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Agentic AI Reparations for One Are a Benefit to All

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Abstract: Most countries suffer significant durable loss of collaboration skills due to historic oppression via environments of forced labor, excessive discrimination and exposure to dangerous chemicals. The result is low real per capita gross domestic product (GDP) adjusted for purchasing power parity (GDPppp). All this while the collaboration intact countries have become extremely wealthy. Moving forward, noncash reparations paid by rich governments can, with the help of Agentic AI, be applied to the recovery of collaboration skills via school team sport, music education and ethical biological gene therapy. Team sport and music education gene therapy is a metaphorical analogy, not medicinal. It is environmental feedback whose impact is the opposite of the historic abusive environment that led to lost collaboration skills. Collaboration is the point of beginning of economic growth and development. This paper discusses the mechanism of economic systems in which raising the income earning ability of the least among us expands the world economic pie to the benefit of all. This is the proverbial "a rising tide lifts all boats." This global economic improvement effect should make reparations welcome, not just palatable. The methodology of analysis is the global time invariant capitalism (C), democracy (D), rule of law (R) (CDR) economic growth model.

Keywords: Agentic AI Collaboration Skill Development; Capitalism; Democracy; Rule of Law; Gross Domestic Product.

INTRODUCTION

A strong economic argument can be made that increasing the earned income of low-income households can benefit higher-income households as well. This idea in reverse is often summarized by the phrase "a rising tide lifts all boats." That is, as the rich get richer and the economy grows as a result, everybody benefits. This paper discussed what happens when income improvements are initiated with the poor and thereby benefit everybody. The paper offers mathematical proof of economic mechanisms that make this possible. In turn, rational high-income members of the economy should be eager and willing to provide reparations to low-income members who, through no fault of their own, were formerly oppressed due to environments of forced labor, excessive discrimination and exposure to dangerous chemicals. To enable understanding of the various economic mechanisms that have been considered previously, the viewpoints of the Keynesian multiplier, consumption multiplier, Henry Ford wage argument, human capital theory, market expansion effects, Social Stability and Transaction Costs, and the recently developed Ridley (2020) global time invariant capitalism (C), democracy (D), rule of law (R) (CDR) economic growth model will be explored.

This research recognizes the Adam Smith (1776) proposition that division of labor and trade amounts to what is described as cooperation. And that cooperation leads to ordinary economic growth. Furthermore, a different proposition, not addressed by Smith is collaboration. It is asserted that collaboration leads to extraordinary economic growth. And the surplus income that results from collaboration must be divided among the collaborators equitably as per prior agreement and criteria. For example, percentage invested. The terms cooperation and collaboration are often confused. In this research one is interested in collaboration based on epistemological, metaphysical, and axiological insights (Randrup, Druckemiller and Briggs, 2016) from first principles, so for clarity of purpose the following definitions are stipulated.

Definition. Cooperation is a plan and execution thereof by participants, each with their own personal self-interest and economic gain in mind yet yielding unintended mutual benefits.

Definition. Collaboration is a plan and execution thereof by participants for their intentional mutual benefit of shared goals, objectives, and rewards.

About ten percent of the people in the world are rich and getting richer while ninety percent are impecunious. The rich practice certain traditions that they pass down without thinking too much about them. They see that they work to their benefit and continue the practices. One thing known from recent research by Ridley (2020, 2023, 2025a, 2025b) and Ridley& Nelson (2022a, 2022b) is that collaboration is the point of beginning of economic growth and development and that

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the way to recover lost collaboration skills due to negative historic environments is through noncash reparations via school teams sport, music education and ethical biological gene therapy where the medical knowledge exists (Ridley & Korovaykovskya, 2025 and Ridley & Nelson, 2026). Rosier, Llaugel & Ridley (2024) discuss how the best American corporations design jobs to raise the collaboration skills of adult employees.

It is a commonly held belief that lack of collaboration skills is psychological and due to a poor attitude toward work and society. However, Ridley & Nelson (2022b) argue that a persistent abusive environment can lead to a negative epigenetic transgenerational psycho-sequela. It may be that epigenetic effects are temporary, but when the historic abuse is applied to human parents, their children, grandchildren, great grandchildren and so on for two hundred and forty-six years, it is not surprising that the effects will enter the genome. The effect may last for generations even after the abusive environment is removed. Six generations after the end of forced labor in the United States of America (USA), income, education and job underperformance are still apparent. The epigenetic effects are random in nature and some of the children of victims are lucky to have been missed by the adverse DNA methylation process. They have gone on to become millionaires and billionaires. But for the vast majority there is no getting over it without specific and deliberate therapeutic actions. For example, it took the English the better part of a millennium to get over three hundred and sixty-seven years of occupation and enslavement by Rome. And then they went on to rule one fifth of the world.

It is known from Lee & Ridley (2024) and Ridley, Lee & Nelson (2023) that Singapore mandates school sport and music education for eight years and that this is a distinguishing policy from that of the USA. Team sport and music require collaboration. As a result, their school children score highest in the world on tests of collaboration. Their highest scores on mathematics and science appear to follow from collaboration. The ministerial class that grew up from that system created a ministerial pay scale that is a function of GDP and the twentieth percentile of incomes. That is, the only collaborative system in the world where government does not get paid if Singapore does not get paid. And the country is run like a business. In just one generation Singapore went from abject poverty to middle class. Today it enjoys a GDPppp fifty percent higher than that of the USA. This is widely referred to as the Singapore Lee Kuan Yew economic miracle. The successful Singapore school experiment may be viewed as a form of gene therapy (a metaphorical analogy, not a biological intervention) for collaboration that takes one school cycle to complete. Ridley, Garcia & Llaugel (2026) suggest the use of Agentic AI to accelerate the Singapore affect in the USA and elsewhere where collaboration skills recovery is desired. The Pareto (1906) discovery that twenty percent of the population will own eighty percent of the money is accepted. There is no suggestion here to redistribute income. Instead, it is suggested that the entire income distribution be shifted to the right so as to eliminate poverty and provide for a living wage for the lease among us. This relies on the CDR claim that the source of wealth is human imagination and creativity, and if imagination is unlimited then wealth is unlimited. Lest we fall victim to the confused thinking that capitalists and capitalism are born out of selfishness. A capitalist is a person who aims to maximize the return from their efforts. That is, all rational people are capitalists. And capitalism is the organization and investment of capital for the maximization of profit. Most people have no interest in super wealth given the risk taking and worry that comes with it. They are happy to let rich entrepreneurs sacrifice their leisure time to create labor-saving devices that make for increased leisure time for the least among us.

The remainder of the paper is organized as follows. A review of the economic literature and a brief mention of legal theory governing the application of reparations is next. Then the economic viewpoints of various growth models is explored. Next, the possibilities for Agentic AI to accelerate collaboration skills recovery is discussed. The paper ends with conclusions and suggestions for future research.

LITERATURE REVIEW

Raising the Productivity of Low-Income Households as a Driver of Broad-Based Economic Prosperity

The proposition that improvements in the productivity of low-income households generate benefits extending beyond those households to the entire economy has deep roots in economic theory. Classical, neoclassical, Keynesian, endogenous growth, human capital, and institutional economics all suggest mechanisms through which investments in lower-income populations can increase national output while simultaneously increasing returns to capital, entrepreneurship, and investment. Rather than viewing poverty reduction as a purely redistributive exercise, contemporary economic theory increasingly recognizes that productivity-enhancing investments among disadvantaged populations can enlarge the total economic pie.

Classical Foundations

Adam Smith (1776) argued that wealth creation depends primarily upon specialization, division of labor, and market expansion. As markets grow, opportunities for specialization increase, raising labor productivity and national income. Smith recognized that workers are simultaneously producers and consumers; therefore, improvements in workers' productive capacity expand both production and demand. Ricardo (1817) further demonstrated that productivity improvements generate gains from specialization and trade, increasing aggregate welfare even when benefits are unevenly distributed. Marshall (1890) extended these insights by emphasizing

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external economies and industrial districts. Productivity gains among firms and workers create spillover effects that increase the efficiency of entire industries. These positive externalities imply that investments improving worker capabilities generate returns beyond the individual recipient.

Human Capital Theory

Modern human capital theory provides perhaps the strongest theoretical justification for increasing productivity among lower-income households. Schultz (1961) argued that education, health, and skills constitute productive capital equivalent to physical capital. Becker (1964) formalized human capital as an investment yielding higher productivity, earnings, and national income. Mincer (1974) demonstrated empirically that education increases lifetime earnings through enhanced productivity. At the macroeconomic level, widespread investments in human capital increase the quality of labor available to firms, thereby raising the productivity of complementary capital investments. Consequently, higher-income households, who disproportionately own productive assets, benefit through increased returns on investment.

Aggregate Demand and the Keynesian Multiplier

Keynes (1936) introduced a complementary mechanism linking higher incomes among lower-income households to broader economic prosperity. Because lower-income households typically exhibit higher marginal propensities to consume, increases in their earned income generate proportionately larger increases in aggregate demand. Higher consumption stimulates business revenues, investment, employment, and production through the multiplier process. Kaldor (1957) similarly argued that expanding markets encourage increasing returns to scale and capital accumulation. Thus, raising earned income among lower-income workers creates additional demand that benefits firms, shareholders, and entrepreneurs.

Endogenous Growth Theory

Traditional neoclassical growth models treated technological progress as exogenous. Endogenous growth theory instead recognizes human capital, innovation, and knowledge creation as internal drivers of sustained economic growth. Lucas (1988) argued that human capital accumulation generates positive externalities because educated workers increase the productivity of others. Romer (1990) demonstrated that knowledge spillovers create increasing returns that sustain long-run economic growth. Since innovation depends upon the collective stock of human capital, expanding educational and productive opportunities for previously underutilized populations enlarges the economy's innovative capacity. Aghion and Howitt (1992) further developed Schumpeterian growth theory by demonstrating how innovation continuously raises productivity through creative destruction. Broadening participation in innovation increases the number of potential entrepreneurs, inventors, and skilled workers, thereby accelerating technological progress.

Capital Complementarity

The Cobb-Douglas production function predicts that increases in labor productivity increase the marginal productivity of capital. Solow (1956) demonstrated that output depends jointly upon labor, capital, and technology. When labor becomes more productive through education, health improvements, or skill acquisition, physical capital becomes more productive as well. This complementarity has important distributional implications. Because higher-income households typically own greater shares of physical and financial capital, increases in worker productivity increase returns to investment without necessarily reducing capital's share of national income. Growth therefore becomes mutually beneficial rather than purely redistributive.

Institutions and Inclusive Growth

Institutional economists argue that productivity depends not only upon individual capabilities but also upon the quality of economic institutions. North (1990) emphasized that secure property rights, effective legal systems, and low transaction costs encourage investment and innovation. Acemoglu and Robinson (2012) argued that inclusive institutions enable broader participation in economic activity, increasing innovation and long-run prosperity. By contrast, extractive institutions limit opportunities for large segments of the population, reducing aggregate productivity. Similarly, Acemoglu, Johnson, and Robinson (2001) demonstrated empirically that institutional quality explains much of the variation in long-run economic performance across nations.

Inequality, Growth, and Opportunity

Contemporary research has increasingly examined how excessive inequality may constrain economic growth. Galor and Zeira (1993) showed that imperfect credit markets prevent talented individuals from investing in education, thereby reducing aggregate productivity. Banerjee and Duflo (2003) argued that inequality may reduce growth by limiting human capital accumulation and entrepreneurial activity. Piketty (2014) documented how persistent concentration of wealth may exceed economic growth, potentially reducing social mobility and limiting productive investment among lower-income populations. Conversely, expanding productive opportunities for disadvantaged households can increase both efficiency and equity by enlarging the pool of skilled workers, innovators, entrepreneurs, and consumers.

Productivity, Markets, and Shared Prosperity

Recent work by the Organization for Economic Co-operation and Development (2015) and the World Bank (2019) concludes that inclusive growth strategies emphasizing education, workforce participation, health, and institutional quality produce higher long-term growth than policies focused solely on redistribution.

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Higher productivity among low-income households increases labor earnings, expands consumer markets, raises business revenues, encourages investment, and increases returns to capital. These mutually reinforcing mechanisms suggest that investments in human productivity generate positive spillovers benefiting workers, firms, investors, and governments alike. Collectively, the literature demonstrates broad theoretical agreement that raising the productivity of lower-income households can generate economy-wide gains. Through human capital accumulation, innovation, increased aggregate demand, capital complementarity, institutional improvement, and market expansion, productivity-enhancing investments enlarge total economic output rather than merely redistributing existing wealth. This theoretical foundation supports the proposition that increasing the productive capacity of disadvantaged populations can raise incomes across the income distribution, including among higher-income households who own productive assets and participate in expanding markets.

Legal Framework

Ridley & Nelson (2026) presented an alternative concept of reparation that requires no cash to be given to the recipient. Their suggestion is that the government pay for mandatory school team sports and music education to induce collaboration gene therapy, similar to what was done in Singapore. Also, pay for research and development to identify and locate the gene responsible for collaboration and if turned off, determine how to turn the gene back on (See Figure 1,2 and Figure 3,4). The expenses will be paid for by the improved income earning capacity of the recipients as well as the national income from economic growth. They could not find any constitutional legal prohibitions against reparations of any kind to remedy durable loss of collaboration skills. But recognized that noncash reparations are more agreeable than cash reparations. Cash reparations are almost impossible to calculate and are likely to be ephemeral.

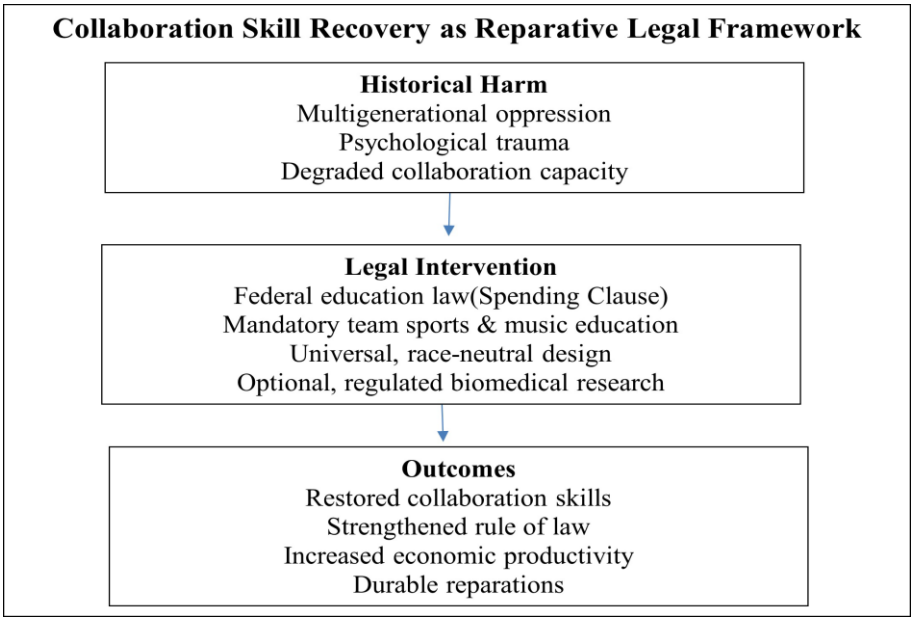

Figure 1. Illustration of our core thesis: reparations can be operationalized as collaboration skills recovery through prospective, universal legal interventions. By shifting from retrospective compensation to rehabilitative capacity restoration, the framework achieves reparative aims while remaining constitutionally durable and politically viable. Reproduced from Ridley, A. D. & Nelson, A. (2026).

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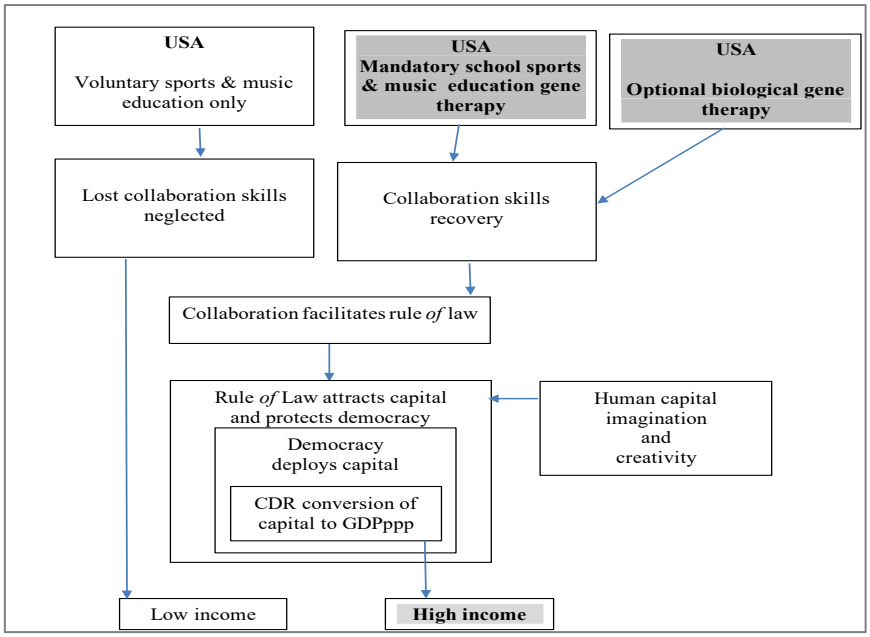

Figure 2. Collaboration skills recovery via mandatory school sports & music education gene therapy, and optional biological gene therapy leads to higher GDPppp via the CDR innovation economics model. Reproduced from Ridley, A. D. & Nelson, A. (2026).

ECONOMIC MODELS AND VIEWPOINTS

The following are several viewpoints that suggest that raising the income earning ability of low-income households results in economic growth for the benefit of all.

Keynesian consumption multiplier.

When low-income households receive higher earnings, they tend to spend a larger proportion of their income than wealthy households. Economists refer to this as a higher marginal propensity to consume (MPC). Increased spending creates additional demand for goods and services, which raises business revenues, profits, investment, and employment.

Suppose a low-income worker receives an additional $1,000 in earnings. The worker spends much of that income at local businesses. Businesses experience higher sales. Businesses hire more workers or expand production. New workers and suppliers receive income and spend it. The process continues through the economy. The result is that total economic output increases by more than the original $1,000. Rich households benefit because their businesses sell more products, their investments earn higher returns and asset values increase as corporate profits rise.

Henry Ford's Wage Argument

A classic example is Henry Ford. Ford famously paid workers wages that were unusually high for the time. His reasoning was that workers with higher incomes could afford to buy automobiles. This illustrates a broader principle. Workers are not only producers; they are also consumers. Higher worker income creates larger markets for firms owned by investors and entrepreneurs.

Human Capital Theory

Higher earnings can improve education, health, skills acquisition and workforce productivity. Economists such as Gary Becker argued that investments in human capital raise productivity and economic growth. As productivity rises firms become more profitable, shareholders earn higher returns, and national income increases.

Market Expansion Effects

Low-income households represent a large share of the population. When their purchasing power rises retail markets expand, housing demand rises, financial services markets grow, and new business opportunities emerge. The wealthy often own the businesses and assets that serve these markets, so they capture part of the gains.

Social Stability and Transaction Costs

Economic theory also suggests that extreme inequality can create crime, political instability, social conflict and reduced trust. These increase transaction costs and discourage investment. By contrast, broader prosperity can increase social trust, improve labor-market functioning, encourage entrepreneurship, and reduce security and enforcement costs. These conditions benefit investors and business owners.

CDR Perspective

Economics is the study of wealth creation by the conversion of human capital imagination and creativity into capital stock for the production, distribution and consumption of goods, services, and wealth. In the CDR model (see Figure 3,4) the true source of wealth is

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entrepreneurial capital. Capital comprises intangible exogenous human entrepreneurial capital ideas of imagination and creativity, intangible endogenous capital stock of knowledge (skills and memory), and tangible endogenous machinery, recordings, computers, etc. Capitalism is, through collaboration, a method of organizing capital for the purpose of profitable investment. Rule of law is an intangible exogenous catalyst that creates stability for attracting capital and protecting democracy. Democracy is an intangible exogenous catalyst that creates additional pathways for the optimal deployment of capital. Total capital is converted into production of capital stock, goods and services, which after consumption, depreciation and obsolescence, contributes to wealth. Since capital stock is subject to continuing depreciation (capital consumption) and obsolescence, entrepreneurship must be the true source of new wealth creation. The CDR index is a weighted average of capitalism (C), democracy (D) and rule of law (R) that jointly with natural resources and geographical latitude explain almost all (90%) economic growth. The next best Solow growth model explains only 36%. Contrary to common belief capital contributes approximately 60%, natural resources only 6% and latitude only 4%. And human capital contributes 85% of total capital. Simon (1981) said that people are the ultimate resource.

Figure 4 indicates the role of rule of law in effectuating economic growth. Rule of law is a holistic concept based on joint interest. Cooperation is a practice that is based in self-interest and is certain to stymie the creation of rule of law. Well-intentioned increased efforts to cooperate will frustrate people who do not understand the cooperation collaboration paradox. On the other hand, collaboration can lead to rule of law, assuming that all other conditions prevail. The only way to get to rule of law is through collaboration. That means curing any collaboration deficits. Gene therapy is what is suggested here.

Using the CDR framework, one could argue that higher earned income increases participation in the economy, greater participation increases collaboration and exchange, collaboration generates innovation, innovation expands total wealth creation, business owners, investors, workers, and consumers all share in a larger economic pie. In this view, raising the earned income of low-income households is not a redistribution argument. It is an economic growth argument: increasing the productive and purchasing capacity of millions of people expands markets, stimulates innovation, and raises aggregate wealth, allowing both low-income and high-income groups to become better off.

A concise academic formulation would be: Increasing the earned income of low-income households can generate positive spillover effects throughout the economy because these households exhibit high marginal propensities to consume. The resulting increase in aggregate demand stimulates business revenues, investment, employment, and innovation. Since higher-income households disproportionately own productive assets and businesses, they capture part of the gains generated by the expansion of economic activity. Thus, policies that raise the earnings of low-income workers may increase both equity and efficiency, creating conditions under which the poor and the rich can become simultaneously better off.

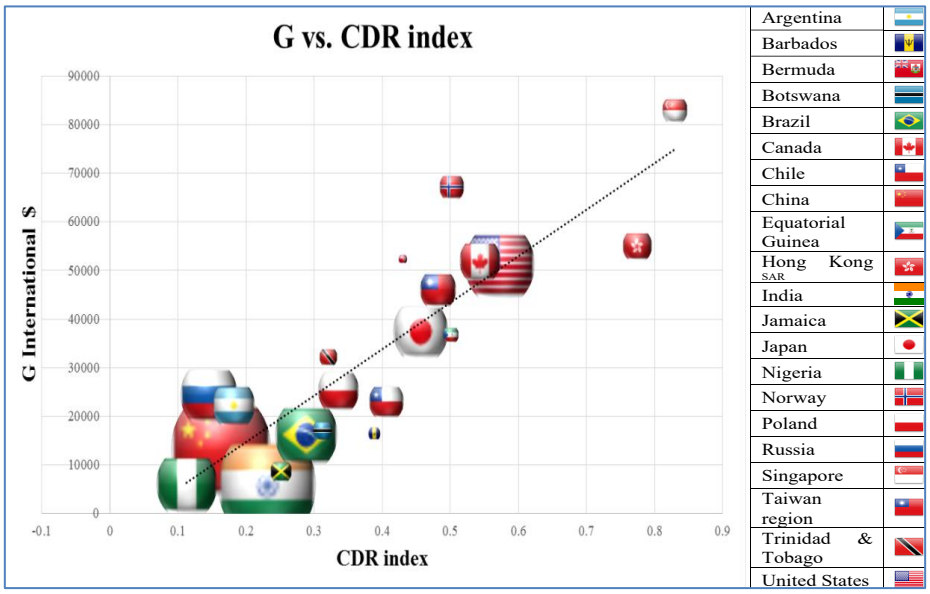

Figure 3. Year 2014 *G* vs CDR Index for 79 countries (line). Bubble size (21 countries) is the square root of population.
This model was re-estimated for years 1995 to 2016 with similar results.
For model estimation and additional comments on the countries listed see Ridley (2020).
$\hat{g}$=1.53C+0.14D+0.23R-1.21CDR+0.38N R^2=0.9
G=$\hat{g}$ (GDPppp highest-GDPppp lowest) +GDPppp lowest)

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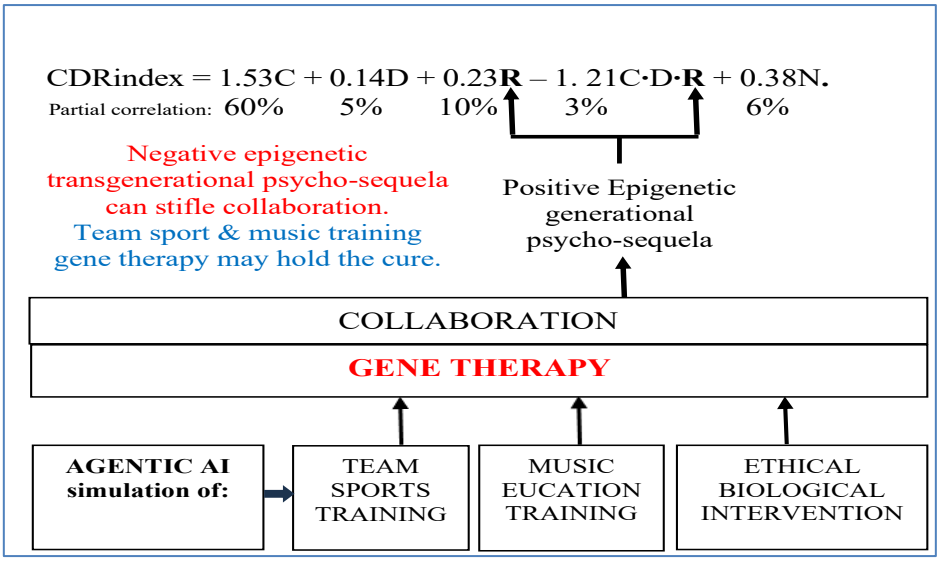

Figure 4. Year 2014 CDR Index and model for 79 countries. This model was re-estimated for years 1995 to 2016 with similar results. For additional comments on the countries included see Ridley (2020, 2023). R requires collaboration skill which requires positive epigenetic generational sequela. Reproduced in part from Ridley, Lee and Nelson (2023).

MATHEMATICAL MODELS

The following are mathematical models that predict that raising the productivity of low-income households raises the income of high-income households. Several established economic models imply that increasing the productivity of low-income households can increase the income of high-income households. The strongest models come from growth theory, general equilibrium economics, and human capital theory.

Cobb-Douglas Production Function
The standard production function is:
$Y = AK^{\alpha}L^{1-\alpha}$

where:
Y= total output (GDP)
A= technology/productivity
K= capital
L= labor
α= capital's share of income

If the productivity of low-income workers rises, effective labor becomes:
$L^{*} = hL$

where h is human capital (skills, education, health, collaboration ability, etc.).

The production function becomes:
$Y = AK^{\alpha}(hL)^{1-\alpha}$

As h increases:
$\frac{\partial Y}{\partial h} = (1-\alpha)AK^{\alpha}L^{1-\alpha}h^{-\alpha}$
$\frac{\partial Y}{\partial h} > 0$

and total output rises whenever $0 < \alpha < 1$, $A > 0$, $K > 0$, $L > 0$, and $h > 0$.

Since capital owners receive αY, their income also rises. This is perhaps the simplest mathematical proof that improving worker productivity increases returns to capital owners.

Marginal Productivity of Capital (MPK)
In the same model:
$MPK = \frac{\partial Y}{\partial K}$

which equals:
$MPK = \alpha AK^{\alpha-1}(hL)^{1-\alpha}$

Notice that h appears positively.
Therefore:
$\frac{\partial MPK}{\partial h} > 0$

As worker productivity increases, capital becomes more productive. Consequently, factories become more profitable, software becomes more valuable, and machines generate greater output. The owners of capital (typically higher-income households) earn higher returns.

Endogenous Growth Theory
The Paul Romer model treats ideas as a source of growth.
A simplified version is:
$Y = A(H)L$

where H represents human capital.
As more people become skilled and productive:
$\frac{\partial A}{\partial H} > 0$

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Knowledge creation rises. Higher productivity among previously low-income groups expands innovation, entrepreneurship, and idea generation. These benefits spill over to the entire economy. The gains accrue not only to workers but also to investors and business owners.

A Two-Class Model

Suppose:
Poor households earn labor income W.
Rich households own capital K.

Output is:
$Y = AK^{\alpha}(hL)^{1-\alpha}$

Labor income:
$W = (1-\alpha)Y$

Capital income:
$R = \alpha Y$

Taking derivatives:
$$\frac{\partial W}{\partial h} = (1-\alpha)\frac{\partial Y}{\partial h} > 0$$

and
$$\frac{\partial R}{\partial h} = \alpha\frac{\partial Y}{\partial h} > 0$$

Thus:
$$\frac{\partial W}{\partial h} > 0$$

and
$$\frac{\partial R}{\partial h} > 0$$

meaning both labor income and capital income increase when worker productivity increases. This is a formal mathematical statement of the "rising tide lifts all boats" argument.

A Microeconomic Model Closely Aligned with the Macroeconomic CDR Theory

There is no possibility of a macroeconomic derivation of the Cobb-Douglas (1928) production function. The Ridley (2020) shows that the Solow (1956) attempt at this is a fallacy of composition. One cannot simply jump from microeconomic conceptions to an understanding of production by society as a whole (Cohen and Harcourt, 2003). For it to be possible, all of the microeconomic elasticities would have to be identical. Baring a miracle, this equality is an impossibility. So, only a microeconomic model is being considered, and the implications then aggregated.

Suppose productivity depends on collaboration:
$h = h(C)$

where C is collaboration skill.

Then:
$Y = AK^{\alpha}[h(C)L]^{1-\alpha}$
Differentiating:
$$\frac{\partial Y}{\partial C} = \frac{\partial Y}{\partial h}\frac{\partial h}{\partial C}$$

If collaboration improves productivity:
$$\frac{\partial h}{\partial C} > 0$$

then:
$$\frac{\partial Y}{\partial C} > 0$$

and capital income becomes:
$R = \alpha Y$

so:
$$\frac{\partial R}{\partial C} > 0$$

Within the CDR framework, collaboration can be modeled as a form of productive human capital. If $\frac{\partial h}{\partial C} > 0$, then improving collaboration through AI-guided sports and music training increases effective labor productivity. This raises total output and, through the complementarity between labor and capital, also increases returns to capital. The model therefore predicts that collaboration training benefits workers, firms, and investors simultaneously. Improving collaboration among lower-income populations raises aggregate output and increases the income of capital owners as well.

The Global Time Invariant Macroeconomic CDR model

The macroeconomic Ridley (2020) CDR economic growth model is global time invariant. The coefficients of the model are equal constants across every country, in all time periods. There is no requirement for equal elasticity over every production unit in the economy. Furthermore, the CDR model explains ~90% of GDP whereas a loglinear expression of a growth model explains only 36%.

The *GDPppp* estimate from the CDR model is
$$GDPppp = 1.53C + 0.14D + 0.23R - 1.21CDR + 0.38N$$

$$GDPppp = 1.53(Cx + Cn) + 0.14D + 0.23R - 1.21(Cx + Cn)DR + 0.38N$$

where:
$GDPppp$ = gross domestic product adjusted for purchasing power parity
C=total capital
Cx=exogenous human capital
Cn=endogenous capital
D=democracy
R=rule of law

CDR=interaction of C, D and R
N=natural resources rents

The positive coefficients for C, D, R and N indicate unconditional additions to GDPppp. The negative coefficient in the CDR interactive term indicates the presence of either over democratization (excessive discussion, analysis and paralysis) that delay decision making, over regulation (laws for the sake of politics) that destroy opportunity, or both. No human ideas ever amount to anything because of just one person. In the macroeconomic economy the collaboration of many specialists of different ilks, is essential. Milton Friedman (1980) said that it takes literally thousands of people and millions in the broad supply chain to make a lead pencil. Ridley (2010) said that the more people there are, the more new ideas will be generated, and that these ideas interact with each other (collaboration) to create progress.

If *Cx* increases,

$$\frac{\partial GDPppp}{\partial Cx} = 1.53Cn - 1.21CnDR$$

The negative impact of -1.21*CnDR* can be eliminated by democracy and regulations that are right sized. That is democratic participation by stakeholders, owners of capital and qualified employees, and regulations that prevent corruption and protect shareholder rights. In any case *D* and *R* in the CDR model are ranked variables that range from 0 to 1. Therefore, the product DR is always a fraction. Therefore,

$$\frac{\partial GDPppp}{\partial Cx} > 0$$

Since capital owners receive a portion of GDPppp, their income also rises.

AGENTIC AI

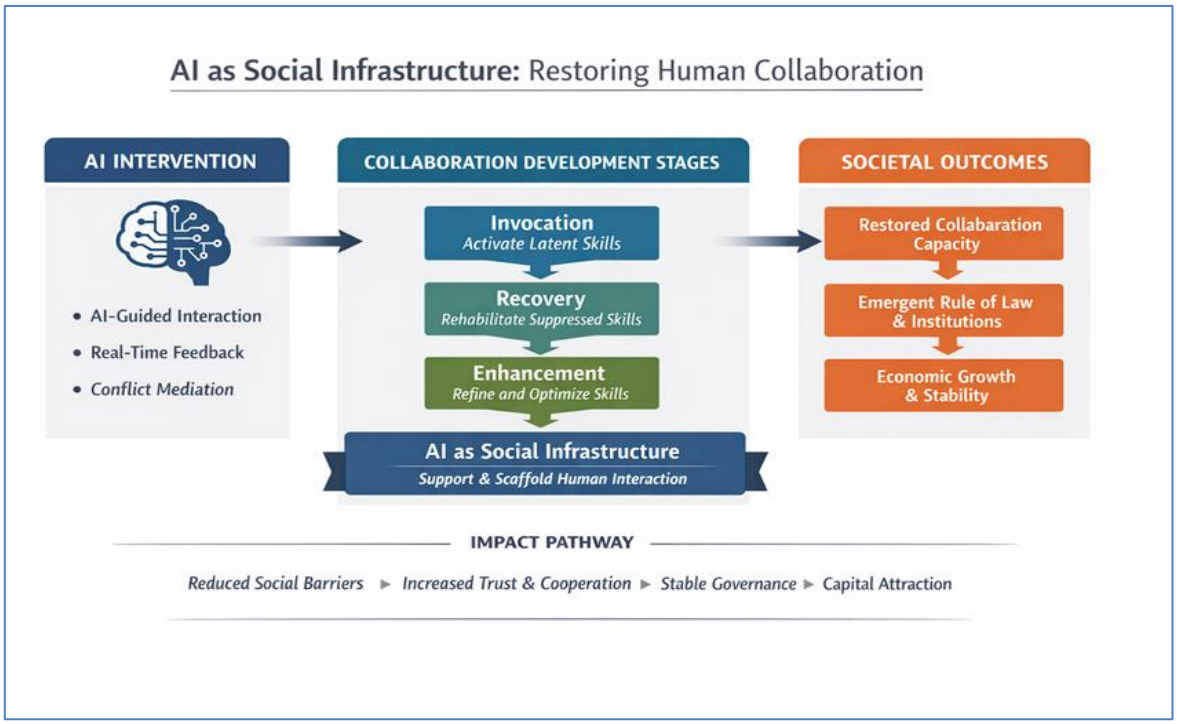

Figure 5. Artificial intelligence infrastructure for the recovery of human collaboration skills. Reproduced from Ridley, A. D., Llaugel, F., & Garcia, C. (2026).

Now that aggregate universal value in improving the income earning ability of the least among us is established, the next question is how to raise collaboration skills that were lost due to historic human abuse thereby suppressing economic contributions. Can Agentic AI aid in raising collaboration skills. Ridley, Garcia & Llaugel (2026) suggest the use of Agentic AI to accelerate the recovery of lost collaboration skills in the USA (see Figure 5). Their idea aligns with a growing research direction in agentic AI, behavioral science, and team training, but it extends beyond current work by treating AI not simply as a tutor, but as a behavioral coach whose objective is to rebuild collaboration skills through repeated social practice. This could become a novel research program, especially if grounded in the CDR (Collaboration–Democracy–Rule of Law) framework.

Agentic AI Collaboration Recovery System (AICRS)

The central hypothesis concept is that collaboration is a trainable behavioral capability that can be strengthened through repeated participation in AI-managed team activities that require communication, trust, coordination, and shared decision-making. These

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learned behaviors transfer from the virtual environment to real-world teamwork. Unlike conventional AI tutors that optimize individual learning, an agentic AI would optimize team performance.

Why Team Sports?

Team sports naturally require participants to anticipate teammates' intentions, coordinate movement, sacrifice individual gain for team success, communicate continuously, develop trust, resolve conflict, share leadership. These behaviors closely resemble those required in engineering teams, medical teams, corporate management, military operations, entrepreneurship, and research laboratories. The AI therefore trains collaboration rather than merely teaching rules.

Why Music?

Ensemble performance requires even tighter coordination than many sports. Examples include orchestras, jazz ensembles, choirs, chamber music. Musicians constantly synchronize timing, rhythm, attention, prediction, error correction. Neuroscience shows that group music-making engages brain systems associated with joint attention, social prediction, and coordination.

Why business games?

Business is directly related to managerial decision making, economic growth and development. Collaboration is a major decision-making factor than affects the economy.

Role of Agentic AI

Instead of acting as an instructor, the AI acts as coach, referee, teammate, strategist, psychologist, and performance analyst. It observes every interaction.

Examples:

Soccer

A soccer computer game can be displayed in 3D graphics. Student teams can play against the computer. The AI can record passing frequency, selfish shots, defensive coverage, communication, positioning, support behavior, and recovery after mistakes.

A play guide on which AI will grade the players is made available to the players.

Example: When not in possession of the ball, spread out, run into an open space at least 3yards from an opposition player and at least 5 yards from a teammate. Use your hands to motion that you are physically and mentally positioned to receive the ball. Be prepared to receive the ball if it is passed to you. Do not occupy an offside position. When in possession of the ball, as soon as possible, pass the ball to a teammate who is at least 5 yards from an opposition player. If there is an open lane to the goal and you are within 20 yards shoot the ball towards the goal, between the goalkeeper and the goal posts (avoid kicking the ball to the goalkeeper), otherwise pass the ball to any teammate who is in a position to see an open lane to the goal. At all times, make the play that has the highest probability of resulting in a goal. AI will grade your play on how well you follow this guideline.

Following the match, the AI produces an individualized and team debrief.

Example: During minute 17, Player 3 had three passing options but attempted an individual shot with only a 12% probability of success. Passing to Player 5 would have increased the team's expected goal probability to 46%. The AI then recommends drills that specifically target this decision pattern.

In passing, it is noteworthy to mention the 2018 winning European French men's national soccer team. The team was almost entirely populated by players of recent African ancestry. The most successful professional European club teams employ numerous African nationals. But when the Africans return home to play for their national teams, they and their teams are traditionally unsuccessful. They are observed to underperform their potential and would benefit from better collaboration. Well, they must have read Ridley & Nelson (2022b) where this phenomenon was mentioned, because in 2026, at the time of this writing, a large contingent of African teams made it to the world cup tournament, with markedly raised levels of collaboration. Furthermore, nine out of ten teams advanced to the second stage knockout round! Collaboration applied to the larger African societies and economies might yield similar successes.

Orchestra

The AI evaluates synchronization, listening, tempo adjustment, dynamic balance, responsiveness, leadership transitions. Rather than criticizing mistakes, it identifies coordination breakdowns.

Example: The violas consistently entered 120 milliseconds late following tempo transitions initiated by the conductor. This suggests delayed shared attention rather than technical inability.

Business Games

One can design an agentic AI collaboration simulator using a city-building/business game model like *Cities: Skylines*. The core idea is that students run a simulated city or firm, but no single student can win alone. Each student controls a role: mayor/CEO, finance, transportation, housing, utilities, labor, environment, or public safety. AI agents act as citizens, firms, regulators, workers, voters, customers, and competitors. Cities: Skylines has already been studied as a useful educational tool for urban planning and simulation-based learning, and recent work on AI agents in education argues that multi-agent simulations can create adaptive practice environments.

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Consider a model for the CDR concept as follows:
$Performance = f(C, D, R, K, L, A)$

where:
C= collaboration skill
D= decision quality
R= rule-following/institutional reliability
K= capital/resources
L= labor/human effort
A= technology/AI assistance

The key learning equation could be:
$Y = AK^{\alpha}[h(C)L]^{1-\alpha}$

Here, collaboration C raises human productivity $h(C)$, which raises output Y. In the game, the AI would measure collaboration by tracking information sharing, turn-taking, joint planning, conflict resolution, trust, follow-through, and willingness to sacrifice short-term individual gain for group performance. The agentic AI coach would observe team behavior, pause after major decisions, and give a debrief.

For example: "Your finance manager optimized the budget, but transportation and housing were not coordinated. Congestion increased, worker productivity fell, and tax revenue declined. Next round, create a joint infrastructure plan before allocating capital."

The business-game version could use supply chains, city budgets, zoning, labor markets, housing affordability, infrastructure investment, entrepreneurship, public trust, and firm productivity.

The experimental design could compare:

- Teams using the game without AI coaching
- Teams using AI feedback only after play
- Teams using real-time agentic AI collaboration coaching

The hypothesis would be:

$$AI\ Coaching \rightarrow Higher\ Collaboration \rightarrow Higher\ Productivity \rightarrow Higher\ Output$$

This fits the CDR framework well: capitalism provides incentives, democracy gives voice and participation, rule of law creates trust, and collaboration converts human effort into innovation and growth.

ADDITIONS AND EXTENSIONS

Agentic Practice Cycles

The AI continually modifies exercises. Week 1: Simple passing drills. Week 2: Small-sided games. Week 3: Hidden information scenarios. Week 4: Leadership rotation. Week 5: Pressure situations. Week 6: Mixed strategy games. The AI automatically adjusts difficulty based on team development.

Digital Twin of Collaboration

The AI constructs a behavioral model for every participant.

Variables might include:
$C_i = (T_i, S_i, L_i, R_i, E_i)$

where:
T_i =Trust
S_i =Sharing
L_i =Leadership
R_i =Reciprocity
E_i =Empathy

Each interaction updates these estimates. The AI predicts who collaborates well, where breakdowns occur, optimal team composition, and effective interventions.

Multi-Agent Simulation

Before humans participate, AI agents simulate thousands of matches. Different AI personalities include: selfish, cooperative, overconfident, passive, adaptive, strategic. The system identifies which behavioral combinations produce the greatest improvement in collaboration. Humans then train under those optimized conditions.

Adaptive Behavioral Coaching

Suppose Player A rarely passes. The AI might: reduce scoring rewards for solo play, increase rewards for successful combinations, assign Player A a supporting role, provide personalized feedback, and later reintroduce attacking responsibilities.

The intervention targets behavior rather than athletic ability.

Measuring Recovery

The AI continuously computes a Collaboration Index (CI) from observable behaviors rather than self-report surveys. Example components include:

Variable	Weight
Communication	20%
Passing/Resource Sharing	20%
Trust	20%
Conflict Resolution	15%
Collective Decision Making	15%
Leadership Rotation	10%

A rising CI across sessions would indicate measurable improvement.

Transfer to the Workplace

The most important research question is whether skills transfer beyond the training environment. Participants would complete: engineering design challenges, business simulations, negotiation exercises, disaster-response planning, entrepreneurial team

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projects. The hypothesis is that teams trained by the AI would outperform control groups on novel tasks requiring collaboration.

Experimental Design

A randomized controlled trial could include four groups:

Group	*Intervention*
1	Traditional instruction
2	AI tutoring only
3	AI-managed sports/music training
4	AI-managed sports/music plus behavioral debriefing

Outcomes would include behavioral collaboration metrics, team performance on transfer tasks, persistence of effects over time, and measures of trust and communication.

Novel Contribution

The key innovation is not simply using AI in education. It is proposing agentic AI as a behavioral rehabilitation system that continuously observes, models, coaches, and adapts team interactions to rebuild collaboration skills. If successful, such a system could have applications in education, workforce development, healthcare, military training, community resilience, and organizational performance, providing an evidence-based method for strengthening one of the most important forms of social and economic capital: the capacity to collaborate effectively with others.

Concluding Remarks

Each of the mathematical models considered in this research predicts that increasing the productivity (human capital) of workers increases total economic output, labor income, and capital income. In particular, the global time invariant Ridley (2020) CDR economic growth model, together with natural resources and geography, explains ~90% of GDP and is chosen in the final analysis. Since high-income households disproportionately own capital, the models predict that raising the productivity of low-income households will, ceteris paribus, increase the income of high-income households as well. A plus sum game. Therefore, it is in the best interest of high-income communities to invest in low-income communities. This investment in reparations is entirely unrelated to any suggestion of income redistribution or ephemeral cash reparations. This is one of the core theoretical results of modern growth economics and human capital theory. It is posited that collaboration is the point of beginning of economic growth and development. Raising collaboration skills raises human capital and can be accomplished by team sport and music education like it did in Singapore. Team sport and music education gene therapy is a metaphorical analogy, not a biological intervention. It implies an environmental feedback mechanism which has the opposite effect of the historic abusive environment that led to lost collaboration skills (ethical biological gene therapy where the medical knowledge exists is very different). Agentic AI computer simulations of team sport, music education and business games can accelerate this process. It can be done in addition to physical team sports and music education which have their own health benefits. Suggestions for future research are to actually build an Agentic AI software program and conduct the type of simulations described in this paper. If the hypothesized experimental simulations pan out, the Agentic AI computer program can be implemented in k-12 schools in the USA, and all low-income countries where the benefits are sought. Programs of business and government employee training should also be considered. Per the CDR economic growth model, if income increases in any other country, income will increase in the USA. All will benefit.

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