

THE EMPEROR'S ECONOMICS: HOW CAN WE PROVE ECONOMIC THEORIES?

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INTRODUCTION

Have you ever wondered why the world's best-known environmental activist is a child? Perhaps this is a modern real-world version of the fable of the Emperor's New Clothes? At Davos this year, the US treasury secretary told 17-year-old Greta Thunberg to study economics at university before she tells world leaders to disinvest in fossil fuels. Why did Mr Steve Mnuchin not provide an explanation of his understanding of economics at the time? Given the embarrassment caused by his condescending outburst, not just to him but also to the wider economics community, his subsequent silence is unexpected. As a result, the public is no wiser about why economists cannot effect the urgent changes needed to avoid environmental catastrophe.

There are numerous theories of economics, but seemingly none open to public scrutiny. This suggests that there is a limitation in the provable knowledge of the mechanisms that drive the behaviour of an economy. Perhaps by understanding the limitations of the current economics research framework we can chose a new approach to enable better understanding of the behaviour of economies. Then we may have a chance of addressing the concerns raised by environmentalist, as well as reversing rising unemployment and halting increasing global wealth inequality.

WHY DO WE HAVE WEALTH INEQUALITY?

The rise in wealth inequality is caused by wage depreciation over time relative to assets, such as shares and land. Why is the rate of pay for labour in the past worth more relative to the value of the stock market than the equivalent rate of pay today? To address rising wealth inequality, we need to know whether there are viable alternative economic structures to avoid wage depreciation, i.e. what are the economic effects of say using capital gains tax to ensure profits from asset trading are commensurate with labour wages?

A political objection from the asset rich to the use of high capital gains tax is that it is contrary to the principle of the free market, which requires the right to profit from speculation. However, taking cryptocurrency as an example, one could argue that burning the same amount of energy as the whole of Switzerland for a small number of people to speculate on the value of Bitcoin is not appropriately balanced against everyone else's right not to suffer the negative effects of global warming. Similarly, the need to speculate in the stock market for our pensions should not exacerbate the poverty of debt laden, asset poor households (and nations) but it probably does.

The economic objections to addressing wealth inequality focus on the pension system. However, is the dependency of pension schemes on labour devaluation a necessity or is this just the system we happen to have? We need validated economic models to explore this complex issue.

CURRENT APPROACH TO ECONOMICS RESEARCH

There are severe limitations with the approach to research within the subject of economics. Firstly, as economics is within humanities and social sciences, the process and application of the philosophy of reductionism is not studied. Secondly, although mathematics is a substantial part of many undergraduate economics courses, the mathematics of reductionistic dynamic systems is not covered. Reductionism is the corner stone of scientific method – breaking down a problem into its smallest constituent parts that establish the mechanisms of how a system works. In contrast, economic researchers take the view of holism, a philosophical approach stating that a system cannot be understood by breaking it down into constituent components. In fact, economists differentiate between the study of the small-scale, such as household behaviour, and the large-scale, such as national economic growth, by calling them microeconomics and macroeconomics respectively. Many economists consider macroeconomics as an emergent system, which means the system behaviour cannot be determined from its smaller constituent parts.

Macroeconomist claims of emergent properties are not based on reductionism, as there is widespread misunderstanding of the process and application of this rationalist philosophy. Reductionism seeks the constituent components to determine the mechanism of the system and not simply to seek building blocks. For example, past civilisations built domestic dwellings and we learn more about people's lives in these bygone societies by understanding the function of the rooms and the role of the buildings rather than by knowing the construction materials used. In addition, to declare that elements of a system have emergent properties we must be able to successfully model some aspects

of the system. Reductionism has not been established by any of the economic schools of thought¹. There are no models that can adequately predict the impact of economic policies on inflation, poverty levels or environmental sustainability. Currently, two economic forecasters running existing models used by governments and central banks (such as the large-scale macroeconomic model) can get substantially different predictions for economic growth. Thus, the results of these models are not repeatable, which in turn prevents generating testable predictions. Therefore, the claim that macroeconomics has emergent properties is not valid as the framework hasn't been established to conclude this.

There are numerous books on various macroeconomic theories, which include elaborate mathematics, but none of these theories can be validated. Mathematics does not prove a theory in the way that a scientific methodology, requiring repeatable, testable predictions, provides proof. Mathematical proof simply demonstrates the system represented is closed, just as an electronic circuit only works when there aren't any breaks in the connections between components. Mathematics can either represent reality or fiction and the only way of knowing which is to validate the mathematics against real-world data. In fact, engineering successfully uses many forms of mathematics that aren't formulated from a theory but are arbitrary algorithms able to capture patterns from real-world data. Often, for engineering applications, the type of mathematics isn't important but the ability to provide repeatable validated predictions is vital. The best known of these are artificial intelligence algorithms which predict the word you're typing and the products you're likely to buy. Mathematics can provide false authority to a theory, whereas, just like prose or poetry, it can describe reality or fiction, and the structure and complexity of the language is simply the personal style of the author.

Aside from the economics academic curriculum omitting reductionism, the next greatest hindrance to the progress of advancing economic theory is that the field is subdivided into schools of thought, which is unlike science and engineering. Scientific subjects each have a core set of theories, known as paradigms, which are the foundation of the field's knowledge and are accepted by the whole community. Paradigms do not need further evidence to be collected to substantiate them, as they have been extensively validated by independent researchers through verification of repeatable predictions. This allows science to progress by standing on the shoulders of giants. However, if repeatable evidence is found to dispute a scientific paradigm then the scientific community will revise the paradigm. A well-known example of this is Einstein's theory of relatively refining Newton's laws of motion. All fields of science, and all scientific theories including paradigms, are open to criticism - as long as the criticism is supported by repeatable testable evidence. Economics research is the antithesis of this, whereby researchers seek to provide evidence to support the school of thought's core tenets. Generally, these tenets are sacrosanct. This means that rather than standing on shoulders of great thinkers, economists are forced to hide behind them. An example of this can be seen in academic writing when citing the theories of other researchers. In economics texts it is usual to reference economists as Nobel Laureates, where applicable, whereas awards are not mentioned in scientific or engineering texts. An

¹ Note that agent-based models are not a complete form of reductionism. In their application to economics, these models create many independent individual entities within a system, such as households, businesses, and banks, which are given prescribed responses when interacting with other entities. The system is run to allow the simulation of the community to evolve and determine its own outcome. However, as the whole system is not defined, many implicit assumptions of the simulation are unknown, and this leads to errors interpreting the results. Moreover, by using reductionism we test our understanding of the mechanisms that drive a system, whereas agent-based models do not enable this.

achievement award is simply community recognition of someone's work and the controversy over many Noble Prizes highlights their subjective nature. These awards do not demonstrate validation of a theory and are not relevant to academic text or research reports.

Unlike scientific research, economic schools of thought are not concerned with advancing the field as a whole, but specifically in gathering evidence to support their core arguments. When economics researchers accept that their preferred school of thought fails to adequately explain their research, and no other schools provide a remedy, then a new school of thought may be established. However, as the economic theories of the new school cannot be validated this means that the old school will still have supporters. This has resulted in a proliferation of schools, none of which has theories that can be proven. This is why debate on economic topics is inaccessible to the public; the body of work is vast but unproven, resulting in hypothetical esoteric debate amongst the formally educated elite.

WHY ARE PENSION SCHEMES LIKELY TO EXACERBATE POVERTY?

When we invest in our pensions, where is our money going? As an asset-based investment it will be divided between buying stocks and shares (owning part of a publicly listed company), property and land (buying land to develop or property to lease), and bonds and gilts (lending money to governments in return for guaranteed income paid by the taxpayer). Some countries, such as the UK, have compulsory levels of pension contributions for employers and employees. Is this a sustainable approach to pensions and what is the long-term effect on the economy?

In the case of investing in shares and land we are not buying new assets. We are chasing the existing assets. This has three effects. 1) It increases the wealth of those who already own the assets. 2) It increases the cost of the assets, which in the case of land increases the cost of living and exacerbates poverty. 3) It causes instability in the asset markets because the valuation of all assets is subject to the effects of speculation.

In the case of lending to governments, who benefits from government infrastructure projects? It can be argued that the greatest financial benefit is gained by business owners and landowners. The wealthy gain income from moneylending and through future business opportunities created by new infrastructure. So why are infrastructure projects paid for by low- and middle-income households? Now here's a problem with the economists' definition of household disposable income. To you and me, disposable income is the value of money we have after tax and after all other essential and committed living costs have been paid. To economists, it is the value of the income after tax. When we consider the working poor who can't afford the basic standard of living but are still paying tax (including VAT) then we know that their tax pays investor income whilst exacerbating their poverty. Unfortunately, this ethical consideration is obscured by the economists' definition of disposable income.

It seems unlikely that the current pension system is sustainable in the long term and it will probably become increasingly unstable with time. There's also the immediate ethical issue; are we comfortable that our pension contributions potentially exacerbate poverty? If not, we need to change the pension system and change how governments borrow money. To do this we urgently need validated economic models to understand the viability of substantial structural changes to the economic system.

ALTERNATIVE APPROACH TO ECONOMIC RESEARCH

By using a valid approach to reductionism and suitable mathematics it is possible to build simulations of complex systems to provide testable, repeatable predictions, such as those demonstrated by weather forecasting (accepting the constraints of chaos theory). As we do not understand the mechanisms that determine the behaviour of an economy, economists tend to view the economy as a fixed system that cannot be changed other than minor tinkering. For example, political parties try to gain advantage over each other by taking the economic high ground; claiming the economy is safe with them. If we can establish validated theories and models, we can reengineer the economy to meet the needs of society, for whichever political party is elected. As we descend into recession and high unemployment, rising poverty and reduced social mobility, and plough headlong to impending environmental disaster, we must accept the limitations of the holism philosophy of economics. If we want to minimise the effects of recession on population welfare and promote environmental sustainability, we need economic forecasting models that are validated against repeatable testable predictions. This will enable us to explore changes to the structure of economies, such as the function of central markets and the focus and structure of taxation. In addition, these models will be able to establish a viable process by which we can transition from the current system founded on exploitation, to a future stable, equitable and sustainable system.

In response to the current limitations of economic forecasting I have established an initial reductionist approach called Economy Dynamics (Maybury, 2020: <http://bit.ly/EconomyDynamicsPaper00>). The school of thought structure to economics means that it is not possible to publish a reductionist approach to economic forecasting within any economics journals. Papers are rejected on the basis that they don't advance the core arguments of the journal and that the mathematics is not accessible to the reviewers or the readership. Imagine if scientific research was constrained by schools of thought and being accessible to the readership! Many significant advancements would never have been published. By comparison with science and engineering, economics research is hindered by a dogmatic approach to argument and debate between the schools of thought. In fact, advocates of a particular school tend to disregard viewpoints that do not align with their own. Like the emperor's new clothes, the failure of the philosophical approach to the field of economics means that its knowledge cannot withstand questioning by a child, but seemingly shrugs off criticism by adults. Thus, one of the world's most powerful economists did not explain to a child why, in his opinion, disinvestment of fossil fuels is a bad idea. Perhaps he's correct or perhaps he isn't, it cannot currently be proven either way.

ARE THE CENTRAL MARKETS ETHICAL?

When the central markets were founded over four hundred years ago they traded in the shares of companies that had private armies, such as the East India Company. These companies generated income through the slave trade, piracy, drug wars and the occupation of foreign lands. Even today the central markets are impassive to the nature of profit and continue to enable investors to benefit from the suffering of others. We must redress the fact that the wealth of the central markets stems from exploitation. We need a new system that is ethical, but how do we demonstrate the viability of alternative systems?

IS TAXATION POLICY EFFICIENT?

All legal financial transactions occur through businesses, include trading in goods and services, paying wages for labour and the purchase and sale of land and other assets. It seems unlikely that a household centred tax system, with its origins in a medieval feudal society, is the most efficient method to manage the redistribution of money within a centrally governed economy nor the most effective tool to deliver employment opportunities for the population. There are many alternative approaches to taxation and the viability of these needs to be explored using validated forecasting models. For example, if a business focussed tax was collected instead of VAT, then businesses could not avoid paying tax due to the location of their headquarters and would have to pay appropriate tax in the countries in which they trade. The question here is could this business focussed taxation system be applied unilaterally and what are the economic consequences for any nation independently following this course of action?

BARRIERS TO PROGRESS

Economy Dynamics is not another school of thought, but an analytical framework based on the principles of reductionism. It does not oppose any existing economic theories, but offers a method to validate, revise or reject existing theories based on their fidelity for forecasting economic growth within the new analytical framework. Crucially, it provides the ability to produce repeatable, testable predictions for the effects of structural change to the economy, not just on economic output, but also on inflation, poverty levels and environmental impact. However, there are significant barriers to adopting a reductionist approach to economic forecasting:

Firstly, economists are not familiar with the concept, which compounded by the defensive approach to the school of thought research structure, prevents any opportunity to discuss the approach in an open academic forum which makes it impossible to gain community support. However, there are many applied economists who are open to concepts outside of the conventional schools of thought, but they want to see evidence of the benefits of the concept before giving their support.

Secondly, the reductionistic concept is considerably more complex than a holistic approach and may at first impression seem insurmountable. However, unlike a holistic model that is developed in a single shot, a reductionistic model can be built up through piecemeal validation of each component and validation of their subsequent integration with other components. If (when) the initial complete computer model fails to be validated against real-world data, for say local poverty distribution or national inflation, weaknesses in the model can be explored. This enables our understanding of the mechanisms behind economy behaviour to be advanced. Then by revising the models and the simulation framework our understanding can be tested against real-world data.

Thirdly, economists are not familiar with the mathematics of a reductionist approach. The Economy Dynamics framework I have proposed uses mathematics derived from engineering and data science. Maths, like language, uses terms with specific definitions that change between communities. Thus, if the terminology is not familiar, reading mathematics becomes slow and cumbersome. Moreover, if there is a conflict of terminology, an ambiguous technical word that means something different to the author and the readership, the reader may doubt the validity of the work. As economics does not have a reductionist approach, we need a new body of nomenclature.

Fourthly, there is the issue of securing funding to enable the current proposed reductionist approach to be developed. My company, Axsym Limited, has funded seven months of effort to develop the initial papers and promote the concept of Economy Dynamics. Senior analysts involved in national policy making have described the method as having the potential of 'providing a great service to the discipline'. However, gaining open support from applied economists will require successful validation evidence. This will take at least two years of effort (around £200,000 GBP) for which we need external funding. After this, to release quality assured software suitable for policy making, will take around five years duration and 50 years of effort (around £5,000,000 GBP). This project requires a significant level of effort from organisations that handle population and business economic data, such as the UK's Office for National Statistics. Therefore, community support at an early stage is vital.

Creating a reductionist approach, such as Economy Dynamics, is ambitious and there are programme and technical risks. But what is the alternative to enable us to address the current crises? Holism is inadequate and we need to change our approach to economics research. Even if Economy Dynamics never achieves its ultimate goal of modelling all mechanisms needed to fully simulate economies, our understanding of the mechanisms that drive economies would greatly advance within a decade. This will open up economics to public questioning and enable public participation in political-economic debate.

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