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Henry George and the Classical Scientific Research Program:

George's Modification of It and His Real Significance for Future Generations

By FRANK PETRELLA*

ABSTRACT. *Henry George's* revision of classical economics was based on a new "hard core" assumption linking *efficiency, equity,* and *social welfare* to a revised concept of *property rights* in *land.* However, rather than create new core-supporting "protective belt" theories, George either accepted or, when necessary, modified existing classical theories especially those which threatened his new hard core, for example, classical "*wages-fund*" *theory.* Consequently, George's adaptation of the *Ricardian* "*stationary state*" model was less accurate than mainstream *classical economics* in its *predictions* concerning the behavior of the *distributive shares* of *income* over time, and the effects of *technological change* on *economic growth* and *economic welfare.* Without its own protective belt, George's classicism became a special case of *classical economics* whose value, nevertheless, existed in its effective criticism of classical property rights theory.

I

Introduction

ALTHOUGH HENRY GEORGE ACCEPTED the principal hard core assumptions of the classical scientific research program, his modification of the program was premised on a new hard core proposition which rejected the equivalence between economic and social welfare established by classical economics. George's revised hard core proposition was a corollary of his "stage theory" of socioeconomic development. In George's view, economic growth through the different "modes of production" increased economic efficiency and economic welfare; however, the growth in social institutions—especially the definition of property rights—

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and social welfare lagged behind the growth in economic welfare. Consequently, economic growth and economic efficiency promoted social welfare and distributive justice provided land was recognized as a public rather than a private good. Then, the single tax on land rents insured the equivalence of equity and efficiency. Only then will society ". . . approach the ideal of Jeffersonian democracy . . . ," and fulfill the social imperative of George's republican millennialism—the republic must be saved!

However, hard core propositions including George's revision, are reinforced and given life and scientific legitimacy in the research program's "heuristics" and "protective belt." The protective belt surrounding the hard core is a collection of core supporting auxiliary theories and hypotheses which shoulder the burden of both logical and empirical tests of the scientific research program. The heuristics, positive and negative, are a series of methodological precepts sometimes explicit, sometimes implicit, suggesting how to modify and develop theories and hypotheses within the protective belt. Thus for example, given George's acceptance of classical hard core propositions dealing with rationality, self-interest, and the efficiency of competitive equilibria, we would have expected George to pursue lines of inquiry (positive heuristic) which reinforced these propositions, and to avoid lines of inquiry (negative heuristic) leading to less than optimal competitive solutions, for example, irrationality as legitimate behavior since this would have denied economic efficiency and George's principle of "least exertion."

Consequently, George's modification of the classical hard core might have produced a new or revised set of heuristics and protective belt hypotheses. Instead, rather than give classical economics a new protective belt, George challenged, modified, and in some instances eliminated the clusters of theories and auxiliary propositions lying within the orbit of the classical protective belt. In effect, George divested the classical protective belt of all elements which threatened or were inconsistent with his new hard core assumption linking efficiency, equity, and social welfare to a revised concept of property rights in land. In fact, much of Books I through IV of *Progress and Poverty* reflected the exercise of George's own positive heuristic. George, in his initial encounter with the classical protective belt, reinforced the superiority of his own research program by a meticulous and critical examination of the methods, definitions and assumptions of the "core threatening" theories from the competing research program.

The classical protective belt confronting George was developed over a period of nearly one hundred years from Smith's *Wealth of Nations* to the later editions of Mill's *Principles of Political Economy.* In Smith's time, the protective belt

was essentially a collection of theories explaining and rationalizing the necessity of economic growth and development. From early Ricardo through J. S. Mill, the protective belt expanded and matured,[1] incorporating much of this development into the Ricardian "stationary state" model,—a model explaining both growth and income distribution through a synthesis of separate theories of wages, profits, population, diminishing returns, and differential rent at both the intensive and extensive margin. This Ricardian cluster of theories was also supported by developments in value theory, trade theory and the doctrine of comparative advantage, and classical monetary theory and its emphasis on the neutrality of money.

II

George's Modification of the Classical Protective Belt

SINCE THEY DID NOT THREATEN his revised hard core, both the trade theory and monetary theory in the classical protective belt were summarily incorporated into George's research program. His treatment of money in *Progress and Poverty* and more extensive treatment in Book V of *The Science of Political Economy* was a conventional classical statement of money as a medium of exchange and measure of value. George's acceptance of the "gains from trade" in classical international trade theory was evident in his portrayal of protectionist doctrine as simply attacks on the "law of competition."[2]

In contrast, although neither Ricardian rent theory nor the law of diminishing returns threatened George's hard core propositions, they were classical protective belt theories crucial to his revision of the classical scientific research program; consequently, they were carefully and extensively treated by George. Ricardian rent theory was viewed as an immediate extension of two hard core propositions: "The law of rent is . . . but a deduction from the *law of competition* . . . it [rent] rests . . . upon the fundamental principle . . . that men will seek to gratify their desires with the *least exertion.*"[3] Although critical of the Malthusian context of the "Law of Diminishing Production" in Agriculture, George accepted the principle. His main criticism concerned its limited application to agriculture. It was ". . . in reality a general law, applying as well to manufacturing and exchanging. . . ." Eventually, George developed for all three "modes of production" the law of diminishing returns to labor in "space" as well as "time."[4]

On the other hand, several classical protective belt theories threatened the revised hard core of George's research program. One of these was the classical "wages fund" doctrine. The degree of perceived peril was evident in George's lengthy list of erroneous classical propositions dependent upon the "wages fund" doctrine.[5] Although broad-based, the heart of George's detailed refutation

of "wages fund" doctrine was concerned with classical growth theory. In classical theory, economic growth, economic welfare, the distribution of output among rent, profits, and wages all depended on the rate of savings or capital formation. Thus, Say's Law notwithstanding, periodic depression, poverty, and low wages were, in the classical view, caused by inadequate capital formation.

An unqualified acceptance of classical growth theory by George would have compromised his view of land monopolization as the cause of rising income inequality. Thus, capital was no longer the "prime mover" in George's revised classical research program; it was a necessary but not a sufficient condition for economic growth. If the institutional framework for growth was poor, capital would be either redundant or wasted: "Is it not the rapacity and abuses of government, the insecurity of property, the ignorance and prejudice of the people, that prevent the accumulation and use of capital?" Moreover, George thought capital accumulation in itself was never a problem. Given existing economic conditions, ". . . as a general rule . . . the social organism secretes . . . the necessary amount of capital just as the human organism in a healthy condition secretes the requisite fat." Thus, poverty and low wages were not the result of capital scarcity.[6]

Another classical protective belt theory which threatened the revised hard core of George's research program was Malthusian population theory. In part, George's rejection of Malthusianism was religious and philosophical in character. Not only was Malthusian pessimism inconsistent with the notion of a "beneficent Creator", to George, its link with Social Darwinism was ethically repugnant. George's belief that population increases neither produced want nor social distress led him to introduce a supporting yet potentially troublesome "increasing returns to scale" argument.[7] Still, George's repudiation of Malthusianism was essentially economic in character. If land monopoly was the source of rent, George had to reject the notion that rents rise because of the pressure of "population against subsistence" and the rising money price of food. However once divested of its classical consequences, George considered population growth in itself as the mark of a "progressive community" and one of the principal contributors to "material progress."[8]

III

A Comparison of the Ricardian and Georgist Models

BEFORE EVALUATING GEORGE'S MODIFICATION of the classical protective belt—the Ricardian stationary state model—some comparison of the two systems is necessary. The following comparative static model will serve to illustrate the features

of both systems.[9] The vertical and horizontal axes in Figure 1 measure respectively the dollar value of output and amounts of capital and labor used by the economy. The underlying production functions for the Ricardian and Georgist macro economy were compatible. In Ricardo, agricultural capital and labor are used in fixed proportions and subjected to diminishing returns when applied to a fixed supply of land, an assumption based on the relative scarcity of land and raw materials.[10] The resulting agricultural output and its distribution determined manufacturing output and its distribution. In George, capital and labor—different forms of "human exertion"—are also used in some fixed proportion which depended upon the prevailing technology and the equilibrium condition that wages and interest must reflect "equal returns to equal exertions."[11] However, capital and labor are used in all three modes of production—growing,

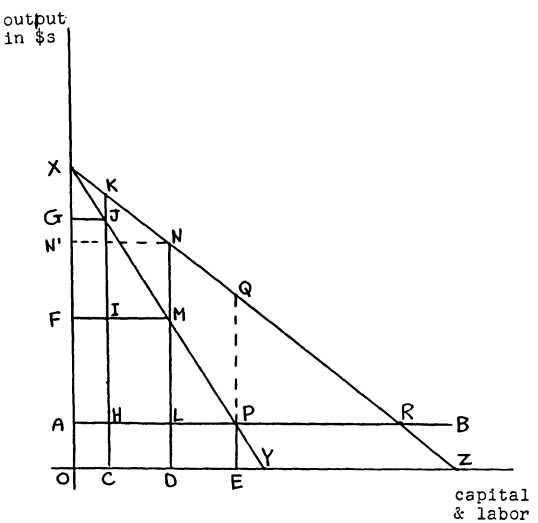

Figure 1. Factor Shares

adapting, and exchanging—and subjected to "eventual diminishing returns" in time and space when applied to a fixed supply of land, an assumption based on land monopolization rather than relative factor scarcity. In both the Ricardian and Georgist models, the prices of inputs and output are competitively determined. However, George's output price must be viewed as a price level reflecting the price of output in all three modes of production.[12]

Thus, given competition in both the Ricardian and Georgist models, XZ in Figure 1 represents the value of the average product of capital and labor (VAP); XY represents the marginal value product-marginal revenue product of capital

and labor (MVP-MRP).[13] In the Ricardian stationary state model, AB represents the long-run supply curve of labor, or the constant real per capita subsistence wage (=OA).

In George's version of the classical model, OA represents the minimum interest and wages necessary to sustain labor effort in either its indirect or direct form. George's minimum wage was the classical subsistence wage: ". . . fixed by . . . the standard of comfort—that is, the amount of necessaries and comforts which habit leads the working classes to demand as the lowest on which they will consent to maintain their numbers."[14] George defined both the interest and wage rates as averages. However, in reality, wages, for example, were a structure of returns reflecting differences in job characteristics like risk, the agreeableness of work, etc.

But, equal exertions of labor effort must be paid similar returns or reallocation of labor effort will occur. Consequently, as George noted, even though they are measured differently, in equilibrium, both interest and wages must be equal since they represented equal returns for equal exertions of labor effort. Thus OA in George's model represents average dollar returns for both per unit of exertion of direct labor effort and per unit of exertion for labor effort diverted to the production of capital.[15]

The operation of the Ricardian model is straightforward. The total value of output at OC amounts of capital and labor is OXJC. Total capital and labor income are determined by their joint MRP with capital receiving profits, AGJH, as the difference between the prevailing Malthusian subsistence wage and the joint MRP. Wage income is OAHC and rent income is GXJ.

As the economy moves toward the "stationary state", point P, the joint share of income to capital and labor decreases; the rent share of income increases. Since the relative or percentage share of joint income to capital and labor can be determined by the ratio of Marginal Product/Average Product, or MRP/VAP, it is clear the rent share increases absolutely and relatively since the gap between XZ (VAP) and XY (MRP), or the rent share per unit of capital and labor, grows from KJ to NM to QP. At the "stationary state," profits are eliminated and there is no incentive for the additional accumulation of capital. Wage income is OAPE; rent income is AXP.

The operation of the Georgist model is also straightforward. However, unlike the Ricardian model, the total value of output is divided between rent, wages, and interest. George believed profits could be decomposed into either the "wages of superintendence" or interest "compensation for risk."[16] During the early stages of economic growth and development, for example at OC capital and labor in Figure 1, rent and the value of land is low, and ". . . there may be a small production of wealth, and yet a high rate of wages and interest, as we

see in new countries."[17] That is, in Figure 1, the total value of output is OXJC; the rent share is GXJ and the wage and interest share is OGJC. Although the wage and interest return per unit of exertion of labor effort, OG, is determined by competitive conditions, the effect of competition is constrained by the rent creating process at both the intensive and extensive margin:

> . . . the effect of competition is to make the lowest reward for which labor and capital will engage in production, the highest that they can claim . . . these two factors will receive in wages and interest only such part of the produce as they could have produced on land free to them without the payment of rent—that is, the least productive land. . . . For . . . the produce, all over the amount which labor and capital could secure from land for which no rent is paid must go to land owners as rent . . . .[18]

As economic growth continues in George's version of the classical Ricardian model, ignoring for the moment improvements in technology, education, etc., the "margin of cultivation" continues to diminish and both the absolute and relative share of rent income increases at the expense of a declining wage and interest share of income. In Figure 1, this is evident at OD capital and labor where the rent share of income per unit of capital and labor has grown from KJ to NM. Total rent income grows to FXM, and since the input prices of capital and labor decrease to OF, the total share of income to wages and interest is OFMD. Consistent with George's understanding of the difference between absolute and relative income shares, or "quantity" and "proportion" as George termed them, the proportion of wage and interest income does decrease, but ". . . the quantity remains the same or even increases." In this case, it increases since the gain in wage and interest income, CIMD, exceeds the loss, FGJI.[19]

The consequences of technological change in both the Ricardian and Georgist models can also be compared. Technological change in the classical "stationary state" can be depicted by a rightward shift of the product curves, or MRP and VAP. To simplify, assume the MRP curve for capital and labor shifts from XY to XZ. Output and income increase, and at some initial level of capital and labor, for example OD, it is clear that the return per unit of capital and labor increases from DM to DN.[20] Thus, in the Ricardian "stationary state" model, either resource using or resource saving technological change protects the return to the relatively abundant inputs, capital and labor, at the expense of the relatively scarce input, land. However, in the absence of subsequent innovation, population growth will move the economy to a new "stationary state" at point R.

In contrast, however, the consequences of Georgist technological change are inconsistent with the model in Figure 1. Like Ricardo, George assumes an increase in technology with *no increase in population,* but his results are anti-Ricardian. Moreover, the form of technological change does not influence the results in George's model. For example, George considered two modes of tech-

nological change: ". . . either one-tenth of the labor and capital may be freed, and production remain the same as before; or the same amount of labor and capital may be employed, and production be correspondingly increased."[21] In capital and labor displacing innovations, George demonstrated that growth in the level and composition of consumer demand was sufficient to reemploy the displaced resources. However, according to the model in Figure 1, in both modes of technological change considered by George, the absolute and relative rent share of income should increase, but do not. Moreover, both the "quantity" and "proportion" of wages and interest should decrease, but do not.[22] For example, at OD capital and labor, clearly evident is at least an increase in the "quantity" of wages and interest from DM to DN.[23]

George's predictions concerning the distributional effects of technological change might be explained in several ways. Although unlikely, he may have assumed implicitly some eccentric form of the production function. More likely, though, growth in the rent share of income appears to have depended on population growth, even though George excluded this possibility. For example, his analysis of technological change in Chapter 3, Book IV of *Progress and Poverty* assumed a constant population. Consequently, technological change increased the "demand for wealth . . . and the demand for land," and increased rent by extending the margin of cultivation in all modes of production. Nevertheless, in Figure 1, for the rent share to increase after technological change, for example, moving from point N to Q along the new MRP curve, more capital and labor effort is necessary. And in George's mind, this additional effort necessary to extend the margin of cultivation was probably associated with another major contributor to "material progress," the "increase in population."[24] Ironically, George's conclusion was more consistent with Malthus' analysis of technological change. Malthusian analysis was long run in character; consequently, although innovation increased output, *population continued increasing* forcing the cultivation of inferior land which, in turn, increased the rent share of income.[25]

Although George's version of the Ricardian "stationary state" model failed to predict the distributional consequences of technological change inherent in the model, it was, nevertheless, more optimistic than the Ricardian model. For example, increases in technology, population, and institutional changes which favorably influence productivity prevent the arrival of the "stationary state" and the establishment of minimum or subsistence levels of wages and interest (OA in Figure 1). Consequently, land rent was never maximized in George's economy. This occurs only at point P in Figure 1. Under competitive conditions in the input markets, all users of capital and labor are price-takers, thus, AB represents constant marginal input cost. At P, marginal input cost equals marginal revenue product of capital and labor. By definition, the rent return to the fixed factor land of QP per unit of capital and labor is at a maximum.

Moreover, despite its limitations, George's model was consistent with his modification of the classical research program's hard core propositions. As long as society defines land as a private rather than public good, then social welfare diminishes even though economic efficiency increases. For example, in Figure 1 at OD, the competitively determined return to capital and labor of DM (=OF) is efficient and commutatively just; however, social welfare is not maximized since the private owners of land impose a "social cost" or "tax" on capital and labor called "rent" equal to NM per unit of capital and labor.

To George, "justice commands" that both capital and labor must "receive their full reward" consistent with land being "free"[26] or accessible to all, that is, a normative public good. Thus, "Labor and capital would then receive the whole produce, minus that portion taken by the State in the taxation of land values, which, being applied to public purposes, would be equally distributed in public benefits."[27] Consequently, both efficiency and social welfare are maximized when labor and capital receive at OD, income ON'ND minus the "single tax" of FN'NM. Now the owner of land pays a price to society, NM, for the private use of a public good.

George's "single tax" can be thought of as a Pigouvian welfare tax which eliminates the difference between marginal private and marginal social costs of using land. The "single tax" also eliminates a subtle form of resource exploitation recognized by George in *Progress and Poverty*. Social costs exceed private costs because the producer (landowner) is able to use a resource at less than its true opportunity cost, that is, in George's case, the cost of capital and labor, DN or ON', that would prevail under conditions of "free land" or land as a normative public good.

IV

The Fate of George's Revised Classical Research Program

HENRY GEORGE'S RESEARCH PROGRAM was novel in its ability to link social welfare to a revised concept of land ownership. But measuring the success of his research program depends on whether or not it was "theoretically and empirically progressive." A theoretically progressive research program is one that makes new and unexpected predictions not present in rival research programs. Moreover, the degree of success depends on the ability of the new program to incorporate as a special case (rather than totally displace) the predictions of a competing research program. Finally, a new research program is empirically progressive if its predictions can be validated.

Since it neither displaced nor treated classical economics as a special case, then, George's research program was not theoretically progressive. However, George's intention was to revise rather than displace; but, in doing so, George's

revision became a special case of the prevailing classical research program, one which predicted the implications and challenged the legitimacy of classical property rights' theory. Still, George's revision and use of classical economic analysis was appropriate. As Warren Samuels has noted, both Ricardo and George "used" classical economics to create policy support for different class interests in society.[28] However, although appropriate, the legitimacy of George's "special case" of classical economics still depended on its ability to explain and predict.

But, given the late 19th century state of the empirical arts, it would be unreasonable to exact empirical verifiability in the modern sense from both George's and the classical research program. Recognizing that much of our assessment involves empirical hindsight, still, the two research programs can be compared on two important issues: the behavior of the distributive shares of income over time, and the effects of technological change on economic growth and economic welfare. George's model predicted an absolute and relative rise in rent income at the expense of wages and interest; however, a comparison of income shares in the 60 years prior to and 60 years following 1900 indicate a rise in the labor and capital shares of income and a fall in the rent share.[29]

However, the classical research program failed the same empirical test, since the predicted rise in the rent share of income and arrival of the "stationary state" did not occur. But the classical model, unlike George's, was at least pointed in the right direction. For example, Mill saw the fate of the rent share depending on the relative rates of change of technology and population growth. Mill realized that technological change should reduce the rent share of income, but he also knew that technological change was slow ". . . often falling far short of the growth of capital and population. . . ."[30] Even Malthus recognized that industrialization constrained population growth and permitted a rise in per capita income as individuals opted for more commodities and fewer children.[31]

But for George, technological change increased the rent share of income even with a constant population. While he considered it a significant source of progress, George did not forsee the favorable effects of technological change on per capita income, especially during the period 1840–1900. Nor did George understand the favorable influence of technology on the capital and labor shares of income, especially the way technology protects the income shares of the most abundant or rapidly growing factors of production, a condition true of United States' capital and labor through most of the one hundred year period after 1840. Still, there was great potential in George's revised classical research program. Had he been able to combine his version of increasing returns to scale with technological change, the resulting benefits to both capital and labor would have been evident.[32]

Although George's revised classical research program failed to predict the distributive consequences of dynamic growth, it was theoretically and empirically

progressive in its advancement of Ricardian rent theory and the theory and practicality of site value taxation.[33] Nevertheless, George was rejected by his peers. Given his legitimate extension of Ricardian rent theory, the degree of rejection is puzzling and clearly incommensurate with the deficiencies of George's revised classical research program. In part, the hostility of George's peers can be explained by the relentlessness, the imperative rather than indicative mood of George's positive heuristic. This quality pervaded George's work. Frequently, George's rhetoric almost commands the reader to link the predictions of George's modified Ricardianism with his alteration of the classical hard core proposition on property rights and social welfare. Perhaps it is this same quality which explains why George's critics considered him "messianic." Ironically, this dedicated and rigorous pursuit of the positive heuristic in any other research program would be considered a mark of vitality and professionalism.[34]

Instead, George's revised classical research program was treated as an invasive, aberrant hypothesis threatening the mainstream of late nineteenth century economic analysis. As Fuller has shown, the isolation and rejection of George's work was made easier by the growing professionalization of economic science. Even though the quality of George's economic analysis was respectable for its time, it did not bear the seal of acceptable academic credentials.[35] Ultimately, however, George's challenge to classical property rights theory marked him and his career. In spite of his professed classicism, he was seen as a radical. In spite of his insistence on taxing land rents after due allowance for improvements, he was frequently viewed as a socialist who wished to dispossess landowners. However, as we have shown, the "single tax" was a respectable and conservative Pigouvian welfare tax reflecting the difference between marginal private and marginal social costs in the use of resources.

V

Conclusion

IF THERE WAS A FAILURE in Henry George's scientific research program, it was rooted less in the inconsistencies between George's and conventional classical predictions from the Ricardian "stationary state" model and more in George's inability or unwillingness to create new protective belt hypotheses to better serve his revised hard core assumption linking equity and efficiency through the single tax on land rents. The success of George's research program, however, lies in the rigorous connection he established between the single-tax and the revised hard core. By carefully deriving the necessity of the equity-efficiency nexus from his stage theory of socioeconomic change, George emphasized the importance of the institutional framework in determining social welfare. In doing so, George seriously challenged the incomplete if not deficient character

of property rights theory inherent in the mainstream classical research program. George's resultant view of land as a public good was a legitimate 19th century extension of Locke's property rights theory. Moreover, George's solution to the paradox of poverty amidst progress was logically consistent with the premises of George's revised hard core. If land is a public good, then the single tax on land rents can be viewed either as a means of removing the negative externality caused by monopolizing a public good, or as a Pigouvian welfare tax which eliminates the difference between marginal private and marginal social costs of land use.

Although George's economic insights are still of value to the current generation, ultimately, George's legacy lies less in the validity of his work and more in the nobility of his vision. Many believe the American republic now stands on a new threshold where passage is perilous, threatened not only by internal social decay as in George's time but also by external dangers including nuclear destruction. The "single tax" will do little in solving these problems; of great value, however, is George's faith in republican values and the goodness of people. At the root of George's republican modification of the classical research program lies the still appropriate imperative: not only is the republic worth saving, it must be saved!

Notes

1. Blaug believes the Ricardian system was a "progressive problem shift" in the Smithian research program ". . . motivated by the experiences of the Napoleonic Wars and designed to predict the 'novel fact' of the rising price of corn leading in turn to rising rents per acre and a declining rate of profit." The "hard core" of Smith and Ricardo are virtually identical, although the "positive heuristic" differs. Mark Blaug, "Kuhn versus Lakatos, or Paradigms versus Research Programmes in the History of Economics," *History of Political Economy,* 7 (Winter, 1975), p. 417.

2. Henry George, *Progress and Poverty: An Inquiry Into the Cause of Industrial Depressions and of Increase of Want with Increase of Wealth* (New York: Robert Schalkenbach Foundation, 1979), pp. 61–63. Hereafter cited as *Progress and Poverty;* Henry George, *The Science of Political Economy* (New York: Robert Schalkenbach Foundation, 1981), pp. 472–528, 402–03. Also, see pp. 134, 196–97, 207. Hereafter cited as *Political Economy.*

3. *Progress and Poverty,* p. 170 and pp. 168, 169. Collier believes the principle of least exertion in George implied that land "would be occupied in descending order of fertility or location . . . ." George's insightful and cogent refutation of Henry C. Carey's "inverted Ricardianism" supports this view. *Progress and Poverty,* p. 228. Charles Collier, "Henry George's System of Political Economy," *History of Political Economy* 11 (Spring, 1979), p. 79.

4. *Progress and Poverty,* pp. 132–33, 230–34; *Political Economy,* pp. 335, 338, 357, 368–69.

5. *Progress and Poverty,* pp. 24–25.

6. *Ibid.,* pp. 83, 86, 87. George's criticism of classical wage theory and his view that wages depended on the product of labor were the inspiration for J. B. Clark's marginal productivity theory. See Charles Collier, *op. cit.,* p. 90.

7. Frank Petrella, "Henry George, the Classical Model and Technological Change," *American Journal of Economics and Sociology,* 40 (April, 1981), pp. 193–94, 199–200. Hereafter cited as

"George and Technological Change." Also see Charles Collier, *op. cit.*, footnotes 59 and 64, pp. 83–84, 86.

8. *Progress and Poverty,* pp. 295, 264, 228. However, George's acceptance of population as a variable exogenous to material progress, does not make him a Malthusian.

9. For a superb treatment of the dynamics of George's model including a theory of the business cycle, see Charles Collier, *op. cit.*, pp. 79–88.

10. In Ricardo's model, capital is a one period wage advance to labor. Moreover, the Ricardian aggregate production function has a simple quadratic form with consequent linear marginal and average product curves, an assumption consistent with the arithmetical examples in Ricardo's presentation of the stationary state model. Because he accepted Ricardian diminishing returns and rent, we make a similar assumption concerning George's production function.

11. *Progress and Poverty,* pp. 198–99.

12. Competition in both output and input markets must follow from George's principle of least exertion and the law of competition. *Progress and Poverty,* p. 167. Although George abhorred monopoly market structures in both input and output markets, the sources of social distress were not attributed to monopoly power in the three modes of production. Even the price of land was competitively determined. If anything, the rise of "excessive" self interest and growth of monopoly market structures can be viewed as a consequence of the rise of rent and increasing inequality.

13. VAP is sometimes called the average revenue product (ARP) of capital and labor since VAP = the average product of capital and labor × price-average revenue of output. MVP-MRP of capital and labor since both terms are derived by multiplying the marginal product of capital and labor by the price of output in the first instance, and marginal revenue in the second. Under competitive output conditions, the firm's price and marginal revenue are equal.

14. *Progress and Poverty,* pp. 304–305.

15. *Ibid.*, pp. 206, 211, 198, 199. Despite this equilibrium requirement in George's work, Collier's dynamic model of George portrays minimum interest greater than subsistence wages over time. Charles Collier, *op. cit.*, p. 83.

16. *Progress and Poverty,* p. 157. Also, pp. 157–62, 189–194.

17. *Ibid.*, p. 172.

18. *Ibid.*, pp. 168–69, 171.

19. *Ibid.*, p. 216. In this model, George's results depend on the elasticity of demand for capital and labor. The move from C to D or from J to M occurs in the elastic range of the MRP curve; consequently, the "quantity" or total income (revenue) going to labor and capital will increase.

20. Capital and labor gain more absolutely and relatively. This could be demonstrated by constructing a new VAP curve appropriate for the new MRP curve, XZ, with the same X intercept and one-half the slope of XZ. Ultimately, however, the "relative" effects on distribution depend on the form of production function and nature of technological change. For example, if we increased the old MRP curve parallel to XY and through point N, then constructed the appropriate VAP curve, the effects of technological change would be neutral, that is the increased rate of return to capital and labor equals the increased rent return per unit of capital and labor.

21. *Progress and Poverty,* p. 250.

22. *Ibid.*, pp. 247–48. George thought the quantity of wages would increase only if the prevailing "area of productiveness" was sufficient to employ the displaced labor and capital. *Ibid.*, pp. 251–52.

23. There is no need to complicate Figure 1; however, we could demonstrate the rent reducing effects of resource saving innovation from, for example, OD to OC by shifting the MRP curve (XY) enough so that the new output at OC equals the old output OXMD at OD.

24. *Progress and Poverty,* pp. 249, 228.

25. Petrella, "George and Technological Change," p. 197.

26. *Progress and Poverty,* pp. 328, 436, 213.

27. *Ibid.,* p. 440.

28. Warren J. Samuels, "The Progress and Poverty Centenary," *American Journal of Economics and Sociology,* 42 (April, 1983), p. 252.

29. The estimated factor output elasticities for the periods 1840–1900 and 1900–1960 suggest slowly rising labor and capital shares of income (from .68 to .71 for labor and .19 to .23 for capital) and declining rent shares for land (from .13 to .06). Output elasticities not only estimate the marginal contribution to output by each factor of production, they also approximate the factor share of income if each factor is paid according to its marginal productivity under competitive conditions. See Petrella, "George and Technological Change," pp. 201–02, 206. The estimates of factor income shares are from the work of Robert Gallman, "The Pace and Pattern of American Economic Growth," Chapter 2 in Lance E. Davis, Richard A. Easterlin, and William N. Parker, eds., *American Economic Growth* (New York: Harper and Row, 1972), pp. 36–39. Also, see Edward C. Budd, "Factor Shares, 1850–1910," in *Trends in the American Economy in the Nineteenth Century,* William N. Parker, ed., *Studies in Income and Wealth,* Vol. 24 (New York: National Bureau of Economic Research, 1960), p. 382; D. Gale Johnson, "The Functional Distribution of Income in the United States, 1850–1952," *Review of Economics and Statistics,* 36 (May, 1954), pp. 175–82.

30. John Stuart Mill, *Principles of Political Economy,* edited with introduction by W. J. Ashley (New York: Augustus M. Kelley, 1965), p. 719.

31. Thomas Malthus, *Principles of Political Economy* (Boston: Wells and Lilly, 1821), p. 195.

32. Petrella, "George and Technological Change," pp. 201–02, 199–200.

33. The *Progress and Poverty* Centenary publication on taxation of land values is a tribute to the progressive elements in George's research program and the contemporary relevance of the theory and policy of site value taxation. Richard W. Lindholm and Arthur D. Lynn, Jr., eds., *Land Value Taxation* (Madison: Univ. of Wisconsin Press, 1982). Also see, Warren Samuels, "Progress and Poverty Centenary," *op. cit.,* pp. 247–51.

34. For a very interesting and provocative list of reasons explaining George's rejection, see Frank C. Genovese, "An Economics Classic and Plutology," *American Journal of Economics and Sociology,* 43 (October, 1984), pp. 459–62.

35. Aaron B. Fuller, III, "Selected Elements of Henry George's Legitimacy as an Economist," *American Journal of Economics and Sociology,* 42 (January, 1983), pp. 56–58.

A 50-Year Perspective on World War II

THE FOURTH ANNUAL MULTIDISCIPLINARY CONFERENCE on the 50th anniversary of World War II, sponsored by Siena College, will be held at the college on June 1–2, 1989, Professor Thomas O. Kelly, II has announced. The focus will be 1939, though papers dealing with broad issues of earlier years will be welcome, he said. Scholars in the social sciences and the humanities interested in participating are invited to write Professor Kelly, Department of History, Siena College, Loudonville, NY 12211.