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McCULLOCH, SCROPE, AND HODGSKIN: NINETEENTH-CENTURY VERSIONS OF JULIAN SIMON

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In *The Ultimate Resource* (1981, 1996), and in many other publications over the last several decades, Julian Simon put forth controversial views regarding the connection between natural resource scarcity, population growth, and economic progress. Simon argued, in contrast to those espousing the "limits to growth," that natural resources were not getting scarcer, but more abundant, and that a large and growing population was an asset rather than a liability in the pursuit of economic growth.

When Simon first put forth these ideas, they were considered radical and even nonsensical by some. But recent reconsideration of the traditional view of a negative relationship between population and per capita incomes by development economists and growth theorists has caused some change in thinking on this issue. For example, D. Gale Johnson argues that the recent reexamination of these traditional views "supports the conclusion that ... in the long run, population growth may contribute to faster economic development (1999, p. 2).

Much of Simon's criticism of the traditional views of the impact of natural resource depletion and overpopulation was that it was based on "Malthusian" reasoning. According to Simon:

> Whether mathematical or verbal, simple or complex, computerized or not, conventional models of the effect of additional people on the standard of living in MDCs—including those from Malthus to *The Limits to Growth*—share the common root of first-edition Malthus: Adding people who must work and live with the original fixed supply of land and capital implies less income for each person (1981, p. 264).

Thus in Simon's view, the primary fault of Thomas Malthus in the first edition of the *Essay on Population*, and of contemporary Neo-Malthusians, is the belief in diminishing returns.[1] Specifically, he criticizes them for a failure to recognize

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[1] The question of the appearance of the law of diminishing returns in the first edition of Malthus's *Essay* is a controversial one. Samuel Hollander reports that Edwin Cannan and Joseph Schumpeter deny its presence. The same can be said of Mark Blaug (1996, p. 68). Hollander cites J. S. Mill, W. S. Jevons, Alfred Marshall, Lionel Robbins, George Stigler, and Anthony Waterman, as well as himself, as believing that Malthus's ratios imply diminishing returns (Hollander 1997, pp. 13–16).

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the potential for increases in productivity "due to additional people's inventive and adaptive capacities." When these are taken into account, he argues, "we arrive at very different results" (1981, p. 264).

The controversy that Simon's views generated was testimony to the widespread perception that his ideas represented a path-breaking approach to the population issue. However, Simon did make attempts to establish an affinity between his work and that of previous writers. Specifically, he credited Malthus's second edition of the *Essay* as a step in the right direction. Why? Because in the second edition of the *Essay*, Malthus was much more willing to accept the possibility that preventive checks based upon a modification of people's procreative habits could stave off the trend to subsistence wages produced by population growing faster than subsistence (1990, p. 163).

However, if Simon really wanted to credit earlier writers with having anticipated his own views, much better candidates could be found in the largely neglected work of several of Malthus's early critics—John Ramsay McCulloch, George Poulett Scrope, and Thomas Hodgskin—who offered views on the role of population and natural resources in economic development strikingly similar to those of Simon.[2] They offered a model of endogenous technical change that presented a strong challenge to Malthusian thinking that unfortunately has been neglected. However, Simon's work, and the emergence of endogenous growth models that incorporate the nonrivalry of technology and its implication that a large population spurs technological change, have given these ideas currency again and provide a motivation for a reconsideration of their writings on population and growth.

I. SIMON ON THE ROLE OF POPULATION IN THE PROCESS OF ECONOMIC DEVELOPMENT

At the heart of Simon's analysis is the claim that population growth plays a positive role in economic development. Simon defends this thesis largely on the basis of empirical evidence linking population growth and improvements in a variety of measures of material welfare over the long run. While much of Simon's argument is drawn from these empirical relationships, he also offers a theory of how population and material progress are linked:

[2] We should note that Simon was the author of a collection of readings devoted to early writings on population (Simon 1998). However, that collection entirely ignores the work of McCulloch, Scrope, and Hodgskin but does include selections from Alexander Hale Everett and Henry C. Carey—other notable critics of Malthus. Because Simon has recognized the contributions of Everett and Carey, their work is not discussed in this paper.

Nassau Senior was another notable anti-Malthusian from the same era, though Simon did not recognize him as such in the collection mentioned above. But he is not included in this paper because, while he was critical of Malthus, the population-push idea was not a part of his thinking. He made no connection between a large population and technological progress. In fact, he expressly rejected Scrope's thinking on this issue. He disagreed with "those who believe that an increase of numbers is necessarily accompanied, not merely by a positive, but by a relative increase in productive power" (Senior 1836, p. 43).

> More people and increased income cause problems in the short run—shortages and pollution. Short-run scarcity raises prices and pollution causes outcries. These problems present opportunity and prompt the search for solutions. In a free society, solutions are eventually found ... In the long run the new developments leave us better off than if the problems had not arisen. This theory fits the facts of history (1995, p. 24–25).

At other points he was more specific about how population causes these material improvements. He argued that a larger population implies a larger market size with greater possibility for the division of labor, which boosts productivity and investment (1989, p. 168). A larger population makes possible many social investments that would not otherwise be profitable, such as irrigation projects and airports (1989, p. 169). It also increases the scale of the phenomenon of learning by doing (1977, p. 35).

The last of these suggests the main thrust of Simon's argument, which is the assertion of a connection between the growth of technical knowledge and population. The relationship between population and knowledge is a simple one: people are repositories of knowledge (1989, p. 174). An increase in population thus represents an increase in the stock of available knowledge to be applied in production. In Simon's opinion, "The most important benefit of population size and growth is the increase it brings to the stock of useful knowledge. Minds matter economically as much as, or more than, hands or mouths. Progress is limited largely by the availability of trained workers" (1996, p. 12). And while he concedes that in the short run increases in population might cause problems, he argues that once they acquire human capital, the long run contributions people make to production are great enough to overcome all the costs associated with their rearing (1990, p. 168).

But in Simon's view the most important connection between population and growth is through the impact of population growth on technology. "Population growth spurs the adoption of existing technology as well as the invention of new technology" (1989, p. 176). Again the relationship is a simple one. Here Simon builds upon an idea that he claims was first put forth by William Petty (Simon 1981, p. 197) and in the modern era by Simon Kuznets (1960). The idea is that a larger number of inventions and innovations are likely to be forthcoming in a larger population than in a smaller one. Inventive geniuses make up a small proportion of the population, so that if we increase the size of the population we increase their absolute number.[3] The new ideas, inventions, and technologies they create eventually become part of the stock of knowledge available to the benefit of all (Kuznets 1960, p. 258; Simon 1981, p. 197).

Michael Kremer acknowledges that this idea has become particularly important in the endogenous growth literature. He cites the work of Paul Romer (1990), Aghion and Howitt (1992), Grossman and Helpman (1991), and the

[3] Petty's original exposition of this idea is found in "Another Essay in Political Arithmetic" (1683) in Petty (1889, p. 474): "As for the Art of Delight and Ornament, they are best promoted by the greatest number of emulators. And it is more likely that one ingenious curious man may rather be found out among 4 millions than 400 persons ... And for the propagation and improvement of useful learning, the same may be said concerning it as above said ... concerning the Arts of Delight and Ornament."

earlier work of Kenneth Arrow (1962) on inventive activity as examples of analysis that incorporate the concept of endogenous technological change. Both these growth theorists and Arrow note that it follows from the nonrivalry of technology that because the cost of inventing a new technology is independent of the number of people who use it, if we hold constant the proportion of resources devoted to research, an increase in population leads to an increase in technological change. Furthermore, he has examined the empirical validity of this thesis and concludes that "the long-run history of population growth and technological change is consistent with the population implications of endogenous technological change" (Kremer 1993, p. 681).

A second relationship between population size and technological growth that Simon asserts is that the stresses caused by population growth provide a stimulus to innovation and invention. "Population growth is a challenge that evokes the response of increased efforts for individuals and societies" (1996, p. 476). These new technologies and inventions he characterizes as arising from "population push" as opposed to "invention pull." The invention pull view characterizes invention and innovation as autonomous and as occurring independently of population growth. In contrast, the population push view asserts that population growth causes scarcities that stimulate technological change.

An important example of this is provided by the work of Ester Boserup, upon which Simon drew extensively. Boserup demonstrates that much of the adoption of new technology in agriculture should be viewed as the response of communities to rising population density. Though in the short run population increase may lead to diminishing returns in agriculture, population increase also "provides motivation for the introduction of more intensive systems of production" (Boserup 1990, p. 26). A second effect of increased population, she notes, is that a larger population makes it easier to build, finance, and maintain collective investments in agricultural improvements such as irrigation projects, developing energy resources, and transportation systems (p. 26). She argues that, "Because a larger population can afford more infrastructure, it can make use of technologies that would be inapplicable or uneconomical for a smaller one" (p. 26). These conclusions are drawn from extensive studies of the adoption of new agricultural techniques by ancient, as well as modern communities. She observes that historically, development occurred not where food was plentiful but where population densities were sufficiently high to make these infrastructure investments worthwhile and to facilitate communication across the whole region. On the basis of these studies she concludes, "because population increase motivated and often facilitated technological change, its effects on development were often positive" (p. 26).

Simon often contrasted his view of the growth–population relationship with what he termed the "classical view" of these issues: "Classical economic theory apparently shows irrefutably that population growth must reduce the standard of living. The heart of all economic theory of population from Malthus to *The Limits to Growth* can be stated in a single sentence: The more people using a stock of resources, the lower the income per person, all else equal" (1996, p. 471). To be fair to Simon, we should note that he generally took pains to make it clear that not all of his classical predecessors were guilty of this charge. He was careful to note that the Malthus of the second edition of the *Essay* was not

guilty of this and that William Petty, David Hume, and Bernard Mandeville made statements expressing the virtues of a large population. But at other times he painted the whole of classical economics, and by implication McCulloch and Scrope, with the same brush as in the passage above. The choice by Simon of post-1798 Malthus as a patron saint is also curious in that Malthus attempted to demonstrate that economic progress could continue only so long as population growth could be constrained. That is hardly in the spirit of Simon's own work.

II. McCULLOCH, SCROPE, AND HODGSKIN ON POPULATION AND GROWTH

John R. McCulloch has been viewed by some as little more than a popularizer of Ricardian economics. In contrast, Joseph Schumpeter considered McCulloch an important contributor to Ricardianism, though he did criticize him for continuing to propagate Ricardian ideas even after they had been abandoned by many of his contemporaries (1954, pp. 470, 477). D. P. O'Brien has also offered a favorable assessment of McCulloch by demonstrating that he was much more of an original thinker than he is often given credit for, with methods and views more akin to those of Adam Smith than David Ricardo (1970, p. 405). One of those areas in which he broke from other members of the Ricardian School was on the population question by rejecting the Mathusian view of population and its impact on growth. McCulloch argued that economic progress could continue indefinitely (O'Brien 1970, p. 271–72). In doing so he rejected the notions of an inevitable stationary state (O'Brien 1970, p. 296) and diminishing returns in agriculture (McCulloch 1864, p. xiv).

Much of McCulloch's analysis of growth and population reflects his belief in the "progressive nature of man" (1864, p. 21). Along with Adam Smith he strongly believed that mankind was innately endowed with a "desire to improve his condition." Furthermore, he believed that we possess the power "to devise the means of gratifying this desire" (1864, p. 21). This desire for improvement led man to increased dominance over the physical world and an expanding output (1864, p. 21). While McCulloch pointed to the usual "classical" factors in the growth process, such as the role of division of labor, saving, and capital accumulation, he accentuated the role of invention, human capital creation, and the growth of knowledge to a much greater degree than any of his fellow classical economists (O'Brien 1970, p. 277). Most importantly, for our purposes, he held the view that the pressure of population growth was a key factor in bringing about invention and the growth of knowledge.

While McCulloch argued that the desire to advance was a powerful force, it alone was not responsible for man's expanding power over nature: "the advance of the arts has not been left wholly to depend on its agency" (1864, p. 23). He pointed to another important factor, the impact of population pressure. He accepted Malthus's view of the strength of the "passion between the sexes" and thus conceded that the "principle of increase" was also a powerful force, which, if left unchecked, would press on the limits of subsistence (1864, p. 24). But

McCulloch also believed, as did Malthus in the second edition of the *Essay*, that this would lead to moral restraint (1864, p. 24) since the fear of falling behind one's fellow man was also a powerful motivator (1864, p. 61). But the pressure of population growth not only compelled mankind to procreate at less than its potential rate, it also "was so very strong as to call forth unceasing efforts to increase the means of subsistence. It forms, in fact, a constantly operating incentive to the activity and industry of man" (1864, p. 24). As a consequence he rejected the "Malthusian view":

> The principle of increase, as explained by Malthus, and afterwards by Chalmers, appeared to form an insuperable obstacle to all permanent improvement in the condition of society, and to condemn the great majority of the human race to a state approaching to destitution. But farther inquiries have shown that the inferences drawn by these and other authorities from the principle now referred to, are contradicted by the widest experience; that the too rapid increase of the population is almost always prevented by the influence of principles which its increase brings into activity; that a vast improvement has taken place in the condition of the people of most countries, particularly of those in which population has increased with the greatest rapadity (sic); and that, so far from being inimical to improvement, we are really indebted to the principle of increase for most part of our comforts and enjoyments, and for the continued progress of arts and industry (1864, pp. xv–xvi).

As mentioned above, McCulloch's growth model pointed to the division of labor and capital accumulation as key features of the growth process. In his discussion of the effects of the division of labor he pointed to the impact of population on the adoption of the division of labor: "The division and combination of employments can only be imperfectly established in rude societies and thinly-peopled countries" (1864, p. 37). He followed Adam Smith in asserting that the advantages of this practice could only be fully realized in situations of an extensive market (1864, p. 44).

McCulloch also placed considerable emphasis upon the acquisition of human capital (1864, p. 67). He stressed the importance of labor in the process of production, in particular, emphasizing the role of labor's mental abilities which he claimed made "immeasurable additions to their productive capacities" (1864, p. 67). Furthermore they were responsible for "numberless inventions, some of which have made almost incalculable additions to our powers, and changed, indeed, the whole aspect and condition of society" (1864, p. 20). Universal education was thus a key element in the growth process, for it placed an increasingly larger portion of the population in a position to take advantage of and extend the insights of inventive geniuses such as Watt and Arkwright (1864, p.68–69). Here McCulloch recognized the essence of the notion of the nonrivalry of technology. Once the technological knowledge came into existence as a result of the activities of inventive geniuses, others could easily use it; i.e., knowledge is a public good.

But according to McCulloch, invention and innovation were no haphazard occurrences. He also put forth a "population push" view of technological change, arguing that the pressure of population growth was the most powerful stimulus to the exercise of the inexhaustible inventive and innovative capabilities of

mankind. The growth of population was not "an invincible obstacle to improvement." To the contrary, it was *the* great cause of prosperity:

> In point of fact, however, the principle of increase is not merely consistent with the continued improvement of the bulk of society, but is itself the great cause of this improvement, and the wonderful progress made in the arts ... The powers and capacities implanted in man seem capable of almost indefinite improvement; but instinct did not direct him in their use. *Want* and *ambition* are the powerful springs that gave the first impulse to industry and invention, and which continually prompt new undertakings ... But in addition to its other effects, the principle of increase ... unceasingly applies the most powerful stimulus—the *duris urgens in rebus egestas*—to industry and invention. Much indeed, of the effect usually ascribed to the desire of rising in the world, may be traced to the operation of this principle ... The increase of population, though generally subordinate to the increase of food, is always sufficiently powerful to keep invention on the stretch, rendering the demand for fresh inventions and discoveries as great at one time as at another, and securing the forward progress of the species (1864, p. 177–79).

McCulloch therefore concluded that those who espoused schemes to repress population growth in the attempt to improve social conditions were misguided in their attempts. The prudential virtue was strong enough to prevent excessive population growth and yet the pressure of continued population growth continued to provide "the strongest incentive to exertion and industry" (1864, p. 181).

George Poulett Scrope (1797–1876) was regarded by Joseph Schumpeter as "above the common run of economists of his time" in terms of his analytical abilities (Schumpeter 1954, p. 489). He termed him an independent and original thinker who "swam against the stream," indicating a willingness to reject conventional views or champion unpopular ones (1954, p. 489). This was much in evidence in his thinking on the population issue.

Much of Scrope's analysis focused on the issue of adequate food supplies in the face of an expanding population. Malthus and others had conceded that nonagricultural products could be expanded without increase in their cost of production while subsistence could only be procured at increasing expense. Scrope objected to this, arguing that manufactured goods must be made of agricultural products and hence if the cost of agricultural outputs rose it must also be felt in the manufacturing sector (1833, p. 267). But in any event, rising consumption of manufactured goods could not fully compensate for a shortage of food (1833, p. 258). Thus agriculture occupied a key position.

According to Scrope, shortages of food caused by a growing population called forth two sorts of responses: a search for more arable land and "the exercise of their ingenuity to contrive means for making the district they inhabit afford them more copious supplies of food" (p. 262). The Malthusians, on the other hand, offered a third option. They recommended that population be constrained by prudential restraint. Scrope regarded this as unnecessary because as history and analysis demonstrated, agricultural improvements were capable of increasing the output of food without limit; thus shortages of food posed no limit to human population (1833, p. 277). The practice of agriculture was itself a response to the

pressures of population. "Agriculture, like most subsequent inventions and improvements in the useful arts, was doubtless the offspring of *necessity* which drives people to exertions, both corporeal and intellectual, for their maintenance" (1833, p. 263).

At the heart of Scrope's analysis is a denial of diminishing returns in agriculture resulting from resorting to increasingly inferior soils due to population pressures, as claimed by Malthus and David Ricardo. Though Scrope conceded that the pressure of population growth had forced resort to soils of lesser quality, improvements in the practice of agriculture had and would continue to offset the effects of declining soil quality. Food could, in fact, be produced from these soils at a falling cost (1833, p. 265). The use of such soils was merely symptomatic of an increased capacity to produce food. Thus the doctrine of the decreasing fertility of the soil was a fallacy. "The fertility—or productiveness—of soils is, on the contrary, daily *increasing*, with every advance in the science of agriculture; and not only in agriculture, but of every other useful art ... The very reverse, therefore of the doctrine we alluded to, is the truth" (1833, p. 265). Scrope then offered his own proposition regarding the relationship between population growth and agricultural production. Rather than requiring an increasing proportion of the population to be employed in agricultural pursuits, "the usual progress of nations" demonstrated a declining share of labor employed in agriculture:

> The proportion of their productive power employed in the gratification of new and varied tastes, for comforts and luxuries, is continually increasing;—every improvement of agriculture and the subsidiary arts enabling a smaller proportion to supply the whole with food. This law is universal, and establishes the very reverse of the proposition we oppose (1833, p. 266).

Scrope held the view that natural resource scarcity did not imply an effective limit to growth for he shared Simon's view that the growth of science was constantly making new resources available and opening up greater knowledge of how to make use of existing ones:

> It is not denied by any that the productive powers of man, his skill, and knowledge, and artificial resources, have been continually on the increase; nay, that they have multiplied, within a few years past, in an extraordinary degree. Those of nature, on the other hand, have surely undergone no decay. On the contrary, every hour is opening to us a knowledge of fresh natural powers with which we were before unacquainted (1833, p. 280–81).

He offered the opinion that he "could see nothing to prevent those resources being, in the course of time, themselves multiplied a thousand-fold by future discoveries and improvements" (1833, p. 274).

But far more important than natural resources were human resources. "National prosperity does not depend nearly so much on advantageous situation, salubrity of climate, or fertility of soil, as on the adoption of measures fitted to excite the inventive powers of genius and to give perseverance and activity to industry" (1833, p. 39).

As in the case of McCulloch and Simon, Scrope asserted a cause and effect relationship between population pressure and economic progress. As population

grew and caused short run problems it created the necessity of expanding output. "The advantages man has derived from the pressure of this necessity, in continually 'sharpening his wits,' and urging him to devise means for removing the local limit to his supply of necessaries, are as obvious as they are incalculable" (1833, p. 277). This led, he believed, to improvements in the "arts of production" the effect of which was "to increase the productive power *of every individual*, and consequently to augment the aggregate productiveness of a nation *in proportion to its numbers*" (1833, p. 280). Attempts to restrict population were therefore misguided and even harmful, for Scrope felt that he had "proved the utter absence of a necessity of any check whatsoever on the natural increase of population" (1833, p. 286). Human energy was better directed toward augmenting human and physical capital, and the more rapidly population increased, the better (1833, p. 287), for an increase in population "is *pro tanto* a direct increase of the means of generating capital (1833, p. 283). Scrope was therefore convinced that the growth of knowledge and productivity would occur rapidly enough "to cause a continual augmentation of the average share of each individual in the society" (1833, p. 281).

The Ricardian socialist Thomas Hodgskin (1787–1869) also downplayed the significance of natural resources and accentuated the role of labor and population in the growth process. Hodgskin sought to illuminate what he referred to as the "natural sources of national greatness" (1827, p. 11), by which he meant those fundamental factors that determined a society's productive power. This led him to consider the role natural resources, and particularly the fertility of the soil, had in determining a nation's productive abilities. He observed that there were nations possessing abundant natural resources and yet mired in poverty, and in other instances countries that had little resource endowment that had achieved great prosperity. In addition, people of ancient times, in possession of the same resource endowment, had not achieved prosperity. This led him to believe that natural factors such as climate and the fertility of the soil had no appreciable impact on national prosperity in comparison with the contribution of labor (1827, p. 15). He therefore concluded that the influence of these natural factors was "so unimportant, compared to the effects of knowledge-guided labor, that it may be neglected" (1827, p. 19). Furthermore, this led him to entirely exclude consideration of the impact of the physical world from the science of political economy (1827, p. 19).

Because Hodgskin claimed labor to be the source of all wealth (1827, p. 20), the key to expanding national prosperity lay in enhancing the nation's labor resources both in quantity and in quality. He believed that mankind was endowed by the Creator with the desire to increase in numbers and a productive potential adequate to meet mankind's expanding needs (1827, p. 26). Hodgskin believed this "natural productive power" to be "the great source of individual opulence and of national greatness" (1827, p. 27). The strength of this natural productive power was primarily a function of knowledge, as the earlier cited example of ancient societies possessing great natural resources but little technical knowledge demonstrated. National prosperity was, therefore, increased by expanding the level of knowledge of the labor resource. But this was a topic that he felt had been much neglected by economists, for they had failed to "discover the general

laws which influence, regulate, and limit the progress of knowledge'' (1827, p. 76). Hodgskin attempted to remedy this deficiency.

Unlike Adam Smith, who claimed that technical knowledge and invention was a by- product of the division of labor, Hodgskin pointed to the influence of an expanding population. As population grew, the pressure of want stimulated the search for more productive means of employing labor. Initially this led to the establishment of crude forms of agriculture and manufacturing. But additional increases in population made possible by these productive improvements led to a continual process of improvement in agricultural and manufacturing techniques (1827, p. 85).

Though the immediate stimulus to inventors was the desire to get ahead in life, Hodgskin pointed to population growth as the ultimate cause of invention:

> But were population not to increase, there would be no additional wants to provide for. The labour of the past year would be more than sufficient to supply the wants of the next; and but for the continual increase of people, there would not now be, there would never have been, a stimulus to invention and the increase of knowledge. Wherever they stop increasing, a stop seems also to be put on the increase of knowledge. Thus ... we may be certain that the cause of that progress in knowledge, which is in turn the cause of the perpetual increase in our productive power, is the natural law which dooms us to labour, and which is kept perpetually in operation, at its greatest extent, by the active principle of population. Necessity is the mother of invention; and the continual existence of necessity can only be explained by the continual increase of people (1827, p. 86).

Hodgskin used the example of agriculture to describe how the increase in wants occasioned by population growth would ultimately generate agricultural innovation (1827, p. 234). His description of the process is identical to that of Simon, who we will recall, argued that in the short run an increase in population would drive up prices that, in turn, would stimulate a search for solutions. In the long run the induced innovations and discoveries would leave us better off than before.

Though in the passage above Hodgskin attributes the growth of technological knowledge to the expansion of wants created by population growth, he also offered other explanations of the connections between population and invention and innovation. Recall that Simon and Kuznets pointed to the fact that an increase in population causes an increase in the number of inventors. Hodgskin had, at a much earlier date, recognized the significance of this argument.[4] He notes that the effect of improved communication has been to stimulate the increase of knowledge. Knowledge of new discoveries rapidly spreads, and improvements and extensions of the original discovery are soon forthcoming (1827, p. 93). The reason for this is that it brings a larger number of minds to bear on the problem:

The chances of improvement, it is plain, are greater in proportion as the

[4] It is possible that Hodgskin derived the idea from Petty. He does not cite Petty but his exposition of the idea uses nearly the same numerical example as Petty's. On the other hand, he does cite the "ancient proverb'' that "two heads are better than one,'' suggesting the possibility of another even earlier source for his thinking.

persons are multiplied whose attention is devoted to any particular subject. It appears to me, therefore, that an increase in the number of persons produces the same effect as communication; for the latter only operates by bringing numbers to think on the same subject ... On the same principle, each of four thousand heads, and of four million heads, will necessarily have still more knowledge than when there is only one head in existence (1827, p. 93–95).

This principle operated not only with regard to the existing population but it also had cumulative effects. The current generation benefited from the discoveries of past generations and in turn their discoveries were passed on to the next. But, he argued, this is not merely a matter of time; it is a function of numbers: "There have been *more* eyes to see, *more* hands to practise (sic), and *more* minds to treasure up and record observations and practices" (1827, p. 94). This proposition is proved, he argued, by the observation that almost all discoveries and innovations have occurred in crowded cities and densely populated countries (1827, p. 95).

III. CONCLUSION

Our examination of the writings of McCulloch, Scrope, and Hodgskin reveals that all three anticipated Julian Simon's optimistic view of the long run material prospects for mankind.[5] They rejected the phenomenon of diminishing returns as irrelevant to the long run as a consequence of their belief in a dynamic process of invention and technological and organizational innovation stimulated by a large and growing population. They identified two means by which population growth would stimulate technological change: by increasing the need for technological change through the pressure of necessity and by increasing the number of potential and actual inventors and innovators, anticipating the later thinking of Kuznets, Boserup, and Simon. They thus pointed to the increasing importance of the human factor and the decreasing significance of natural resources in the growth process. One suspects they would not be at all surprised to find that over the past two centuries increases in production and population have occurred without evidence of diminishing returns in spite of limited land and other natural resources, or that the rapidly rising population has been accompanied by increases in productivity and average standards of living.

The insights of McCulloch, Scrope, and Hodgskin on population, though largely ignored by their contemporaries, have been reconsidered here mainly as a result of their rediscovery by Simon, who, it seems was unaware of these earlier

[5] The reader should note that the similarity of their thought does not go much beyond their views on population. Scrope was critical of McCulloch's views on productive labor, capital, and the effects of taxation (1833, p. 46, 147, 439). At one point he lumps him in with Malthus on the issue of diminishing returns in agriculture (p. 267). Both Scrope and McCulloch were critical of Hodgskin's radical views. Scrope found Hodgskin's views on capital to reflect a "blindness" that he found "unaccountable," and he referred to him as a "schemer" whose views, if adopted, would lead to "the isolation and helplessness of barbarism" (1833, p. 150). Hodgskin refers to McCulloch as "a gentleman not favorable to our agitation" and characterized him as being a member of a group of men who assert that mankind was bound "to continue for ever the vicious and unholy system which ignorant and selfish men have imposed upon us" (A Lecture on Free Trade, p. 22, in Hodgskin 1966).

writings of McCulloch, Scrope, and Hodgskin on this subject. The history of these ideas thus also affords us an affirmation of George Stigler's assertion of "a general rule of scientific work that a scholar's successes and failures are judged by his contemporaries, and their judgement is accepted by later scholars" (1976, p. 1210). Furthermore, he argues that if or when the idea gains acceptance it will not be because of the influence of the neglected contributions of the earlier writers. That certainly seems to be the case here.[6]

The question this raises is why their contemporaries rejected their ideas. Stigler argues that the "overwhelming cause of failure of scholars is that their ideas were erroneous or infertile or too primitive to provide useful guidance to their contemporaries" (1976, p. 1211). The leading figures of political economy of that era certainly regarded these ideas as erroneous. From their perspective it was perhaps not surprising that they concluded that diminishing returns would be relevant in the long run. Given the largely agrarian nature of the economy of their day and the rate of technical change they had observed, it was perhaps hard for most to believe that agricultural innovation could offset diminishing returns to that great a degree. The case of Ireland seems to have suggested to many of them that a large population and economic development were incompatible.[7] And even though today the question is being reconsidered and these ideas are gaining some acceptance, the Malthusian perspective on the impact of population still significantly influences much of current thinking and policy.[8] It is therefore not surprising that little attention has been paid to McCulloch, Scrope, and Hodgskin's views on population. However, it is surprising that Simon, who demonstrated a willingness to acknowledge the contributions of earlier writers, did not recognize theirs.

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[6] It therefore is ironic Simon recognized this to be true of the early writings on population: "Perhaps more than in most branches of economics, the history of population includes many writings (especially in the nineteenth century) that made great advances that may be seen as correct in light of more recent developments, but nonetheless had no influence on subsequent thought" (1998, p. x). The writing of McCulloch *et al*. is an obvious example of this.

[7] Henry George's critical observation on the use of Ireland as an example of over-population by the classicals is instructive here:

> Ireland of all the European countries, furnishes the great stock example of over-population. The extreme poverty of the peasantry and the low rate of wages there prevailing, the Irish famine, and Irish emigration, are constantly referred to as a demonstration of the Malthusian theory worked out under the eyes of the civilized world. I doubt if a more striking instance can be cited of the power of a preaccepted idea to blind men as to the true relations of facts (1938, p. 123).

[8] See, for example, Tom Tietenberg's discussion of the relationship between population and economic growth in his widely adopted textbook, *Environmental Economics and Policy* (2001). He presents a largely negative view of the relation between the two.

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