Measuring the value of science

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Science can help explain the mysteries of the universe but how do you put a dollar value on that? Credit: Flickr/James Gilbert, CC BY-NC

Reports about the worthy contributions of science to national economies pop up regularly all around the world – from the UK to the US and even the developing world.

In Australia, the Office of the Chief Scientist recently released an analysis of science and its contribution to the economy down under, finding it's worth around A$145 billion a year.

It's perfectly sensible and understandable that science (and related sectors) would feel the need to account for themselves in financial or economic terms. But in doing this we need to be wary of getting lulled

into believing that this is the only – or worse, the best – way of attributing value to science.

When it comes to determining the value of science, we should heed the words of the American environmental scientist and thinker, Donella Meadows, on how we think about indicators:

Indicators arise from values (we measure what we care about), and they create values (we care about what we measure). Indicators are often poorly chosen […] The choice of indicators is a critical determinant of the behaviour of a system.

Much public debate about the value of science has been hijacked by the assumption that direct, tangible economic impact is *the* way to measure scientific worth.

We seem now to be in a place where positing non-economic arguments for science benefits runs the risk of being branded quaintly naïve and out-of-touch at best, or worse: insensitive, irrelevant and self-serving.

But relegating science to the status of mere servant of the economy does science a dramatic disservice and leaves both science and society the poorer for it.

So here are five ways we can acknowledge and appreciate the societal influences and impacts of science that lie well beyond the dreary, soulless, cost-benefit equations of economics.

Testing and presenting ideas and the great tools to do it

The mechanisms of scientific enterprise have proven their worth time

and again. The formulation of challengeable hypotheses, and the increasingly sophisticated methods we use to test them, have repeatedly been confirmed as the most potent tools for finding out things about our world.

The scientific method has helped us make sense of the world in a way that counters our natural tendencies to make connections and draw conclusions that simply aren't true.

For example, the issue of correlation and causation, and how we regularly mess this up if we don't apply rigorous scientific and statistical reasoning.

Scientific reasoning protects us and saves us from ourselves

Scientific thinking and reasoning – and the social and institutional capital that often comes with it – help free us from control by superstition, magical thinking and unscrupulous power-seekers.

Science has been our guide, our sword and our shield, when identifying all manner of evils. Think the connection between smoking and disease, the damage of human-induced climate change, or waking us up to the first rule of gambling: that the house always wins.

While there are benefits to the economy in saving lives or working to stem the effects of climate change, these are not the first, nor even the most, significant effects on us as individuals.

Inspire, motivate and delight

By pushing the boundaries of what is possible, science has repeatedly

inspired and facilitated humanity's ability to not just dream, but to turn our most ambitious dreams in to reality.

People now live into their 70s and 80s as a matter of routine, we easily and instantly communicate with any part of the globe on a whim and we have even left the planet itself.

A quick search for the most popular science sites on the web turns up an armful of space-related material, explainers on how things works and general science story aggregators. If economic benefits are even mentioned, they are frequently an afterthought at best.

At my own university, the most popular video on our YouTube channel is a physics lecture on the great unsolved mysteries of the universe. Yes, a lecture. An hour-long lecture, filmed in lo-fi nearly five years ago.

The inspirational effects of science are powerful, ubiquitous, and are by no means limited to contested contributions to the economy. And this is just the tangible, more obvious stuff.

Challenging the status-quo and inspiring reflection

Equipped with scientific methods and reasoning, no subject need be off the table for reasoned debate, discussion and dissent. In science, no subject is taboo as long as the methods for considering it are scientific.

This ethos allows us to challenge the assumptions upon which fundamental norms are based without worrying that rogue, opposing ideas might somehow infect us.

The application of scientific reasoning allowed us, for example, to discover that the sun doesn't revolve around the Earth and to recognise there are more than two straight-forward biological representations of

human sexes.

Pushed further, respect for the appropriate application of scientific thinking accepts challenges to the very basis of our beliefs about ourselves as a species. Nowhere is this more powerfully confronted than in Australian-born philosopher Peter Singer's thought-provoking dismemberment of our rationale for justifying experimentation on non-human animals that we would not conduct on ourselves.

Yes, greasing the economic wheels of day-to-day subsistence is important, but reflecting upon, and challenging how we understand what makes us human? That's something you'd be hard pressed to cost-out for your bank manager.

Meaning, worth and expressing the best of ourselves

We already know that science can free us from the tyranny of superstition, ignorance and devious influences.

At its finest, it provides a model for exploring and understanding anything in the tangible universe. But science and its products also offer a vehicle for considering what it is to be human, not just physically but esoterically.

Science can offer a sense of mystery and connectedness that doesn't rely on faith or appeals to authority and dogma. It can provide a humbling, perspective-smashing sense of the scale of the stuff of the universe and our place in relation to it (from sub-atomic to galactic and beyond).

I say this not to usurp the place of religion for those to whom it is important. On this I agree with American physicist and writer Alan Lightman when he says:

Science does not reveal the meaning of our existence, but it does draw back some of the veils.

For atheists like me though, I am more moved by sentiments like those expressed by Ann Druyan, the widow of the American astronomer Carl Sagan, who said Carl saw science as a kind of "informed worship". Science can provide a wonderful path to connecting with something bigger and more profound than ourselves, without requiring divine support.

So anyway …

I'm not so idealistic that I'd argue money doesn't matter. It matters. It matters a lot. But to accept without contest that it is the most important, realistic or mature way to measure value in society is not only diminishing, it's perverse.

Science helps us see that we are more than just the sum of our economic outputs and contributions (how often do you hear Einstein, Newton or Curie lauded for their contributions to the economy?).

Science helps us accept that idealism is okay, even beneficial. Science is as intrinsic to culture and cultural-identity as high-culture (think music, poetry, literature, painting and the like).

Science provides a refuge for those of us who know that knowledge for its own sake can be intrinsically valuable. It supports we who appreciate that there can be immeasurable value in judging human endeavours using indicators that stretch far beyond the mundanities of improving wages or boosting trade.

Yes there are benefits of science that can be measured by their contribution to GDP, but that doesn't mean they should be.