeanor and seemed to be hard on himself (although gracious to the people who worked for him). We then asked, "When you were a little boy, if you knew that you would achieve everything in your academic life, what would you have predicted about your daily mood?"

The chair smiled, "I would have predicted that I would be ecstatic with my successes. But it turns out that my days now seem about the same as when I was younger. Some are better than others and some are bad."

On a running treadmill, the total forward progress relative to the ground is zero. Similarly, on the hedonic treadmill, we see zero change in happiness. Put another way, people become accustomed to new circumstances. This is a universal phenomenon—true across cultures and in response to huge changes, both good and bad, in circumstances.

Some parts of the literature claim *complete* adaptation to changed circumstances. For example, the seminal study of accident victims and lottery winners argues for more than 100% adaptation for lottery winners—they are *worse* off after winning—and almost complete adaptation for accident victims.

The summary of their results was definitive and dramatic: "lottery winners were not happier than controls and took significantly less pleasure from a series of mundane events" (Brickman et al., 1978, p. 917). Accident victims—permanently paralyzed—were less happy, but were more optimistic about their future than control subjects. And, the accident victims were even more optimistic about their future than the lottery winners!

The lottery winners and accident victims study is almost 50 years old. What have we learned since? There is a huge literature; a recent review article states that there have been more than 170,000 articles and books published about happiness in the last two decades (Diener et al., 2018).

What have scientists learned about happiness from these hundreds of thousands of works? Every sort of variation imaginable has been documented. Some people adapt more than others, there is variation between people in different countries, there are some events to which people adapt less well than others, money is reported to have lasting impact on happiness in some studies, etc., etc.

Persisting through all these important clarifications and nuances, the central finding remains. Humans get less joy from positive events than anticipated, and less unhappiness from negative events than anticipated:

> We overestimate the overall magnitude and generality of the positive or negative feeling generated by an event. (Brickman et al., 1978, p. 926).

People adapt hedonically to changes in life circumstances. Good outcomes are generally less sweet than expected, and failures are less brutal than feared. Why?

Adaptation in the psychological sense occurs because the hedonic treadmill is an adaptation (in the biological sense) to *induce* certain behaviors, not to provide permanent reward or punishment for them (Burnham, 1997; Burnham & Phelan, 2000, 2020b; Rayo & Becker, 2007). The ultimate cause of happiness is genetic replication. Here is a modified excerpt from *Mean Genes* explaining this perspective (Burnham & Phelan, 2000).

> Owners of dog racing facilities have learned how to create exciting contests by using an artificial rabbit. The dogs think they'll soon be feasting on rabbit flesh, but they'll never catch their prey. To entertain the customers, the racetrack keeps the rabbit just ahead of the dogs.
>
> Happiness is a tool that our genes use to induce us toward behaviors that benefit them. The rabbit moves to further the interests of the racetrack owner, not the

dog. Similarly, we strive towards elusive goals, not for our own happiness, but to further the interests of our genes.

We've been built in such a way that satisfaction cannot be won by accomplishing particular goals nor lost by any setback. Allowing us to rest on our laurels or weep over spilt milk would be a genetic mistake. Our genes don't care about our past achievements, only about continually re-positioning our emotional rabbits to keep us working.

Happiness and unhappiness are tools created by our genes to further their goals. Regardless of our circumstances, our instincts squeeze the most out of us. We are therefore very attentive to small changes that indicate progress and are almost completely unmoved by anything that we expect.

### 3.3 Happiness & pleasure can lead to disaster

If the world were to end in 24 h, what would you do? In class, we ask this question of our students. The question produces giggles as the students contemplate all sorts of dopamine-releasing behaviors that cannot be discussed in a classroom.

There is one behavior, however, that all students agree they would do at the end of the world. What is it? They would leave class. Not one student ever has said, "Sitting in class listening to your scintillating lecture is the way that I would spend my last minutes on earth."

To be successful in a modern environment, people must constantly choose behaviors that lead to less immediate pleasure than alternatives. In today's modern urban environment, achieving good life outcomes requires constant use of will power to suppress certain behaviors.

Why hasn't evolution produced a happiness function where doing what feels good is the most productive choice possible? Wouldn't that make more sense (and be more effective)? Why must we constantly fight our own human nature? Why is our brain, in so many situations, our own worst enemy?

The answer is a bit complicated. Evolution *did* produce a happiness function where doing what feels good is the most productive choice possible. Unfortunately, humans have changed our world and circumstances so much and so quickly that our evolved happiness function is out of date in today's world.

This is called evolutionary mismatch. Sharks—in the ocean—are efficient and successful. Catch one and put it in a swimming pool, however, and none of its evolved behaviors will enable it to succeed or even survive.

For most of our evolutionary history, humans existed as hunter/gatherers. As such, evolution caused our brains to become exquisitely adapted to solving hunter-gatherer problems. Survive, eat, and reproduce.

When humans lived as hunter-gatherers, pursuing pleasure in the short-term *did*, in most cases, lead to long-term success. Any organism in equilibrium with its environment can "go for the dopamine" and not fear a bad outcome. Table 1 summarizes the alignment between preferences and payoffs for ancestral humans.

**Table 1** In equilibrium, pleasure and replication are aligned (Burnham & Phelan, 2020a)

| | | Feels | |
|---|---|---|---|
| | | Good | Bad |
| Outcome in terms of evolutionary fitness (relative survival and reproduction) | Good | Having babies, helping genetic relatives, engaging in mutually advantageous cooperation, eating nutritious foods, making good decisions regarding risk, having appropriate concern for the future | None |
| | Bad | None | Suicide, consuming life shortening foods, living only for today, living only for the future, taking bad risks, not engaging in advantageous risky behaviors |

In equilibrium, an organism derives the most pleasure from the activities that lead to the highest lifetime reproductive success. Theoretically, for organisms living in environments to which they are fully-adapted, there are no behaviors that feel good but are bad for reproductive success. Similarly, there are also no behaviors that feel bad, but are good for reproductive success.

In modern industrialized settings, our preferences—which are adaptations to life in the hunter-gatherer environment—are mismatched to the current environment. We perpetually desire calorically-rich food. We prefer to expend as little energy as possible. And we surely do not want anyone sticking a needle into our arm or a tube into our colon.

We have written about evolutionary mismatch over and over again. (See Burnham, 1997, 2016; Burnham & Phelan, 2000, 2019, 2020a; for some of the dozens of our articles on mismatch.) In the modern world, people constantly face conflict between what we want and what is good for us. In Table 2, we identify some behaviors for which pleasure and payoff are in conflict.

Mismatch pervades every area of human life, and every assumption of economics. Table 3 includes a summary organized by the axioms of economics.

What is the implication for welfare economics? A key assumption of welfare economics is that people are able to make good decisions. Because of mismatch, however, people living in novel situations will not make good decisions by any criteria.

A naive life of maximizing utility is likely to lead to low income, poor health, and early death. There is nothing optimal about an unexamined, pleasure-seeking approach to life in the modern world.

**Table 2** In evolutionarily novel environments, being bad can feel good, and being good can feel bad (Burnham & Phelan, 2020a)

| | | Feels | |
|---|---|---|---|
| | | Good | Bad |
| Outcome in terms of evolutionary fitness (relative survival and reproduction) | Good | | colonoscopy, dental visit, flossing, saving money, college, vaccines, helmets, prudence |
| | Bad | crack cocaine, Big Mac, TV, motorcycle, pizza, *trans* fats, cigarettes | |

**Table 3** Mismatch impacts every axiom of economics (Burnham & Phelan, 2000, 2020a)

| | Human environment before the invention of agriculture | Industrialized economies |
|---|---|---|
| Products we encounter in our environment | Persistent for entire lifetime, relatively slow introduction of novel items | Rapid proliferation of novel products |
| Savings | Fat stored on our body, family assistance, and relationships with friends | Financial instruments, stocks, bonds, real estate, money, bitcoin |
| Food availability | Variable and generally limiting | Overabundance for people with sufficient wealth |
| Risk | Physical, biological, and social risks | Physical, biological, and social risks, also novel financial and technological risks |
| Social interactions | Public and repeated, most frequently with same relatively small number of people | Anonymous and public. Both repeated and one-time interactions with a large number of people |
| Decision making | "*As if*" maximization leads to good outcomes | Naively doing what feels good often leads to terrible outcomes |

### 3.4 Evolutionary success is relative

An ancient folk tale tells of a god that visits a farmer. The god says, "I will grant you whatever you wish. However, I will give each of your neighbors twice what I give to you." The farmer pauses, then says, "Poke out one of my eyes."

Evolutionary success is relative. Spite is defined within biology as a costly, voluntary action that imposes costs on other entities. The farmer is being spiteful when choosing the cost of missing an eye in order to inflict costs on their neighbors. In "rational spite," the frequency of the genes of the spiteful actor increases in percentage terms

in the population (i.e., the "market share" of those genes) even though they decrease in absolute terms.

W.D. Hamilton discusses spite as follows, "Would we ever expect an animal to be ready to harm itself in order to harm another more? Such behavior could be called spite" (Hamilton, 1970, p. 1218). Hamilton answered his own question with yes. Under certain conditions, spite can evolve. The key condition being that the spiteful gene must increase in percentage terms within the population made smaller by the spiteful act. (For more recent work on spite, see Gardner & West, 2004; Gardner et al., 2004; Smead & Forber, 2013).

Rational spite has been documented in a wide variety of species. In some species, rational spite takes the form of alleles—specific variants of genes—causing the death of embryos carrying them.

Before we discuss spite, here is the basic biology. In sexually-reproducing species with diploid chromosomes (that is, a full set from each of two parents), for every location on a chromosome, an individual carries two alleles, one inherited from each parent. Many people recall learning that two brown-eyed parents can produce a blue-eyed child. This occurs when each parent has one blue-eye color allele that they transmit to the child.

This diploid system of genetic transmission is central to one documented version of spite, referred to as 'killer meiotic drive.' Here is how it works. An embryo can have 0, 1, or 2 copies of the killer allele. With zero copies, the embryo develops normally. If there is at least one copy of the killer allele, however, the allele 'inspects' its partner allele. If the partner allele is also a killer, the embryo also develops normally. However, if the killer allele finds that it is paired with a non-killer, it kills the embryo.

The explanation for this phenomenon is that, "Killer meiotic drivers are ultra-selfish DNA sequences that are transmitted into more than half (sometimes all) of the meiotic products generated by a heterozygote. As their name implies, these *loci* gain a transmission advantage in heterozygotes by destroying otherwise viable meiotic products that do not inherit the driver" (Núñez et al., 2018, p. 424).

Note that killer meiotic drivers are spiteful. In the heterozygous embryo, the killer gene destroys an embryo in which it exists—a form of genetic suicide. This is costly to the killer allele, but by inflicting this cost on competing alleles, the proportion of killer genes in the population increases. Many examples of spite at a genetic level have been described and documented (see Burt & Trivers, 2009, for a summary).

Spite is also present at the organismic level in many species. Jane Goodall documents the systematic destruction of one chimpanzee group by another. Beginning in 1974, Goodall and her team of researchers described the murder and extinction of all the chimpanzees in what was labeled the Kahama community. The aggressors from the neighboring Kasekala community expanded their range and took over the territory of the victims.

Here is how Goodall summarizes chimpanzee aggression.

> In the chimpanzee, territoriality functions not only to repel intruders from the home range, but sometimes to injure or eliminate them; not only to defend the existing home range and its resources, but to enlarge it opportunistically at the expense of weaker neighbors; not only to protect the female resources of a

> community, but to actively and aggressively recruit new sexual partners from neighboring social groups (Goodall, 1986, p. 528).

Data from a more recent, long-term study of chimpanzees supports the same perspective on chimpanzee aggression:

> Our studies of chimpanzee territorial behavior have also shed light on why males patrol and kill their neighbors. Since 1999, we have observed the Ngogo chimpanzees kill over 30 of their neighbors. During the early part of our study, most of the victims were from a group that inhabits an area to the northeast of the Ngogo chimpanzee territory.
>
> After killing 13 individuals from this group, the Ngogo chimpanzees had reduced the coalitionary strength of their neighbors considerably. After doing so, the Ngogo chimpanzees expanded their territory into an area once previously occupied by their neighbors. The area of expansion was 6.4 $km^2$ representing a 22% increase in the size of the Ngogo chimpanzee territory (Mitani, 2021, p. 7).

In short, chimpanzees engage in spiteful, deadly aggression. Chimpanzees will only attack if they have a superior numerical advantage, thereby allowing one group to kill a usually lone male victim. The odds are definitely on the side of the larger group, but the attackers can still be injured.

Chimpanzee aggression is costly to both aggressors and victims, but redounds to the benefit of the victorious group by decreasing future competition and increasing access to resources (Mitani et al., 2010). Intergroup chimpanzee aggression is also argued to facilitate in-group cooperation (Samuni et al., 2020).

Within economics, there is a significant literature that labels certain laboratory behaviors as spiteful. In these studies, people choose less money for themselves in settings where their choice also takes money away from others. (See Marcus et al., 2014, for a summary and review). In the ultimatum game, for example, a person might choose to not accept $10 to inflict a loss on another person of $90.

Spite is built into our brains. Experimental subjects placed in brain scanners experience pleasure when they consider bad outcomes for other people—even though the bad outcomes have no direct impact on the subjects. Seeing others fail makes people happy: "pleasure at another's misfortune is correspondent to the activation of the *ventral striatum* and the medial orbitofrontal cortex" (Takahashi et al., 2009, p. 939).

We believe that humans are spiteful for the reasons articulated by W.D. Hamilton. The economic laboratory experiments are, however, generally conducted under evolutionarily novel circumstances of anonymity, with no ability to form reputations. Thus, we view these as products of reputational management machinery that is mismatched to an artificial environment (Burnham & Johnson, 2005). We will address these issues in more detail in future Ordinaries articles.

In summary, spite is an evolutionary route to success. A spiteful action is costly to the actor and inflicts costs on others—usually much greater costs. Spite can evolve under conditions where the genes inducing the spiteful behavior gain market share in the population. There is unambiguous evidence of spiteful behavior in many non-human species, and behavior that appears spiteful in the brains and behavior of humans.

### 3.5 Evolution is myopic

The dodo bird may be the most famous of extinct species. What killed the dodo?

If you need a hint, among the Miriam-Webster definitions are "one hopelessly behind the times" and "a stupid person." Synonyms for dodo include, "old-timer," "fogey" and "Colonel Blimp."

You know what killed the dodo.

Let us discuss a different species. Fruit flies (*Drosophila melanogaster*) are commonly used in research because they reproduce sexually, have short lives enabling multi-generational studies, and are inexpensive to maintain in laboratories (Jennings, 2011). Fruit flies, like people, vary in intelligence. In one experiment, researchers set out to make fruit flies smarter, by rewarding flies that could remember a cue to where to lay their eggs (Mery & Kawecki, 2002).

The flies were taught an aversive chemical cue and then were given a choice of substrate for their eggs. Flies that learned better were rewarded in the evolutionary currency of enhanced fitness—that is, a higher representation in the subsequent generation. The experimenters founded subsequent generations with eggs chosen preferentially from the locations not associated with the aversive cue.

What happened to the fruit fly population? It got smarter.

In this experimental, laboratory process of evolution, selection favored flies that were more intelligent. Specifically, with respect to learning fast and effectively. Over the course of 15–20 generations, the entire fly population became smarter. The fly population evolved, such that the individuals in it learned faster and had better memory relative to the flies from the original population.

So evolution can and did produce smarter fruit flies. Among the starting population of flies there was variation, with some flies being smarter than others. The experimenters created a setting where the smarter flies had higher reproductive success. Then, through the inexorable process of genetic evolution, the average intelligence of flies within the population increased.

This result raises a question. Before the experiment began, there was already a range of intelligence among the flies. There were smart flies and there were less-smart flies. Why hadn't natural selection already favored the smarter flies and wiped out the less-smart flies?

Two further experiments reveal why the smarter flies hadn't already outcompeted their dumber compatriots. The smarter flies laid fewer eggs (Mery & Kawecki, 2004) and the smarter flies were poorer at competing for food in the original setting that did not reward learning (Mery & Kawecki, 2003).

In summary, fruit flies evolved rapidly to become smarter—but only in an artificial setting that rewarded IQ. These smarter flies had fewer offspring and were outcompeted by less-smart flies in a setting that did not require intelligence.

What are the implications of these fruit fly experiments for the dodo and for welfare economics? The dodo went extinct because they were not afraid of humans. Thus, Dutch sailors landing on the shores of the island of Mauritius could walk right up to the birds and kill them. The arrival of humans on Mauritius started a variety of environmental changes that doomed the flightless, ground-dwelling dodo.

The dodo would probably have survived if it laid its eggs in trees and if it were able to fly. Interestingly, the dodo evolved from pigeon-like birds that arrived in Mauritius some thousands of years before the Dutch. If only the dodo had not evolved, it would have survived.

In the environment before the arrival of humans, however, the flightless and relaxed dodo outcompeted its conspecifics. Among the colonizing birds that became dodos, one or more happened to employ a reproductive strategy that included laying eggs on the ground. On Mauritius before the arrival of humans, this novel approach led to greater reproductive success. Similarly, to the extent that there was variation in scanning the environment for predators, the animals that scanned less, and ate more, won the evolutionary competition.

In short, the dodo became fat, complacent and slow because fat, complacent and slow was favored by natural selection.

The relevance for welfare economics is that evolution is myopic in a particular manner. Evolution selects for traits that confer the highest relative reproductive success in the current environment. An organism that over-invests in some trait that may turn out to be advantageous in a future, different environment, loses.

Smart fruit flies do not evolve in an environment that does not require smarts. Vigilant birds lose to complacent birds in environments lacking predators. Building safe nests in trees is punished in environments where ground nesting is less costly and therefore more productive.

Humans, like all these other organisms, are built to compete for the current environment. We have an ability to look out for long periods of times (see Ordinaries 5, Burnham & Phelan, 2021a, on discounting). Nonetheless, evolution favors only competitiveness in the current situation.

There is no genetic evolutionary pressure to take actions to preserve the environment into the distant future, and no tolerance for investing in costly capabilities without current payoff.

### 3.6 Summary

Welfare economics takes preferences as stable and uses individual tastes to calculate surplus. A person who values an object at $2, but can buy it for $1, creates $1 of surplus. Consumer surplus is treated by welfare economics in a physics-like manner. Just as a rock has a mass, consumer surplus is a mathematical reality to be manipulated.

Preferences are, in fact, evolutionary creations, instantiated in physiology. Nothing relating to preferences can be understood except in the light of evolution. Each of the four biological insights have important implications for welfare economics.

First, the hedonic treadmill is pervasive and powerful. This means that people will tend to obtain less consumer surplus than anticipated from future events. The new car is less great than imagined, obtaining tenure brings less satisfaction than hoped. Similarly, bad events are less terrible than imagined beforehand. Thus, the economic approach to calculating surplus is biased and does not take into account the fact that humans are built to become accustomed to changes in circumstances.

Second, evolutionary mismatch jumbles the relationship between preferences and outcomes. People want some items that are bad for themselves and the world, and people are averse to other items and actions that are good for the individual and the society.

Third, people are built to care about *relative* outcomes. Because of this, many wealth-creating exchanges will not take place and some wealth-destroying behaviors will be undertaken.

Fourth, evolution builds people to care about relative reproductive success in the short term. Individuals can and do plan for the future, and some people are willing to sacrifice for the longer-term good of the planet. Nevertheless, the optimal level of concern for the distant future will not arise automatically from a mass of organisms built for winning in the current time period.

In summary, welfare economics treats a dollop of surplus as permanent value. The natural sciences suggest instead that: (1) the dollop is likely to shrink when viewed from the future, (2) some pleasure creates negative surplus because of mismatch, (3) concerns for relative outcomes will create destructive behaviors, and (4) the future is likely to be incorrectly valued.

## 4 Welfare economics vs biology applied

We now return to the four "thought topics" introduced earlier. We have selected these topics because they illuminate the stark contrast between conclusions generated from the perspective of standard welfare economics and the conclusions we draw from a natural science perspective.

### 4.1 Pain

*Issue:* Some people voluntarily undertake behaviors that cause intense pain.

> I wanted to die. … I desired suicide so passionately that it blinded me from everything else.
>
> It is unbelievable how the amount of pain can keep growing and multiplying even though you think you have already experienced the worst possible pain.
>
> The amount of pain was completely unbearable, there was no way I could survive it alive. I started looking at the windows, but I knew that someone would stop me if I tried to jump. I wanted to escape. I feared I would lose my mind.

*Question:* Would the society be better off with policies designed to minimize this root behavior?

What does welfare economics have to say about this behavior? Nothing. How can we reconcile people voluntarily enduring such extreme levels of pain with the fundamental assumptions of welfare economics? We can't. There is no answer within economics.

What do the natural sciences say? These quotes come from women giving birth. Because evolution selects for maximizing reproduction—not happiness—there should be no expectation that people will always prefer pleasure over pain. Is enduring pain in labor a necessary cost for a person to achieve a happier life (as a parent)? No. There is, in fact, no evidence that people with children are any happier than people without children (Nomaguchi & Milkie, 2020).

Why then do women endure intense labor pain to become parents if being a parent does not make one happier? The answer is that we are the descendants of people who reproduced, as opposed to people who chose to be as happy as possible. The economic assumption that all behavior is motivated by a drive for happiness and avoidance of pain is simply not true.

### 4.2 Pleasure

*Issue:* Some people take steps that cause them to experience extreme pleasure.

> "I want to feel like this for the rest of my life ... all my problems seemed to melt away. All my troubles disappeared."
>
> "It blasted me into space."
>
> "The most pleasurable feeling of pure relaxation … It was like a full-body orgasm times ten that kept going on and on."

*Question:* Why would anyone not take these same steps and experience such pleasure?

What does welfare economics have to say about this question? Nothing. Based on the assumptions about human behavior at the core of economics, there is no answer.

These happy people are drug users experiencing massive dopamine release in their brains' pleasure center. In ancestral environments, behaviors that produced dopamine reliably led to high reproductive success.

Because of mismatch, we now live in a world in which technological 'advances' make it possible to create and deliver drugs that stimulate huge dopamine release. Consuming such drugs, including heroin and fentanyl—produces what is among the most intense, immediate pleasure measured for any behavior. Yet virtually everyone would consider such behavior unwise and sub-optimal.

In a world that differs dramatically from that of our ancestors, there is no connection between pleasure and optimality. People are better off not feeling pleasure in many situations, and better off enduring pain in others.

### 4.3 Free lunches

*Issue:* If it were possible, should we implement actions that give half of a country's population extra resources—food, cars, appliances—while taking nothing from the other half of the population?

*Question:* Is this sort of free lunch good for society as a whole?

What does welfare economics conclude about the impact of such a free lunch? Would a society be better off if half the population were given extra resources? Yes is

the standard answer from the welfare economics perspective. If people like resources, then getting more resources will increase the recipients' self-assessed happiness. More possessions for some people is a Pareto improvement.

H.L. Mencken once quipped, "a wealthy man is one who earns $100 a year more than his wife's sister's husband." Although Mencken's quip predated W.D. Hamilton's work on rational spite, it captured the spirit of that work.

While some aspects of life are non-rivalrous, many gains come at the expense of others. Would you be happy if each of your neighbors won a million-dollar lottery? What if one of your colleagues was promoted? How would you feel about your rival—in matters of love or work—getting extra resources that you do not?

The natural science perspective on human behavior speaks directly to these questions. Because evolution is a competition measured in relative terms, one person's material, objective gain is almost certain to impart some sort of cost or harm to another person. Thus, there are almost no Pareto improvements in the original, self-reported welfare sense.

### 4.4 Optimal environmental destruction

*Issue:* Environmental degradation is a common side-effect of human activities.

*Question:* How much environmental destruction is optimal? Or, in this specific example, what is the optimal date for the extinction of Tuvalu?

> Tuvalu is a Pacific island country with a population in 2023 of approximately 12,000 people. Rising sea levels are predicted to inundate all the land of the country, forcing all of the inhabitants to emigrate. Should an optimal global society cover Tuvalu with water?

From the welfare economics perspective, the answer to this question is straightforward: In an optimal world, Tuvalu ought to be destroyed. The exact date depends on a handful of parameters, but not the outcome. The world should not invest enough in climate protection to save Tuvalu indefinitely.

Consider two options. In the first, Tuvalu is saved and everyone in the world pays a bit more for material possessions, such as TVs and cars. In the second, we get cheaper products and islands are obliterated.

Welfare economics adds up the additional consumer surplus from cheaper products and compares it to the cost of saving Tuvalu. If a sufficient number of people get cheaper TVs, then welfare economics concludes that environmental destruction is appropriate. Put another way, welfare economics comes to the conclusion that there is an optimal rate of environmental destruction, for which the marginal benefit of cheaper products equals the marginal cost of destruction.

In contrast, the natural sciences argue that preserving the environment so that Tuvalu can persist indefinitely may be optimal. Specifically, this perspective incorporates the fact that people inevitably adapt to new circumstances; the value of their new, slightly-less-expensive TV will be less than imagined. Further, people also desire products that they themselves will ultimately regret acquiring and consuming, such as heroin and Big Macs. As such, the standard welfare economic process and conclusion are flawed.

**Table 4** The natural science perspective is different and better than that of welfare economics

| Situation | Welfare economics | Biological perspective |
|---|---|---|
| Pain | Pain is bad. People do not need help to avoid pain | Pain is not necessarily bad |
| Pleasure | Pleasure is good. People do not need help obtaining pleasure | Pleasure is not necessarily good |
| Is a free lunch good?—Extra resources for some people | A free lunch for some is a Pareto improvement | A free lunch for some is not necessarily a Pareto improvement |
| Should the world protect Pacific islands? | Sinking Pacific islands is optimal | It may not be optimal for Pacific islands to sink |

### 4.5 Summary

Happiness is nothing more than an incentive scheme—a tool used by our genes to modify behavior in ways that benefit those genes. As such the nature of happiness can be surprising. Table 4 summarizes the analysis of our four salient situations from a welfare economics and a natural science perspective.

## 5 Biological welfare economics

### 5.1 Preferences are evolutionary and biological

The fundamental welfare theorems of economics argue that the best societal outcomes arise spontaneously from laissez-faire competitive markets. In sharp contrast, the natural sciences suggest that such a hands-off approach is likely to lead to worse outcomes and likely societal disaster.

Welfare economics is based on a version of human nature that is plausible, but importantly inaccurate. People are assumed to have stable preferences, to want outcomes that are good for themselves, and to make choices that lead to happiness. Happiness is quantified by welfare economics into consumer surplus, which is assumed to have physics-like characteristics akin to the mass of an object.

Biology suggests very different attributes for preferences, beginning with the insight—and thoroughly-documented fact—that the ultimate cause of happiness is an incentive scheme produced by the process of natural selection to induce reproductive success. As such, happiness conforms to an evolutionary, not a physics-like, logic.

We have highlighted four important biological insights into preferences that are relevant for welfare economics.

First, our happiness (and unhappiness) fade after events. ‘Adaptation’ is the term used in the psychological literature to describe the fact that our new car provides less joy than we thought, and that losses become less painful over time. Thus, our consumer

surplus as calculated by welfare economics is likely to be different and less than we imagined.

Second, because of genetic mismatch we often want items that are bad for us. People derive great pleasure, for example, from unwise gambling, eating foods that hasten death, and from consuming drug compounds that are deadly. Conversely, there is a wide range of behaviors that are distasteful or unpleasant, yet good for us.

Third, we have the potential to be spiteful, undertaking behaviors that hurt ourselves and our rivals.

Fourth, we are built to care about relative success with a form of myopia. We are the products of organisms that won the contemporaneous competition, not those that looked many generations ahead.

Put a population of people into a location and let them interact without laws or institutions. Will you spontaneously get a Pareto optimal outcome? No.

We are likely to pursue illusory goals, creating permanent losses on our way to outcomes whose values we overestimate. Some of the items we lust after are downright toxic. Our myopic and competitive drives push us to expend tremendous energy to dominate the current mountain, even at the expense of devastating consequences.

### 5.2 The naturalistic fallacy

Welfare economics suffers from what biologists (and philosophers) label the "The Naturalistic Fallacy." If you look in supermarket aisles, among the most common labels you will find is "All Natural." And "Made with 'natural' sugar." And "no artificial ingredients," etc.

Is natural good? Product labels resonate with consumers who have some intuitive notion that there is an inherent relationship between natural and good. In reality, 'natural' is not necessarily good. This is apparent from even a short bit of reflection. Life-saving medicines can be good and are natural only in a derivative sense of having been produced by natural organisms. Conversely, cancer, smallpox, and deadly hurricanes are all natural, but not good (see Table 5).

Natural is not necessarily good. What, then, *is* good?

The answer is that there is no simple, categorical, or unambiguous indicator of what is good. Unnatural medicines can be great. Natural saturated fats can be bad. The messy reality is that each decision, and each product, must be considered on its own merits, rather than relying on the simplistic and incorrect idea that we can determine goodness based on the process for production or its history. We must discard the naturalistic fallacy—and remain vigilant against relapse.

**Table 5** The naturalistic fallacy

| | Natural | Non-natural |
|---|---|---|
| Good | | Medicine |
| Bad | Cancer, smallpox, hurricanes | |

Welfare economics is a version of the naturalistic fallacy. The fundamental welfare theorems state that people on their own, navigating an evolutionarily novel world, will automatically and effortlessly pick the outcome that is best for themselves. Furthermore, such individual decisions, with some caveats, lead not only to the best outcome for individuals but also for society.

When we pivot our perspective and adopt a more accurate version of human nature, we recognize that competitive equilibria are highly unlikely to be optimal in any sense. People get happiness from a set of biological mechanisms that evolved solely to maximize relative genetic replication rates—and in a world that differs vastly from our own.

Left on our own, in a hedonic pursuit of pleasure, people are likely to produce all manner of bad outcomes including genocide, pollution, dictatorship, drug addiction, and systematic violence.

Consider a thought experiment in which the world could forget how to produce fentanyl. We believe that such a world would be a better place. And not for the reasons contained in the welfare theorems. The welfare theorems worry about externalities—the impact on non-addicts of addiction. However, even the addicts themselves would be better off without the one substance that produces the most happiness for them in the world.

So the fundamental welfare theorems have no efficacy with respect to creating a good society. The messy truth is that even interventions that make people less happy can improve societal well-being.

### 5.3 Welfare economics in its current form is positive, not normative

The 18th amendment to the U.S. constitution states, "the manufacture, sale, or transportation of intoxicating liquors within, the importation thereof into, or the exportation thereof from the United States and all territory subject to the jurisdiction thereof for beverage purposes is hereby prohibited."

Prohibition sought to end the consumption of alcohol. If it were possible, would society be improved by stopping the drinking of alcohol? The welfare theorems argue that drinking is good for the individuals and society. We argue that the welfare theorems are not helpful in assessing societal well-being. It is possible that people drink too much for their own and societal good, and that the world might be better without alcohol.

While we find no value in the welfare theorem's normative statements, there is a positive, predictive logic to them. Letting people do whatever they want in a laissez-faire market economy reduces the need for police, jails, courts, and all the machinery of enforcement.

So welfare economics helps predict and reduce the cost of enforcing intervention. Here, the notion of consumer surplus is helpful in predicting the effort that people will exert to evade sanctions.

Some people obtain tremendous consumer surplus from a pint of beer. Any attempt to get between a drinker and a drink will be fiercely opposed. So fiercely opposed,

in fact, that the 21st amendment to the US constitution repealed prohibition. Prohibition was ineffective, not because drinking alcohol is good for society, but because attempting to stop drinking was too costly.

To illuminate the positive value of consumer surplus, consider the horn of the rhinoceros. Should we allow the competitive market to decide the fate of the various species of rhinoceros?

The welfare economic approach is to calculate the consumer surplus of people who buy rhino horns and compare their gain to the loss of surplus from non-consumers. If the buyers really enjoy their rhino horns, the welfare theorems argue for letting the free market proceed. In fact, the consumers love rhino horn so much that several species—including the black rhino—have been driven to near-extinction due to the actions of poachers obtaining the valuable rhino horns.

Do the welfare theorems help evaluate whether we *should* protect the rhinoceros? We argue that the answer is no. Welfare economics does not help with this issue nor any other normative question.

Today, the market price of a kilogram of rhino horn can exceed $100,000 dollars. Per ounce, rhino horn is more valuable than gold. This is due, in part, to the belief in some parts of the world that rhino horn has cancer-curing properties. (An abundance of scientific research refutes this belief.) From a positive, predictive economics point of view, this massive consumer surplus tells us that efforts to protect the rhinoceros are going to be very costly.

The welfare economic approach cannot, however, help determine whether we should save the rhino. Nor can it help determine whether we should protect the Amazonian rainforest, help wild orangutans survive, ban fentanyl, nor evaluate any other policy. Welfare economics is silent on the normative aspect of economics.

So welfare economics is unhelpful in assessing economic welfare. But is it entirely useless? No. The surplus calculations contained within welfare economics have significant value in estimating the cost of enacting intervention.

Welfare economics is a form of positive economics, rather than normative economics as it purports.

## 6 Concluding comments

In graduate school, one of us (Terry) took a Harvard course called "Social Choice Theory." The course was taught by future Nobel Laureate Amartya Sen, future Nobel Laureate Eric Maskin, and Robert Nozick, a leading scholar on social choice theory. The course proceeded with mathematical theories of optimality based on standard economic theories of human nature.

Nearing the end of the course, we asked, "I know that this course is about social choice ***theory***, but does it, or should it, have anything to do with ***actual*** social choice? For example, are there implications for laws under consideration by governments?"

Amartya Sen answered, "Terry, did you know that the Marquis de Condorcet [an early leader in social choice theory] served in the French legislature?"

Terry responded with, "No, I did not know of Condorcet's political career. Is it true?" Professor Sen replied, "It is not true." This produced huge laughter from the audience, followed by Professor Maskin asking, "Does anyone else have a question?"

So the three Harvard professors, world leaders in the field, ducked the question about the relevance of social choice theory. The professors did not answer because the reality is that social choice theory and welfare economics have nothing to say about social choice in practice.

> You are wasting your time … if you are not interested in a certain line of work you would do better not to interfere but let those proceed without interruption who are interested in the particular subject and who will take the pains to investigate it in every way calculated to lead them to the truth. (Pareto, 1897, p. 486).

Economists study a biological organism that evolved by natural selection. Every decision is made by physiological machinery, shaped over millennia by selection. Preferences—the foundation of economics—are an evolutionary creation evolved **solely** to induce genetic replication. Economists who are not interested in biology, best follow Pareto's advice.

Welfare economics, in its current form, is a waste of time because it is based upon a flawed view of human nature. Welfare economics treats utility as a concrete, persistent numerical attribute. As such, happiness can be added, manipulated mathematically, subtracted, discounted, etc.

In reality, because happiness is an incentive system built by genes, it obeys an evolutionary logic. Without the perspective provided by this evolutionary logic, the world appears to be filled with paradoxes.

> Why are my fears worse than reality? Why do I not remain happy with accomplishment? Why do I get pleasure from destructive behaviors and pain from beneficial actions? Why do I remember some events and emotions clearly, but forget others or retain biased memories?

The answer is that happiness, pain, memory, friendship, and love are all genetic creations, shaped by natural selection to produce and enhance genetic replication. The ultimate goal of emotions is not happiness, nor love, nor accurate predictions or memories. Rather, it is to produce behavior that benefits the genes that create the human mind. Nothing more. Nothing less.

Biology reveals that welfare economics is not useful for its stated purpose. What then are we to do to decide on public policy? Here biology is silent—just as the naturalistic fallacy critiques the false idea that natural is good, but does not provide a replacement. In the area of welfare economics, a competitive equilibrium does not lead to a good society, but biology provides no replacement framework.

We once asked E.O. Wilson, "Does it depress you that friendship, love, and morality are simply genetic tools evolved to further genetic replication?" E.O. responded with, "That is where stoicism comes in." E.O. never explained what he meant by the comment. We take it to mean that people cannot rely upon biology to determine what is good for themselves or society.

What is to replace welfare economics? We do not have a substitute. One could argue that a critique without a replacement is not helpful. We disagree. Consider

that phrenology, a field that once had dozens of 'academic' centers, and hundreds of publications is now debunked with no replacement. Similarly, many societies sacrificed people to gods or other purported supernatural forces. No replacement for human sacrifice is needed.

When possible, a bad theory should be replaced by a better theory. However, in other cases, a bad theory or ritual can simply be discarded.

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