GROWTH:

1) Aristotle vs. Ringelmann (1+1>2.5): cooperative projects and productivity;
2) multi-scale business cycles;
3) Social bubbles as engines of discovery

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Growth is the modern “God", supposed to provide happiness (through economic wealth), solve unemployment, dilute debt and address the intergeneration problem (in the presence of dwindling population as in Japan and Europe). We present three complementary components of growth of economic and social systems.

First, we present empirical evidence and theoretical mechanisms of superlinear productivity in collective group actions (open source projects) and delineate the implications for organisation design.

Second, for the USA over the last two centuries, we show that business cycles appear at all scales and the distribution of GDP growth rates can be well approximated by a bimodal function associated to a series of switches between regimes of strong growth rate and regimes of low growth rate. This suggests that the overall growth dynamics of the US economy is fundamentally punctuated, with phases of strong growth that are intrinsically unsustainable, followed by corrections or consolidation until the next boom starts.

Third, this can be interpreted within the theory of ``social bubbles”, which articulates that great innovations proceed via a reproducible pattern, in which strong social interactions between enthusiastic supporters weave a network of reinforcing feedbacks that lead to widespread endorsement and extraordinary commitment by those involved, beyond what would be rationalized by a standard cost-benefit analysis. Collective over-enthusiasm similar to those developing during financial bubbles seems a necessary and unavoidable process to foster collective attitude towards risk taking, breaking the stalemate of society that is restrained in a tendency towards risk avoidance. An important consequence is that estimations of the cost of the 2008 crisis is grossly misleading. We also interpret the absence of strong recovery since 2008 as a protracted low growth regime associated with the exceptional nature of the preceding large growth regime, which we have called the “illusion of the perpetual machine” regime.

We end by discussing the super-Apollo project for in nuclear R&D for a safer and prosperous world and our expectations for the future.

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