Comments on Agarwala, Coyle, Penasco, and Zenghelis 2023.

Nicholas Z. Muller, Carnegie Mellon University and NBER

Agarwala, Coyle, Penasco, and Zenghelis (ACPZ) correctly argue that "[u]seful economic models and predictions need appropriate data." (p. 1). This claim encapsulates the motivation for rigorous natural capital accounting and it portends, in a broad sense, the implications of critical and longstanding omissions in official economic statistics. ACPZ dive deeply into specific examples of important gaps in the accounts, focusing on risk-adjusted valuation of natural capital, measurement of both intra-and-inter country inequality, and macro-level labor productivity. This essay will augment the topics raised by ACPZ by examining the implications of omissions of pollution damage for measures of economy-wide growth, monetary policy, and business cycles.

In 2016, Robert Gordon argued that the halcyon days of American growth are over, in part, because essentially all of the fundamental growth-enhancing technological innovations had already occurred and that their stimulative effects were played out (Gordon, 2016). In particular, Gordon (2016) showed that following 1970, productivity growth rates[1] in the U.S. economy had fallen from 2.4% between 1920 and 1970 to 1.8% between 1970 and 2014. Using historical data on air pollution levels in the United States (U.S.) economy collected from 1957 to 2020, Muller (2020) argued that at least part of this apparent slowdown in productivity growth was due to incomplete economic statistics. In particular, Muller (2020) deducted air pollution damages from Gross Domestic Product (GDP) and tracked annual growth in this adjusted measure. Rather than an attenuation of growth after 1970, this net measure of output grew *more rapidly* after 1970. Why? Following the passage of the federal Clean Air Act Amendments of 1970, the U.S. invested trillions of dollars in pollution control, fundamentally transforming key aspects of the capital stock and durable goods. The result was a steep decline in pollution levels and damages (Muller, 2020). Modest growth in real GDP coupled with falling damages from pollution meant that the net measure of output grew more rapidly than market GDP.Failure to measure pollution damage, or degradation of natural capital, leads to the conclusion that growth attenuated after 1970; whereas, a measure of output inclusive of these unpriced, social costs from productive reveals entirely different patterns in U.S. growth. Investments in natural capital often yield returns not captured by the conventional income and product accounts.

Muller (2020) reports that, from the late 1950s to 2016, pollution damages fell especially quickly during troughs of the business cycle. Particularly notable reductions in pollution intensity occurred during the sharp contractions during the early 1980s and through the Great Recession. These episodes embodied compositional change in the U.S. economy: the dramatic collapse of steel manufacturing during the late 1970s and early 1980s as well as a marked shift away from reliance on coal-fired power generation during the Great Recession. As a result of these declines in pollution intensity, the adjusted measure of output exhibited less clear troughs. In fact during all recessionary periods from 1957 to 2016, the adjusted measure *grew* by 0.4%, whereas GDP shrank by 0.3% on an annual basis. The conclusion here is that extending the accounts to include measures of natural capital may influence the rhythm of economic fluctuations which affect important decisions made by investors, policymakers, and the general public.

[1] Gordon reports output per person and output per hour worked if figure 1-1 p. 14. The growth rates quoted here are in terms output per person.

On the connection between natural capital and economic policy, Muller (2021) shows how monetary policymakers can use information on pollution intensity to adjust their policy rates, thereby moving consumption from high-to-low pollution intensity periods. Specifically, Muller (2021) leverages a New Keynesian framework (Goodfriend, 2016) to show how the so-called natural rate of interest (or r*) is influenced by macro-economic changes in pollution intensity. During periods when an economy is becoming more pollution-intensive, this pollution-adjusted interest rate (r_g) falls short of the conventionally-defined r*. And, when an economy is cleaning up r* exceeds r_g. The intuition for the orientation between r* and r_g hinges on the growth effects of pollution damage established by Muller (2014), ACPZ (2023), and Muller (2020). Namely, increasing (decreasing) pollution intensity exerts a drag (boost) on growth when the national accounts can track such phenomena. The upshot from Muller (2021) is that during periods of rapid changes in pollution intensity (energy transitions, decarbonization, large scale policy changes, e.g.) central banks can use r_g to achieve their traditional goals of price stability and full employment while also mitigating pollution damage. Omitting consideration of the growth effects of pollution damage gives rise to the potential for resource allocation mistakes due to biases embedded in r*.

Each of the examples offered in this essay bolster ACPZ's prescient claim that functional economic models depend on apposite data. The core message conveyed here and which is complementary to that of ACPZ is two-fold. First, without a complete representation of economic activity, inclusive of stocks and flows of natural capital, foundational metrics such as real growth rates may be biased. Second, systematic omissions from the official accounts permeate the information environment in which globally significant decisions (such as the calibration of monetary policy) are made.

Finally, ACPZ argue that "the effects of human activity on economically vital aspects of the natural world are demonstrable and unsustainable." (p. 2). That *some* of these "vital aspects" of the natural environment may be deemed *essential* to sustained human development undergirds the both the importance and the urgency of the current efforts to revise the System of National Accounts (SNA) to include measures of natural capital.

References.

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