
DEBATES

Railroads and Rigour

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I

In a recent paper Stefano Fenoaltea¹ refers to the empirical vulnerability of the new economic history contrasting with it the analytical laxity of the old. To a large degree the respective images of the two have become set in this mould. Yet it is an odd quirk of fortune that the first major study of the new economic history, Prof. Fogel's breathtaking analysis of the role of the railways in American economic growth,² has been subjected to telling criticism from every point of view, except that of the empirical vulnerability of the data used. It is not my intention, however, to test that empirical validity but rather to reconsider the analytical strength of Prof. Fogel's approach and to expand on the lines of argument interestingly suggested by Prof. Fenoaltea.

II

Implicit in Prof. Fenoaltea's paper is the criticism that Prof. Fogel is really asking the wrong question. Prof. Fenoaltea distinguishes between the concepts of "historical importance" and "indispensability".³ He rightly asserts

¹ S. FENOALTEA, *The Discipline and They: Notes on Counterfactual Methodology and the "New" Economic History*, « Journal of European Economic History », Vol. 2, No. 3, Winter 1973, pp. 729-746.

² R. W. FOGEL, *Railroads and American Economic Growth: Essays in Econometric History*, (Baltimore, 1964).

³ FENOALTEA, *ibidem*, pp. 734-5.

that Prof. Fogel was concerned with the latter but implies that he should have been concerned with the former. Moreover, it is true that interpretations of Prof. Fogel's work have started from very different hypotheses. The following question do have different meanings. Was transport improvement vital to a rapid rate of growth of national income? ⁴ Were railways an indispensable precondition for such growth? ⁵ Did the investment in railways yield an adequate social rate of return? ⁶ Prof. Fogel is free to choose the question he believes most relevant and/or interesting; he clearly had the second in mind. In consequence, however, it is appropriate to relegate his work to a secondary role in an explanation of economic growth. It can be conceded that there is some, if only very limited, interest in showing that the qualities peculiar to the railways, as against the other transport media, contributed little to the growth of national income. ⁷ Indeed, it is also a matter of some dispute. ⁸ However, when Prof. Fishlow rather casually remarks, « The cumulative contribution made by the transition from the common road through to the railroad is so large and so obvious as to defy accurate calculation », ⁹ we cannot help but agree with Prof. Fenoaltea's opinion that, « It is gratuitously paradoxical to argue that cheap transportation was important (as the cause of Δ NI) [that is, an increase in national income], but that everything that actually provided the cheap transportation was not . . . » ¹⁰ Apparently what most interests the economic historian, judging by the emphasis of recent work, is the contribution which better transport makes to economic growth, and by better is meant transport which is not just cheaper but also faster, more regular and less risky. ¹¹ As Prof. Wilson has written, « I see no

⁴ Lebergott flits rather uneasily between the different questions, although clearly being most interested by the first. S. LEBERGOTT, *United States Transport Advance and Externalities*, « Journal of Economic History », Vol. 26, 1966.

⁵ That Prof. Fogel focused his interest on the "axiom of indispensability" is clear from the first pages of his book. FOGEL, *op. cit.*, pp. 1-9.

⁶ P. D. McCLELLAND, *Social Rates of Return on American Railroads in the Nineteenth Century*, « Economic History Review », Vol. 25, No. 3, Aug., 1972.

⁷ FENOALTEA, *op. cit.*, p. 738.

⁸ Elsewhere I have sought to show that Prof. Fogel's method of calculation leads to a serious underestimate of social saving, at least for the movement of grain on the Russian railways of the mid-1870s. C. M. WHITE, *The Concept of Social Saving in Theory and Practice* (to be published in the « Economic History Review »).

⁹ A. FISHLOW, *Internal Transportation*, Chap. 13 of *American Economic Growth - An Economist's History of the United States*, Ed. L. E. Davis, R. A. Easterlin, W.N. Parker *et. al.*, (1972), p. 514.

¹⁰ FENOALTEA, *ibidem*, p. 732.

¹¹ Of course it is open to other economic historians to question the obsession with growth and substitute such, perhaps more interesting, questions as — what effect did the railways have on social differentiation in the village? How did the peasant producers react to new market opportunities? What framework best explains this effect and that reaction?

necessary reason to suppose that investors would have constructed 5,000 miles of canals if they had not constructed the railways ».¹² Proof of technological feasibility is not proof of probable realization.

III

A second angle of attack aims at the vulnerability of counterfactualism to charges of concern with, in Prof. Redlich's words, « 'as-if history', quasi-history, fictitious history ». Prof. Redlich continues, « Historical research deals with the past that was, not with the past that might have been ».¹³ It does seem that this criticism is much overdone. It seems reasonable to follow Prof. Gerschenkron in rejecting as unscholarly any *a priori* condemnation of a particular historical approach but to require that approach to find its justification in the plausibility of the results yielded.¹⁴ However, two important reservations must be made. The argument that all causal statements are implicitly counterfactual seems beside the point.¹⁵ Even if all causal statements are implicitly counterfactual this does not justify adopting an explicitly counterfactual approach as central to a strategy of research.¹⁶ To justify explicit counterfactualism we would need to show either that in a particular case the relevant data required this approach as the only feasible one¹⁷ or that in some way the approach was more efficient in generating results. Two recent papers in the *Economic History Review* have shown how difficult it is to define the conditions under which the latter might hold.¹⁸

12 C. WILSON, *Transport as a Factor in the History of Economic Development*, « *Journal of European Economic History* », Vol. 2, No. 2, Fall, 1973, p. 333.

13 F. REDLICH, *Potentialities and Pitfalls in Economic History*, « *Explorations in Economic History* », Vol. 6, No. 1, Fall, 1968, p. 99.

14 A. GERSCHENKRON, *The Discipline and I*, « *Journal of Economic History* », Vol. 27, No. 4, Dec., 1967, p. 455.

15 Fenoaltea and Gerschenkron have disagreed over whether all causal statements, and in particular the statement, "The bear died because I shot him", are implicitly counterfactual. See GERSCHENKRON, *ibidem*, p. 456; FENOALTEA, *op. cit.*, pp. 730-1.

16 Prof. Fogel shows extremely persuasively how E. Genovese's argument in his paper *The Significance of the Slave Plantation to Southern Economic Development* is riven with counterfactual statements. R. W. FOGEL, *The Specification Problem in Economic History*, « *Journal of Economic History* », Vol. 27, No. 3, Sept., 1967, pp. 285-9.

Indeed, in an earlier paper Fogel asserted, « ... the new economic historians have not been primarily engaged in launching new counterfactual propositions but in making explicit and testing the ones they find in traditional history ». R. W. FOGEL, *The New Economic History - Its Findings and Methods*, « *Economic History Review* », Vol. 19, 1966, p. 665.

17 J. D. GOULD, *Hypothetical History*, « *Economic History Review* », Second Series Vol. 22, No. 2, 1969, p. 198.

18 GOULD, *ibid.*, pp. 204-5; T. A. CLIMO and P. G. A. HOWELLS, *Cause and Counterfactuals*, « *Economic History Review* », Second Series, Vol. 27, 1973, pp. 462-5.

Secondly, in view of the theoretical and practical difficulties involved in the counterfactual approach, the question must be asked right at the beginning, why cannot the particular problem under research be tackled directly? Instead of comparing the cost of carrying a given bundle of commodities in the world of 1890 with railways and in a hypothetical world without, why not ask the more immediate question, what reduction in costs occurred on particular routes in the transport of particular commodities after the construction of particular railways? Instead of calculating the extent of the hypothetical contraction in cultivated area consequent upon the removal of the railways, why not consider the question, how far did the cultivated area expand after the construction of particular railways? There is no reason why these questions should not be amenable to direct research, although the scope of the analysis and its results might be significantly reduced.

The results of the counterfactual method are not amenable to direct testing. For example, the counterfactual approach might tell us, for a hypothetical world without railways, what would happen to the cultivated area, given the assumption that it is also a rational world in which all economic agents are profit maximizers, where there are no impediments to competition and the free movement of factors of production. Comparison of such results with the actual changes investigated directly by the traditional approach can tell us how far the assumptions of the model employed in the counterfactual approach differ from those implicit in the direct approach. As Loschky argues, however, locating the vital differences in assumption might be an important step forward.¹⁹

IV

Accepting the validity of the counterfactual approach leads the researcher straight into the problem of choosing the "degree of counterfactuality".²⁰ In the absence of the railways other changes must be made in order to maintain logical consistency and empirical congruity.²¹ Prof. Fogel would include in such an adaptation the changes which might result from existing behaviour patterns and non-railway opportunities, for example, investment

¹⁹ D. J. LOSCHKY, *Counterfactuals in Logically Formed Economic Analysis*, « Journal of European Economic History », No. 2, Fall, 1973, pp. 432-434.

²⁰ Counterfactual conditionals have been a continuing source of interest to philosophers. In particular see N. GOODMAN, *The Problem of Counterfactual Conditions*, « Journal of Philosophy », 1947; S. HAMPSHIRE, *Subjunctive Conditionals*, « Analysis », 1948; N. RESCHER, *Belief-Contravening Suppositions*, « Philosophical Review », 1961; J. L. MACKIE, *Counterfactual and Causal Laws*, in *Analytical Philosophy*, Ed. R. J. Butler, 1962; D. LEWIS, *Counterfactuals*, (1973), chapters 1 and 3.

²¹ See RESCHER, *ibidem*, pp. 182-6; LOSCHRY, *op. cit.*, pp. 430-4.

in new canals and contraction of the cultivated area.²² The selection of such adaptations clearly rests upon one's perception of the network of relationships emanating from the railways. A whole series of possible worlds²³ can be envisaged in which different relationships hold. Specification of these relationships must depend to a large extent upon direct analysis. Although an element of ambiguity is intrinsic to the problem, any *a priori* delimitation of relevant relationships is likely to predispose the researcher to a self-fulfilling argument.

However, it does seem rather odd to take the *ceteris factually paribus* assumption as involving the adjustments envisaged by Prof. Fogel, i.e., a world with new canals, and the *ceteris counterfactually paribus* assumption as one without these new canals, that is, one just at it was before the railways.²⁴ Prof. Fenoaltea relies on this paradoxical argument to reach the conclusion that criticism of the standard counterfactual paradigm could be met by expanding its counterfactual aspects rather than by abandoning them.²⁵ Should we choose to reverse our definitions we could reach exactly the opposite conclusion.

Moreover, achieving the coincidence of "necessity" and "sufficiency" undermines the whole rationale of counterfactualism without adding anything to compensate for this loss. By reducing the problem to concrete historical events²⁷ Prof. Fenoaltea makes it amenable to direct analysis. In practice he is focusing his attention on Prof. Fishlow's "realized consequences"²⁸ rather than Prof. Fogel's "unique attributes".²⁹

V

In the context of the counterfactual approach Prof. Fenoaltea has still not managed to remove the problem of adaptation. What effects did the railways have? We need to answer this question before we can define our counterfactual world. Prof. Fenoaltea is quite wrong to distinguish so explicitly the construction of a model from the interpretation of the

²² FOGEL, *op. cit.*

²³ Lewis has interpreted counterfactual conditionals in terms of "possible-world" semantics. In other words, in its appropriate context, its own world, each counterfactual is validly asserted.

²⁴ FENOALTEA, *op. cit.*, pp. 736-7.

²⁵ FENOALTEA, *ibidem*, p. 738.

²⁶ A determined application of Prof. Fenoaltea's argument would carry it to an absurd conclusion. If there were no substitutes for the railways, in their absence the economy would be reduced to a subsistence level. Calculation of the social saving would in this context produce an enormous figure.

²⁷ FENOALTEA, *ibidem*, p. 738.

²⁸ FISHLOW, *op. cit.*, p. 58.

²⁹ GUNDERSON, *op. cit.*, pp. 210-11.

model's solution.³⁰ The interpretation of a model's solution depends vitally upon the assumptions which underpin that model. This is true at different levels. The researcher's understanding of the kind of relationships which are important for the railways and, therefore, the adaptation he might wish to make in their absence, obviously has a direct bearing on his choice of appropriate model. The desire to limit counterfactuals to problems which are not unduly open and involve a short time horizon³¹ demarcates an area amenable to what economists call marginal analysis. According to the conventional view neoclassical economic analysis is appropriate when the influence of railway operation is almost completely exhausted by its direct effects.³² When important ramifications run right through the economy we have a level of counterfactual ambiguity which is totally unmanageable. We also have a problem which is not amenable to the *ceteris paribus* assumption of cost-benefit analysis, whether applied prospectively or retrospectively. To assume from the outset that the impact is a marginal one is to beg many important questions. The argument may become circular — if you feed in the right assumptions you are bound to get the expected answers.³³

Furthermore, there is a great danger in the inadequate specification of assumptions which are implicit in such models.³⁴ Let us take three in particular. There is certainly a need to simplify and for some problems it might be nothing more than a matter of simplification to assume that all economic agents behave rationally,³⁵ that is, maximise profits, that perfect competition with its attendant assumptions prevails and that all factors of production are perfectly mobile. However, what if none of these assumptions holds before the advent of the railways but all hold after their construction? Furthermore, what if the satisfaction of these assumptions creates an environment very favourable to rapid growth? In this case a serious researcher would want somehow to take account of these changes and certainly not to adopt a model which rules them out from the beginning. In Prof. Fenoaltea's terminology the movement from a non-railway world (non-RR) to a railway world (RR) also implies a movement from a world of institutional constraints

³⁰ FENOALTEA, *op. cit.*, pp. 729-30.

³¹ See GOULD, *op. cit.*, p. 202; CLIMO and HOWELLS, *op. cit.*, p. 462; GERSCHENKRON, *op. cit.*, p. 457; LOSCHKY, *op. cit.*, p. 435.

³² Another way to express this is to take existing prices as given.

³³ This argument applies particularly to Prof. Fogel's intra-regional social saving in which the loss of output from land taken out of cultivation in the absence of the railways is represented as the capitalised value of the rent multiplied by the mortgage rate of interest, where the land is assumed to be taken out of cultivation if it yields a rent less than the increase in transport costs. See WHITE, *op. cit.*, section 3.

³⁴ The problem of inadequate specification has merely been shifted in the new economic history.

³⁵ In neoclassical economics *Homo Economicus* is set up as a self-constituting origin. This approach has been criticised as analogous to Christian theology.

(IC) to one without them (non-IC); in which case the true measure of the effect of railway operation on the level of national income is $Y(\text{RR, non-IC}) - Y(\text{non-RR, IC})$ - not $Y(\text{RR, IC}) - Y(\text{non-RR, IC})$, as Prof. Fenoaltea argues.³⁶ Growth is not simply a matter of movement on a technical frontier shifting outwards. Movement to that frontier can be equally as important, especially in a relatively backward economy. Moreover, the evening out of regional differences with the diffusion of new techniques can occur at varying speeds. These speeds are very much related to the nature of institutions and attitudes. One of the key institutional transmitters of change is the market. Market orientation is governed by knowledge of potential gains and the riskiness of those gains.³⁷ If the railways dissipated ignorance and reduced risk, this is an important result of railway construction.

Some assumptions are made explicit. For example, as Prof. Fenoaltea rightly point out, « The [Fogel] model lets the railroad influence national income only by altering average factor productivity ».³⁸ and then only in the transport and agricultural sectors. Prof. Fenoaltea is much concerned with the assumption of fixed factor inputs. Quite clearly factor inputs in the open American economy were responsive to demand conditions, both in the capital and labour markets. This ought to be considered. Nor do markets adjust automatically to ensure full employment of all factors during the period of railway construction, even if their supply is fixed.

We need, therefore, to ask from the beginning what relevance a given model has to the kind of problem under discussion. The model proposed must be capable of dealing with the level of counterfactual "ambiguity", intrinsic to the problem.³⁹ The more limited and less open-ended the problem, the lower is the level of ambiguity. The marginalist neoclassical model can only operate with a low level of ambiguity. There is very little value in using a model which captures effects of only minor significance. An appropriate model makes the most important effects endogenous rather than exogenous.

VI

Prof. Fenoaltea clearly considers that the strength of the new economic history consists in its analytical rigour.⁴⁰ Allegedly assumptions are spelled out fully and deductions correctly drawn from those assumptions. However,

³⁶ FENOALTEA, *op. cit.*, p. 742.

³⁷ A generalised theory of asset choice would lead us to expect this but once again it deals with the desocietised economic man.

³⁸ FENOALTEA, *op. cit.*, pp. 740-1.

³⁹ This begs the question of whether any level of counterfactual ambiguity can be handled.

⁴⁰ FENOALTEA, *op. cit.*, p. 746.

reference has already been made to the number of assumptions implicit in Prof. Fogel's own analysis. There are further analytical problems. A few important ones can be briefly indicated.

The inherent ambiguity of the concept of social saving is insufficiently appreciated.⁴¹ The problems multiply when an attempt is made to operationalise the concept on the basis of reported market data. There is no unambiguous maximum or minimum social saving. Inherent biases are ineradicable.

Other difficulties might have been avoided. For example, the use of current prices in the calculation of social saving is incompatible with the assumption of perfect competition which is necessary to make the analysis meaningful.⁴² Under perfect competition the price of homogeneous products, such as transportation by alternative media between points A and B, is equalised. Moreover, where the products are not homogeneous consumers would be willing to pay more for the superior commodity; for example, in the case of transport that medium offering greater speed and regularity of service and less risk.⁴³ These positive features of the commodity have as a consequence a negative influence on the size of social saving calculated from current prices. Separate account of these factors only offsets the initial negative influence.⁴⁴

Under perfect competition a decrease in transport costs is passed on to the ultimate transport users. Let us assume that in the case of grain transportation this results in an increase in price at the point of production and a reduction in price at the point of consumption. This increase in producer's surplus is in its turn passed on to the landowner in higher rent.⁴⁵ In that case the measurement of the consumer's surplus of transport users either by the product of the difference between the old and new price of

⁴¹ WHITE, *op. cit.*, section 4.

⁴² This point has been made frequently. See LEBERGOTT, *op. cit.*, p. 439; P. D. McCLELLAND, *Railroads, American Growth and the New Economic History: A Critique*, « Journal of Economic History », vol. 28, 1968, p. 114; P. A. DAVID, *Transportation Innovation and Economic Growth - Professor Fogel on and off the rails*, « Economic History Review », vol. 22, 1969, p. 513; G. R. HAWKE, *Railways and Economic Growth in England and Wales 1840-70* (Oxford, 1970), p. 20. The point holds in both the short run and the long run since in the long run uncompetitive routes will be closed or experience a reduction in traffic until they are no longer uncompetitive.

⁴³ The point is recognised but then ignored even by the critics of Prof. Fogel. See McCLELLAND, *op. cit.*, pp. 477-8 and footnote 1, p. 475; A. FISHLOW, *American Railroads and the Transformation of the Ante-Bellum Economy*, (Cambridge, Mass., 1965), pp. 23-4.

⁴⁴ See WHITE, *op. cit.*, where these issues are discussed at much greater length.

⁴⁵ This can only happen if the supply of one factor of production is fixed and that of the others flexible. For the basic economic theory see J. VINER, *Cost Curves and Supply Curves*, pp. 198-233 in *Readings in Price Theory* (AEA 1951). In a densely settled subsistence agriculture this is even more likely to be the case. See FISHLOW, *op. cit.*, (1972), p. 470.

transport services and the quantity of transport services demanded or by the increase in rent plus the product of the difference in old and new prices at the point of consumption and the quantity demanded, is equivalent.⁴⁶ Therefore Prof. Fogel's addition of the inter- and intra-regional social saving must contain some measure of double counting in so far as the value of output lost in the absence of the railways is calculated from the capitalised value of the rent multiplied by the mortgage rate of interest.⁴⁷

VII

Finally we must consider how the results of a counterfactual experiment can be interpreted. It must be conceded immediately that such experiments do not allow one to test theories.⁴⁸ The divergence between the inferences arising from a counterfactual experiment and those from more direct analysis must be carefully explained. Not only the deductive reasoning but also the "validity" of the assumptions must be checked for each model. In our example the nature of the possible models constructed for a situation without railways is very important. Inductive support is necessary to establish the plausibility of key relationships which must be considered in the construction of the possible models.

A result expressed in terms of social saving is itself ambiguous since there is no rule which determines whether social saving is high or low.⁴⁹ Is two per cent or ten per cent low? ⁵⁰ What criterion can be used to adjudicate on this issue? If we accept that one small change can spark off a whole series of changes, not directly related to the initiating change, it becomes difficult to envisage even the existence of an absolute criterion.

We must also be very careful in interpreting the general significance of the counterfactual results. There has been a tendency to abstract from non-economic factors in such experiments. This is a necessary simplification but it must be borne in mind when the results are evaluated. Counterfactual exercises do not support mono-causal explanations of change, nor must they

⁴⁶ McCLELLAND, *op. cit.*, pp. 399-401; WHITE, *op. cit.*, section 4.

⁴⁷ FOGEL, *op. cit.*, p. 53. If the capitalisation were done at the mortgage rate of interest the value of the output lost would be equal to the rent.

⁴⁸ LOSCHKY, *op. cit.*, pp. 433-4 and p. 436.

⁴⁹ LEBERGOTT, *op. cit.*, p. 438; DAVID, *op. cit.*, p. 520.

⁵⁰ The inevitability of results within this band is striking. If in 1890 the transport sector accounted for as much as 20% of G.N.P., then even a 50% reduction in costs could at the very most raise G.N.P. by only 10%. Similar considerations have occurred to the more perceptive economists when they have contemplated the measured effects of tariff reduction on entry into the Common Market if calculated within the confines of a static rather than a dynamic model.

be used, even implicitly, to support a purely linear view of causality.⁵¹ Causality is often reciprocal. From one point of view it might be desirable to consider the line of causation as running from railways to changes in the level of national income, from another it might be appropriate to reverse the direction.

Counterfactual "thought" experiments clearly have their place in the analysis of historical causation, but this is a rather more limited one than often claimed by its practitioners.⁵² Counterfactuals are most effective in a relatively closed system with a limited time horizon. The analysis is most plausible when "covering laws" apply to the relevant relationships.⁵³ However, the existence of such "covering laws" usually means that the direct approach can be more usefully applied.⁵⁴

Prof. Fogel's counterfactual experiment is open to criticism on all these grounds. The time horizon is long; the system almost completely open; covering laws provided by the body of neoclassical economic theory are employed. Yet Prof. Fogel operates with a model which is appropriate to the more limited type of problem. There also doesn't seem to be any good reason why a more direct approach should not be tried first.

Prof. Fogel's analysis is weakened by a host of analytical problems, some inevitable, others of his own making. It is unacceptable to argue, even implicitly, that the analytical rigour of the concept of social saving lends to its calculation an *a priori* superiority over other methods of approach. An undeserved reverence has been accorded to the application of economic theory to historical data, particularly in the area of railway operation. The only relevant economic theory is sound economic theory. Nor is all sound economic theory necessarily relevant. Discussion of the concept of social saving has included much that is unsound or irrelevant.

⁵¹ REDLICH, *op. cit.*, pp. 102-3.

⁵² The work of Fogel and Gunderson has been interpreted as proving that no single innovation contributes much to economic growth.

⁵³ This point has been most forcefully put in the articles of Rescher and Mackie already cited. Prof. Fogel has written, « In order to determine what would have happened in the absence of a given institution, the economic historian needs a set of general statements that will allow him to derive a counterfactual situation from institutions and relationships that actually existed ». R. W. FOGEL, *op. cit.*, p. 285.

⁵⁴ GOULD, *op. cit.*, pp. 198-9; CLIMO and HOWELLS, *op. cit.*, p. 464.