We have seen how complex and sophisticated these two bodies of theory are, but that does not tell us much about how good they are. Certainly they pass the test of using serious mathematics, but that’s really an aesthetic criterion and internal to the theoretical process. So we turn to the relation of these theories to the outside world, with applicability, range, and power as the criteria for judging them.

At a practical level you could say theory is no better than the quality of the uses to which its results are put. Civil, mechanical, and electrical engineering are the major tools for the transformation of the results of theoretical physics onto the real world. The yield—our structures, vehicles, engines, computers, and electronic devices—are the material basis for our civilization, which could not exist without them, and which in turn could not exist without the relevant parts of theoretical physics. No other body of abstract thought can approach this achievement.\textsuperscript{1}

The range of physics is also astonishing. Astrophysics explores the mechanics of the heavens, cosmology the origins of the universe, physical chemistry the properties of chemical reactions, materials science the generation of previously unknown substances. These and other fields, some only recently emerging, testify to the extraordinary, even dominant range of theoretical physics and its impact on the world, including the world of theory in other fields such as biology and earth science.

Surely the most important measure of the power of a theory is its ability to produce successful predictions. Without a good dynamics as part of classical mechanics, engineers would be unable to build bridges that can withstand the complex stresses of traffic and weather and earthquakes. Those bridges, though much improved, are still not immune to all shocks, and both the improvement and continued prospects for more are based ultimately on the forecasting ability provided by classical mechanics. As
for quantum mechanics, the reliability of computers, as well as their speed, the accuracy of GPS and of satellite orbits, the control of rates and magnitudes of release of atomic and nuclear energies—all these are possible because of the confidence in the quality and accuracy of forecasts made by sometimes virtual and sometimes actual teams of physicists and engineers. Without those forecasts the reliability and accuracy of the products would be a will-o’-the-wisp.

There is also an internal test of power that theoretical physics passes with flying colors: the capacity to anticipate basic results of empirical research. A good example is the use of the symmetries of the Eightfold Way, a branch of quantum theory, to predict successfully the existence of a new and unanticipated particle. A major goal of the Large Hadron Collider is to find the Higgs boson, a particle predicted by the standard model but not yet observed. The latter, of course, is not yet a proven success, but the confidence of physicists with respect to its existence is itself an indicator of the already-demonstrated power of the theory.2

So physics and economics share a very high level of complexity and sophistication, and even commonality in their theory as well as strong connectedness among branches of theory and similarity in their use of approximations and the theory of dovetailing of theoretical and empirical results. The performance of theoretical physics in terms of its applicability, range, and power is truly outstanding. How does economic theory compare?

The answer to this question is: In this relative sense, economic theory can only be considered a dramatic failure. Economic theory simply cannot do the things theoretical physics can in its applicability to the real world. One indicator of this comes from asking, what is economics’ equivalent of engineers? Well there are business economists for larger businesses, financial analysts to advise consumers, and government economists to appraise government policies. Finance looms large in all three of these categories. About half the members of the Association of Business Economists work in the financial sector of the economy. Finance, of course, is the primary task of financial analysts, but there is serious question as to how much exposure to economic theory most of them have received. Finance is important but far from dominant among government economists and they at least are likely to have some appropriate economics background. The real-world economy that we live in rather than invest in gets somewhat short shrift, partly because of the practitioners’ doubts as to economic theory’s usefulness for them.3

What is their product? Most of it is probably advice and education—for consumers, investors, politicians, businessmen. They do produce appraisals of policies and recommendations, but we know little about the general usefulness of this activity, much less the extent to which economic theory