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Historical models and economic syllogisms

Luiz Carlos Bresser-Pereira

Getulio Vargas Foundation, Rua Araripina, São Paulo, Brazil

ABSTRACT

This paper proposes a classification of economic models into three types: historical, axiomatic and conditional. Historical or empirical models utilize the historical-deductive method, and are generalizations from the economic regularities and tendencies that we find in the real world. Axiomatic models utilize the hypothetical-deductive method; they are syllogisms whose major premise is an axiom – a self-evident truth; they are appropriate for methodological sciences such as mathematics and econometrics. Conditional economic models are likewise syllogisms, but they are suitable for economics because they make for clearer and more precise economic reasoning. The criterion of truth of the substantive sciences is the conformity with reality, of the methodological science, its internal consistency. When a school of economic thought adopts mainly axiomatic models, as is the case with neoclassical economics, it implicitly falls into contradiction because their best representatives believe in the conformity with reality criterion.

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J.M. Keynes, in a letter to Roy Harrod, remarked, ‘economics is a science of thinking in terms of models joined to the art of choosing models which are relevant to the contemporary world’ (Keynes, 1938, letter 787). But what type of models? Historical models, such as those at the heart of Keynes’s *General Theory*, or axiomatic models that dominate the thinking of neoclassical economists? I have argued elsewhere that the core method that economists should adopt is the historical-deductive rather than the hypothetical-deductive, because economics is a ‘substantive’ science that has a clear objective, namely understanding economic systems, or, to avoid the tautological character of this definition, it is the science that searches to understand – explain and predict – behaviours relative to the production and distribution of scarce resources (Bresser-Pereira, 2009). If economics were an ‘adjective’ or methodological science like mathematics and econometrics, which don’t have an object of study but just an objective, namely to help economic agents and policy-makers think, it would be legitimate to adopt the hypothetical-deductive method as its core method. But economics is a social science, a substantive science like the natural sciences. It has a clear object of study, the market or economic systems. Therefore, my conclusion is that the schools of thought that use primarily the hypothetical-deductive method, such as neoclassical and

CONTACT Luiz Carlos Bresser-Pereira ✉ bresserpereira@gmail.com, www.bresserpereira.org.br

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Austrian economics, suffer from an original sin. They use timeless and often axiomatic models that ignore the realities of the world in which we live and its changing character.

Neoclassical economists often view economics as a 'theory of choice', instead of 'the theory of economic systems'. If this is the understanding of economics, it would be a methodological science whose legitimate method would be the hypothetical-deductive one. These economists would accordingly not be required to check their models using econometric procedures, because the criterion of truth for methodological sciences is not how accurately the models reflect reality but their degree of logical consistency. But the claim that economics is just the theory of economic decision-making is unacceptable to most economists, regardless of the school of thought they adhere to. They want also it be the science that explains and predicts the behaviour of economic system. Instead of theory of choice, I believe that most economists would accept as reasonable the definition of economics offered by David Colander: economics is 'the study of the economy and economic policies using empirically testable models' (Colander, 2000, p. 137). In this case, the neoclassical economist faces a contradiction, because he learned that he must adopt Karl Popper's falsifiability method, but, as he works with the hypothetical-deductive method, which is based in axioms, there is no room for falsification; the relevant criterion of truth is the logical-consistency one.

In this paper, I am assuming economics consists of models, and I will propose that models are either historical or syllogistic, and that economic syllogisms are either axiomatic or conditional. I understand that the core models of a substantive social science as is economics are the historical or empirical models, which are the outcome of the historical or empirical-deductive method, also called the *scientific method*; it is the systematic observation of empirical or historical data in search of regularities and tendencies, from which the scientist is able to derive meaningful generalizations. I prefer to call it historical-deductive instead of just inductive method to emphasize that after an original observation of reality and the formulation of a hypothesis, the scientist is supposed to get involved into a series of deductions to build a systematic body of knowledge. When, besides the syllogistic, I consider the historical models, I am adopting a broad concept of model, I am not viewing models just as a series of assumptions from which the model derives some logical implications (these are the syllogistic models), but also as abstract claims relating cause and effect that derive closely from the observation of reality, but is unable to fully 'capture' or represent the 'real' world.

In Nicholas Kaldor's words, it is the method that looks for 'stylized facts' in the real world and subjects them to tests to establish their truth or otherwise. The main economic schools of thought – the classical school including economic Marxism, the German historical school, the American institutionalist, the post-Keynesian, the Schumpeterian, and development economics or classical developmentalism schools – have all essentially adopted the historical-deductive method. The exceptions are the Austrian and particularly the neoclassical schools, which adopt the hypothetical-deductive method whose outcomes are mostly axiomatic models, more appropriate to the methodological sciences.

Economics is made up of historical models and economic syllogisms, and also of economic concepts, which name and define 'things' – whether things that exist in the real world or those that we invent. We have concepts of highly objective and simple things, as well as of highly complex things such as love, values, integrity or theories that describe relations among things. The basic economic concepts and the simpler historical models and conditional syllogisms constitute what I call 'basic economics' – the concepts and simple models that all good economists are supposed to know and use regardless of the school of thought they

subscribe to. Take, for instance, concepts like GDP, national income, inflation and elasticity. We use these concepts as the building blocks of our historical models and our economic syllogisms. Even though these basic concepts vary from one school to another, there is a sufficient common understanding that makes them part of common and basic economics. The same applies to some historical models, like the law of supply and demand and economic growth as a function of the rate of investment, and to some economic syllogisms such as the law of comparative advantage, or the Balassa–Samuelson effect. Again, these historical models and economic syllogisms are used in ways that vary from one school to another, but there is broad agreement on their meaning.

Models are abstract and simplified representations of reality. As Marcel Boumans observed, since models began to be formally defined in the 1930s, ‘the problem facing the economist was presented as finding the right degree of simplification in order to achieving an approximate balance between approximating reality as close as possible while keeping the model manageable’ (Boumans, 2004, p. 261). Economic models may be quite different, depending on whether they are historical or syllogistic.

In this paper, I first distinguish historical models from syllogistic models; second, I briefly analyze the role of models in economic theory, and their relations with the method and the truth criteria adopted; third, I identify the historical models that I believe are at the core of economics; fourth and fifth, I discuss axiomatic syllogisms and conditional syllogisms, and I argue that, although conditional syllogisms are hypothetical-deductive, they are legitimate, whereas axiomatic syllogisms are not for substantive sciences; they only make sense for methodological sciences. As we will see, the distinction between historical and syllogistic models is reasonably clear-cut; not the distinction between conditional and axiomatic syllogisms, which are two ways of viewing the same model, as a referee to this paper remarked.

Models, methods and the truth criteria

Historical models are based on the relation of cause and effect among a set of variables that we derive from the observation of regularities and tendencies in market economies. We may call them empirical models, as econometricians usually do, first because the ‘empirical’ in social sciences is always historical, and second because they involve a narrative which, in principle, can be reduced to a series of numbers: a series of GDP, a series of interest rates, etc. In contrast, syllogistic models or economic syllogisms are systems of logical relations. In contrast to historical models, economic syllogisms have two distinct features. First, they may be fully expressed in rigorous mathematical terms – because mathematics is also a system of syllogisms. Second, they may be proved, just as mathematical theorems are proved. As Davis and Hersh held, proof in mathematics ‘is a ritual, and a celebration of pure reason’ (Davis and Hersh, 1981, p. 151). Economic syllogisms are logical consequences that we deduce either from a given axiom, which we believe to be self-evidently true, or from given possible conditions that may or may not materialize.

Thus, there are two basic types of economic syllogisms: axiomatic and conditional. The axiomatic syllogism starts from a ‘self-evident truth’, the conditional syllogism from a clearly defined condition or set of conditions.

In substantive sciences, axiomatic models only make sense if the researcher is exempted from supplying empirical content to his model – if he adopts as truth criterion not the conformity with reality, but internal logical consistency. This is true not only for a social science

as is economics, but also for the natural sciences. The fact that the natural sciences deal with atoms, or with cells, which are more predictable than human beings, does not change that. Scientists in the natural sciences are able to derive complex theories under the form of systems of syllogisms, but they are necessarily conditional syllogisms, which don't exempt the scientist from verifying empirically his model.

The historical-deductive and the hypothetical-deductive methods correspond different truth criteria, respectively, conformity to reality and internal logical consistency. I refer to final criteria. For sure, models in substantive sciences also use the logical consistency criterion in so far as it usually involves a chain of deductions, but to be valid it must begin and end respecting the conformity to reality criterion. Theoretically, one could combine the two criteria. One could, for instance, take an axiom like the *homo economicus*, deduce a model from it, and examine how well it conforms to reality. But this 'axiom' is far from being an evident truth. As an axiom, it is a quite general one, from which one can derive only a very general model (the general equilibrium model in the case of neoclassical economics), which cannot be subject to the falsifiability test. The neoclassical economists do not necessarily hold their axioms as self-evident truth. The hypothetical-deductive method that they learned leads them to discuss economic issues as if the respective assumptions were axiomatic, not conditional. For instance, they learned logically that financial crises will not break out so long as fiscal balance is maintained. This hypothesis is persistently falsified by reality, but not only neoclassical economist but also economists of other schools of thought continue to build models on financial crisis that are based on it. But this that derives from the clear distinction of conditional from axiomatic reasoning, not a curse. The economist that is doing research may incorporate particular assumptions based on empirical information, for instance, that preferences satisfy Engel's law, or production functions imply a high elasticity of substitution, and, in this way, avoid axiomatic reasoning. Another alternative often found among economists involved in policy-making is to continue to cling to the general view that he learned in school, but to work pragmatically with simpler models which are eventually inconsistent with the neoclassical axioms.

Conditional economic syllogisms are distinct from axiomatic syllogisms, although their structure is similar. The conditional model will be true in so far as its conclusion is logically consistent and its conditions do materialize. The scientist doesn't proceed from something that he believes is obviously true, but just from a *condition* or a group of conditions that may eventuate in the future, and must be verified. In this case, the condition materializing, logical consistency will be enough to validate the model. All economic schools of thought use the two types of models, but classical political economy, Marxist economics, Keynesian economics, classical developmentalism and new developmentalism all use mainly historical models and conditional economic syllogisms.

There is a corresponding method for historical and the syllogistic models. Historical models are the outcome of the historical-deductive method – a method that arrives at abstract relations of cause and effect or of correlation between variables, which are inferred from the observation of regularities. First, the historical method is a holistic method in so far as the economic behaviour of each society is different from the sum of individual behaviours. Second, the historical-deductive method, which may also be called the empirical or the scientific method, always proceeds from close observation of reality. According to Charles Peirce, the scientist proceeds from 'abductive reasoning', from a simple and incomplete observation of reality, which leads to a logical inference or hypothesis (the model), which,

in a third move, is effectively tested empirically (Peirce, 1878). Thus, the criterion of truth is conformity to reality, which is continuously checked. Third, in the historical models the major premise is never as general as it is with the axioms, such as general equilibrium or rational expectations. The economist proceeds from the assumption that microeconomic prices are often the outcome of imperfect markets, and also that the five macroeconomic prices (the profit rate, the exchange rate, the interest rate, the wage rate and the inflation rate) only by chance will be the *right* prices in the absence of an active and competent macroeconomic policy: the profit rate is often not satisfying, i.e. will not motivate firms to invest; the interest rate may be too high or too low; the exchange rate is volatile, and, in developing countries, such volatility follows a long-term tendency of overvaluation interrupted by cyclical currency crises¹; the wage rate is artificially high due to the overvaluation of the exchange rate; and the inflation is relative high. And, so, the competent economists, who believes that the firms using the best available technology should be competitive, concludes that an active macroeconomic aiming to full employment and the equilibrium of the five macroeconomic prices, including an exchange rate policy, is required.

In contrast to the historical models, axiomatic economic syllogisms use the hypothetical-deductive method. Neoclassical economics is the school of thought that uses primarily axiomatic syllogistic models, such as the general equilibrium and the rational expectations models.² In this type of model, which is the heir to philosophical idealism – where what *really* exist are ideas – society as well as history disappears. What is usually called reality is something confused and contradictory, the ‘shadows’ that we see in Plato’s cave. Instead, ideas or ‘forms’ constitute a clear and beautiful reality. In this line of thought, logical consistency – the consistency between ideas – becomes the truth criterion, even though economics is a substantive science. The fact that economics has a substantive object of study – the economic system – does not really matter. The neoclassical economist accepts, if not demands, that his models are checked with econometric tests, but, following Popper and Lakatos, he adopts a highly ‘sophisticated’ falsifiability criterion, or he builds such a strong ‘protection belt’ around the core models of economics, which makes the econometric tests ultimately irrelevant.³

For the mercantilist and the classical (or political economy) schools of thought, economics was a historical-deductive science.⁴ It was John Stuart Mill (1836) who proposed to change it into a hypothetical-deductive science, but economists did not adopt such a method until 1870, when the neoclassical school first appeared with the marginal utility theory of value; it didn’t become dominant until after the publication of Marshall’s *Principles of Economics* (1890), and it gained epistemological legitimacy only in the 1920s with the Vienna Circle and its ‘logical positivism’. A group of philosophers, who met in Vienna between 1924 and 1936, reacted against relativism by criticizing the empirical-deductive method or the ‘scientific method’ because it was based on the empirical proof of inductive generalizations, which was dominant in the nineteenth century but did not guarantee ‘indisputable’ truth. Instead, these economists adopted the hypothetical-deductive method because it would guarantee definitive truth. This was a Platonist *fuite en avant* or a response to the ‘frightful’ relativism for which an opening had been made, first, by Albert Einstein’s theory of relativity and, second, by the horrors of an irrational war (World War I). Mark Blaug, who probably inspired the opposition that I adopt between the historical and the hypothetical-deductive method, described the new ‘truth’, which neoclassical economists eagerly adopted, as the universal laws that ‘are not derived by inductive generalization from individual instance; they are

merely hypotheses, inspired in conjectures if you like, that may be tested by using them to make predictions about particular events' (Blaug, 1980, p. 4). Scientific explanation was, in this way, identified with a syllogism, or as a 'covered law', in which scientists make predictions starting from some major axiom or 'universal law' that already contains or *covers* the conclusion.

Historical models

Historical models are quite different from economic syllogisms. When I say, for instance, that the higher the investment rate of a country is, the higher will be its rate of economic growth, or that there is a tendency to an insufficiency of demand, I am referring to historical models from which I can derive economic predictions and make immediate policy recommendations. In contrast, take a conditional syllogism: if the productivity of labour in country A is increasing faster than that in country B, and if the current accounts of the two countries are balanced and will remain so, then the currency of country A will appreciate in relation to that of country B. This syllogism will help me to predict economic behaviour and frame policies, but only on the condition that the labour productivity in country A really is increasing faster than that in country B and the current accounts of both countries remain balanced. Yet, in the case of the conditional syllogism, I will have to be much more careful with my predictions and policy recommendations than I would with a historical model because the major premise has to be correct, and the other significant variables must be kept under control.

If a historical model is right, it definitively orients economic action. The problem with historical models is that they are seldom 'completely' right, not only because they are unable to take into account all the variables involved in the problem, but also because strong regularities and tendencies are rarely found when we deal with human behaviour. So, given modest regularities, the models too will be modest and imprecise. In contrast, if the premise of an axiomatic model is correct beyond any doubt, or if the condition in the conditional model is true, the logical conclusion will be also 'true'. More than that, it will be precise and open to be expressed in mathematical terms. The problem is that in economics the axiom will be often wrong, because unlike the natural sciences economics has to deal with a complex and contradictory reality, and because when the axiom is only partially true, it is a *false* axiom unable to generate valid scientific conclusions. The conditional syllogisms may often be based on a wrong condition, but this is not a problem because they just involve conditions and logical consequences. If the condition eventually does not materialize, the competent policy-maker will not be surprised or fooled, because this eventuality had been already taken into account.

Historical models may or may not be self-explanatory, they may be stronger or weaker, they may or may not depend on an *ex post* micro-foundation. Take, for instance, the simple model that makes consumption dependent on income. This is a well-demonstrated model that was born of the observation that when income grows consumption also grows. We don't need to use axioms to prove that. What we can do is to explain the fact, *ex post*, with a micro-foundation: it is rational for the agent to consume basic consumption goods proportionally less in relation to his income as it increases. But this contributes little to the comprehension of the model, which is self-explanatory.

Taking the case of the model where growth depends on investment, we again have a simple historical model that comes from the observation of an economic regularity. One of

the stronger correlations existing in economics is this: from country to country, from time to time, the greater the rate of investment is, the greater the growth of GDP tends to be. Again, we don't need to look for rational causes. But would this be helpful in explaining this historical model? In contrast to the previous example, it would not be of much help. The explanation for it lies in a prior historical or empirical relation: the fact that the national income of each country depends on its stock of physical capital. The higher the stock of capital, the higher will be GDP, but if the measurement of GDP is already problematic, then the measurement of the national stock of capital will be even more so. Anyway, given that investment corresponds to the net increase in the stock of capital of a country, we may conclude that growth depends on investment. To be sure, it depends on other variables, among which technological progress is key. But we cannot measure technological progress. What can be done, following Robert Solow's model, is to run regressions and conclude that the 'residuum' – that which is not explained by investment – is technological progress or total factor productivity. This is a hazardous conclusion, but Solow's model is useful.

Another example of a historical model is the investment function. In this case, we may begin reasoning using a micro-foundation: the business entrepreneur will invest as long as the expected rate of profit is higher than the interest rate. If the difference between the expected profit rate and the cost of capital in a given industry narrows, it will be rational for firms to stop investing in this industry, or to invest only what is strictly necessary to keep the plants modernized and competitive. The problem is this: what does the expected rate of profit depend on? Classical and neoclassical economics, thinking in a linear way, made it depend inversely on wages; Keynes showed more realistically that the expected rate of profit depends on effective demand, which falls if wages go down in the short term. More than that, he showed historically that there is a tendency towards the insufficiency of demand, which is behind the cyclical economic crises that characterize capitalist growth. Therefore, he argued for active monetary and fiscal policies. In conjunction with the other historical models that form the *General Theory*, with this new investment function Keynes radically changed our understanding of economic systems. Recently, new developmentalism has added a key variable to the investment function: the exchange rate and the corresponding current account balance. According to this view, it is not enough that business firms calculate on the basis of effective demand; it is necessary for them to have *access* to this demand – something that is often not available in developing countries where there is a tendency to the cyclical and chronic (in the long term) overvaluation of the exchange rate. Thus, during the long periods that the national currency is overvalued, competent business enterprises will not invest because, although efficient, they know that they will not be sufficiently competitive (Bresser-Pereira, 2014; Bresser-Pereira et al., 2014).

A fourth example of the historical model is the Prebisch–Thirlwall law. In the Prebisch, 1950s, within the theoretical framework of classical developmentalism, Raúl Prebisch realized that developing countries faced a major foreign constraint: while the income elasticity of the demand for imports of manufactured goods was bigger than one, the import elasticity of the demand for primary goods in rich countries was smaller than one (Prebisch, 1950). This insight was a major historical model for developing countries, but it was not formalized. Prebisch deduced from it that developing countries should industrialize, a conclusion that he also derived from the tendency to the deterioration of the terms of trade. Anthony A Thirlwall formalized the model in 1979, which opened the way for a large number of econometric studies showing that the foreign constraint was real and could be measured. The

formalization made it crystal clear, first, that the growth rate of a country is limited by its export rate, which will be higher than the growth rate, and, second, that this constraint will remain present as long as the country does not industrialize and exports commodities. In consequence, post-Keynesian and new-developmental macroeconomics deduced that developing countries should adopt an export-led strategy based on the export of manufactured goods.

In discussing these examples of historical models we see, first, that only in the third one – the investment function – does the micro-foundation reasoning have explanatory power, and second, that none of the models depends on it. They can be stated and are true independently of the *homo economicus*, or of general equilibrium. The essential thing that makes them true is not logical consistency but their regularity; the truth criterion is conformity to reality. In certain cases, the micro-foundation is useful as an *ex post* explanation. When it turns an *ex ante* explanation and is transformed into an axiom, it leads to major theoretical and policy mistakes.

Historical models usually depend on historical tendencies: for classical and Marxist economics it is the tendency of the rate of profit to fall; for Keynesian macroeconomics, the tendency to the insufficiency of demand; for classical developmentalism, the tendency to the deterioration of the terms of change; and for new developmentalism, the tendency to the cyclical and chronic overvaluation of the exchange rate. Both axiomatic and conditional economic syllogisms are static or synchronic models.

Axiomatic models

Why am I bringing micro-foundations to the fore? Because when we speak about them, we are referring to the axiomatic model that is at the core of neoclassical economics: the general equilibrium model. As it is a syllogism, it may be expressed through a system composed of a major premise, a minor premise, and a conclusion: and remember that the conclusion is already included in the major premise, although not explicitly. Let us see whether this format applies to the general equilibrium model:

- *Major premise:* there is general equilibrium when the following are true: economic agents always maximize their gains, there is full capital and labour mobility, and all firms have the same rate of profit, while individuals are remunerated according to their marginal productivity.
- *Minor premise:* in market economies, where all economic agents are free to produce and consume – they are consumers maximizing their utility, or workers maximizing their wages, or producers maximizing their profits – and free to move from one industry to another, or from one employer to another, or from supplier to supplier, the profit rate will be equal in all industries, and the remuneration of the factors of production will correspond to their respective marginal productivities.
- *Conclusion:* Thus, market economies are, basically, in the general equilibrium condition.

This fully syllogistic axiomatic model does not aim only at describing ideally how market economies work; it seeks to show how market economies *do* work. But the axiom involved – *homo economicus* – is far from a self-evident truth. Thus, we are in the presence of a false axiom, and we could call it a dogmatic model instead of an axiomatic model. The case would be different if, for instance, the general equilibrium model was just a conditional syllogism,

as its creator, Léon Walras, implicitly wanted it to be; it would be a highly elegant model to explain how, ideally, market economies *would* work. But for the neoclassical economist it is definitely more than that: it is a representation of how capitalist economic systems *do* work in abstract terms. He knows that there is no full capital mobility, nor full labour mobility; he knows that the options open to consumers are always limited; he is well aware of monopolies, externalities and increasing returns, which block the tendency to equality of the rate of profit; he knows that in the general equilibrium model there is no place for money, which is at the centre of all economic transactions. That is why for the conventional economist market economies would be 'basically', instead of 'completely', in general equilibrium. But this knowledge does not represent a real problem; it does not mean that the true neoclassical economist is viewing general equilibrium as a conditional syllogism. Instead, the neoclassical economist will usually think and act *as if* the economy is in general equilibrium or very near to it, that markets are 'efficient'. He starts from general equilibrium, and then drops its simplifying assumptions one by one so as to include all possible market failures. But soon he will conclude that this procedure is a waste of time because the market failures are eventually hardly significant. Thus, he will dismiss these annoying interferences in the model, and assume that the economy under scrutiny is basically in general equilibrium. He knows, for instance, that market economies don't behave as if they were in general equilibrium or close to it, that growth rates among countries that don't converge, he is aware of how frequent major economic and major financial crises are, of how poor is the correlation of individual revenues with marginal productivity. Nevertheless, he is not ready to abandon the beautiful neoclassical construction, where everything is well ordered and clear. But in doing so he pays a price: he gains logical consistency at the cost of discarding the criterion of conformity to reality; he continues to undertake econometric tests – the specific economic method of checking the conformity of models to reality – but they are accepted only when they confirm what was 'logically' predicted. For this economist there is practically only one significant thing that can significantly distort the market: state intervention. And for the same reason he offers a standard set of solutions for all problems: fiscal adjustment, privatization, deregulation, trade liberalization and financial liberalization. Instead, what this economist should do is to follow Adam Smith's approach. Instead of assuming the existence of general equilibrium, Smith emphasized how efficient the competitive process is. As Blaug observed, 'if indeed General Equilibrium is strong on equilibrium and very weak on how it comes about, the Smith–Marshall analysis [of the competitive process] is, by way of contrast, weak on equilibrium and very strong on how it comes about' (Blaug, 1980, p. 190). Indeed, in the case of industries where there is real competition, the market is a highly efficient institution for the allocation of resources. If this were not so, economics, which is the science of how markets coordinate economic systems, would not exist. Economists must believe in the role of the market or competition in coordinating the economy, but they cannot lose sight of its limitations if they are committed to the scientific method.

Conditional models

There are many other axiomatic models besides general equilibrium, which proceed from a lower level of abstraction. But let me consider the second type of syllogistic model, the conditional model. These are formally similar to axiomatic models. The difference is that the premise is not something self-evidently true, but just one or more conditions from which

we logically deduce conclusions. It is a much more modest kind of syllogism in relation to what can be legitimately deduced from it. To be sure, you cannot or should not develop a whole theory and deduce policies from it, as do economists who adopt the general equilibrium model as an axiom. For sure, we can take general equilibrium just as a condition, but in this case we would have to admit that it never really materializes, and so it wouldn't be a legitimate basis for theories and policies.

Let us take another model: David Ricardo's law of comparative advantage in international trade, formalized in the Heckscher-Ohlin theorem. It is probably the most beautiful of all economic syllogisms, and very probably the most axiomatic and ideological one. Its attraction is that it leads us to a counter-intuitive conclusion in favour of free trade. Consider two countries that both produce only two goods, wheat and tractors. Even if country A produces both goods more efficiently than country B, it would be advantageous for A to specialize in the production of tractors if it had a greater comparative advantage in doing so than in the production of wheat, while B would specialize in wheat, and both would gain from international trade. The only condition required is that there is full employment. If the law of comparative advantage was viewed as a conditional syllogism, it would be a beautiful and helpful economic syllogism or 'theorem'. But this is not what happens in practice. For many, Ricardo's law is the general equilibrium of the theory of international trade.

International trade economics views the law of comparative advantage as an axiomatic model and uses it as a weapon to prevent countries from industrializing or adopting more sophisticated lines of production. If the Germans had believed the liberal British economists, they would never have become so rich and powerful as they did by industrializing. Friedrich List (1846 [1999]) was right when he said that the British liberal economists were 'kicking away the ladder' from Germany by trying to persuade Germany not to industrialize (Chang, 2002). At least three conditions must be met for the comparative advantage syllogism to be useful in orienting policy-making. First, the country must be in full employment most of the time. This is false. In most cases countries don't have to reduce their agricultural production in order to industrialize. Second, things will be always as they are today. The comparative advantage syllogism is static. It could have been true that at a given moment Germany had a comparative advantage in agriculture, but this could change rapidly as German business entrepreneurs and workers became more advanced technologically. Third, the syllogism is indifferent as to whether countries industrialize or remain primary product exporters, or whether they produce sophisticated goods and services that require well-educated workers, engineers and managers, or produce less sophisticated goods. This is definitely false. A country will grow faster when it transfers labour from low-value per capita industries to high-value ones, from less to more sophisticated industries, from industries that pay lower wages to industries that pay higher wages. England's kings have known this simple truth since the thirteenth century, when Edward III prohibited the export of raw wool. But economists who work essentially with axiomatic models instead of historical models still have difficulty in understanding this. In our scenario with countries A and B, if we assume (a) that the production of tractors involves higher value added per capita, requires more skilled workers and engineers, and pays higher wages and salaries, and (b) that B follows the model and continues to produce only wheat, then country B would be condemned to permanent underdevelopment. In short, this model would be useful if economists changed their way of seeing it; if they saw it as a conditional economic syllogism; if they realized that the model is far

from being as applicable as it seems. In fact, the conditions that make the model workable are rare in the short term and practically non-existent in the long term.

If Ricardo had arrived at this law of comparative advantage from the observation of reality – in other words if this was a historical model – it would be much more defensible. We would be able to derive policy from it. But Ricardo, Heckscher and Ohlin didn't follow this procedure. They did not verify in any way that the countries that followed its precepts more closely grew faster. If they had followed this procedure, they would have realized that these 'obedient' or dependent countries were unable to grow and catch up, while those countries that challenged its short-term analysis and decided to industrialize were able to grow fast and catch up. Ricardo was not interested in this kind of reasoning. What he clearly saw was, first, that Britain was industrializing and becoming much richer than other countries and, second, that other countries were seeking to follow the British path – something that was not in Britain's interests. Given such concerns, Ricardo proved to be a genial economist by aligning his scientific curiosity with the British national interest. With the law of comparative advantage he 'proved' axiomatically that a country such as Germany, for example, should not industrialize because its comparative advantage lay in agriculture.

There are many excellent conditional syllogisms that don't involve the risks of the comparative advantage model. I have already referred to the Balassa–Samuelson syllogism; it links the exchange rate to productivity growth in different countries. This is an example of a purely conditional economic syllogism – one that does not depend on how we see it from a conditional or axiomatic perspective. But we cannot say the same in relation to another instigating syllogism: Mundell's trilemma. One country would not be able simultaneously to pursue a monetary policy, a policy of free movement of capital, and a fixed exchange rate or, in other words, an exchange rate policy. The trilemma, also called the 'impossible trinity', is a syllogism that is logical, but not so correct in practical terms, and definitely wrong in the way it is used. It proceeds from two assumptions: (a) that monetary policy and a fully floating exchange-rate regime are required, and so, (b) that the exchange rate regime cannot be a fixed one, or, in other words, that exchange rate policy must be excluded. But why should the exchange rate be fully floating? Why not an intermediary regime – a managed float regime? On the other hand, why not use capital controls when capital inflows are unduly appreciating the national currency? In other words, instead of assuming that the exchange rate should be fully floating (which is just a means, not an end in itself), the economic authorities could assume that the exchange rate should be competitive. They should adopt an exchange rate policy that makes competent business enterprises in the country competitive – and adopt this as a core objective of economic policy, together with an inflation target. The problem comes when full capital mobility is presupposed, so precluding the possibility of an exchange rate policy. However, there is no reason to consider full capital mobility to be part of the natural order of things.

There is a system of conditional syllogisms that changed the history of economics. I refer to Alfred Marshall's microeconomics. This is the most extraordinary hypothetical-deductive system of thought that I know. But this is true on one condition: that we view Marshall's graphic theory of the firm not as a system of axiomatic models but as a system of conditional models that help us to understand economic systems, and that are neither a representation of how economic systems work nor the foundation of economics. There are no 'foundations' for economics in so far as we understand economics to be essentially a historical substantive science. As to the representation of markets, the historical models of classical

microeconomics play this role; they show how prices reflect values, or costs, and demand and supply; how markets allocate resources; how relative prices are permanently changing; and how the profit rate tends towards becoming equal in all industries but never reaches equality. Marshall's conditional syllogisms complement this analysis. I know that economists will have difficulty in accepting this, particularly those who see microeconomics as the foundation of economics. But if we think the problem through more thoroughly, we can see that Marshall is telling us how economists and businessmen should take decisions, on this or that condition; he is not telling us how the market works. Actually, Marshall is among the top economists of all time because he founded a new science, the science of economic decision-making, which game theory completed, and because he contributed to the understanding of how markets work. Lionel Robbins had his differences with Marshall, but I believe that when he came to the conclusion that economics was 'the science of choice' he was drawing on what he learned from Marshall (Robbins, 1932).

The Ricardian vice

In the previous section, we saw that when the conditional syllogism of comparative advantage is transformed into an axiomatic syllogism, it leads policy-makers to adopt flawed policies, and fails as a model. When conditions are transformed, in practical terms, into dogmatic claims, mistaken policies necessarily follow. Economic models that suggest incorrect policies have no use and are false, unless we believe in a truth that is something angelical, disconnected from the real world. In the case of the law of comparative advantage, as an axiomatic syllogism it says that a country will grow faster if it opens its economy. Yet this is something that history shows to be false in all countries, beginning with Britain, which experienced its industrial revolution in the context of mercantilism.

Joseph Schumpeter once called the direct application of economic theory to policy-making 'the Ricardian vice' (Schumpeter, 1954, p. 472). When I first learned that from Antonio da Silveira (1991), I was surprised. My philosophical pragmatism rejects the idea that policies deduced from a true theory can be wrong. If the theory is right, the policies derived from it are necessarily good ones. Yet Schumpeter was a divided economist. His great contributions were his historical models: the theory of profit, innovation and the entrepreneur, and the theory of business cycles. On the other hand, as an economist who learned economics from the Austrian school, and who migrated to the United States where the neoclassical school was dominant in the academy, he admired the mathematical outcomes of the hypothetical-deductive method. His solution to the contradiction between his historical approach and his intellectual admiration for mathematical models was to view axiomatic economic syllogisms as true, but remarked, paradoxically, that they could not be transformed directly into policy. If a syllogistic model does not legitimize policy, something is wrong. Either the policy-maker is understanding the model in axiomatic terms, or he drawing complex policy conclusions and expecting that policies will work exactly as 'predicted' from simple models. With the concept of the Ricardian vice, Schumpeter was probably expressing his uneasiness with axiomatic syllogisms, but he may have also considered the asymmetry between complex policies and simple models.

In real life, what we have been seeing is the abusive use of axiomatic syllogisms to orient economic policies. Decisions to deregulate, to privatize, to liberalize may be good, but not in all cases. They will be good policies when specific conditions are realized, never merely

as prescriptions deduced from the general equilibrium model or from the rational expectations model. In a syllogism, the conclusion is already part of the major premise, and axiomatic premises are rarely true because they are too general. To try to derive economic policy from axiomatic economic syllogisms is to contract the Ricardian vice. We can derive policies directly from historical models; and we can derive policies indirectly from conditional models, provided that we check carefully the reality of the conditions. We must not derive policies from axioms.

Conclusion

Uskali Mäki, writing on 'The dismal queen of social sciences', observes, 'If there is a puzzle about modelling, it is that economists build models that depict model economies that may appear to bear little or no resemblance with the real world' (Mäki, 2002, p. 10). Indeed, this disconnection between economics and reality is troubling. The reason for this difficulty becomes obvious once we see that axiomatic economic syllogisms and the corresponding hypothetical-deductive method are at the core of today's mainstream economics, that is, neoclassical economics. If neoclassical economics used primarily historical models complemented by properly used conditional economic syllogisms, the alienation of economics from the real world would be reduced dramatically. But this would come at a cost: economists would have to limit their use of maximizing mathematics to conditional models, they would have to accord a secondary role to the hypothetical-deductive method, and they would have to work with historical models that cannot be subjected to sophisticated mathematics. In other words, economists would have to limit their 'Platonism' – the desire to substitute ideas for the reality –, which is powerfully attractive to academics. Nothing seems more 'scientific' and more beautiful to many academics than a knowledge system that can be expressed fully through a system of equations. I always remember the remark of Paul Romer (1986) that he had been able to successfully complete his endogenous growth model only because recent advances in mathematics had given him the required tools. I can imagine his happiness when he was able to prove that education and technical progress were endogenous to economic growth and a main cause of it, something that has been well known to historical economists since Adam Smith and Karl Marx. Nevertheless, Romer made an effective contribution to economics in so far as he developed models with imperfect completion and increasing returns – two key characteristics of technologically sophisticated manufacturing industries that have no room in general equilibrium theory.

Instead, what the economist needs to do is to devote less attention to beautiful mathematical models where ideas play the role of facts, and more attention to simple historical models and conditional syllogisms. This is what competent economists do, regardless of whether they are heterodox or orthodox. The difference is that orthodox economists must forget their axiomatic syllogisms, or, more elegantly, must drop, one by one, the simplifying assumptions that these models contain, to eventually arrive at a competent analysis and at sensible policies, while heterodox economists may already start from a more realistic vision of the economic system under scrutiny. Orthodox economists are more prone to get involved in the ideological defence of market coordination, while heterodox economists could be pragmatic. But we know that there is no guarantee of that. Neither orthodox economists nor heterodox economists have a monopoly on incompetence; and not only axiomatic models but also historical and conditional ones may be wrong or may prescribe flawed policies.

Notes

1. The causes of this chronic overvaluation are the Dutch disease and three 'habitual policies adopted in developing countries: the growth *cum* foreign savings policy, the use of the exchange rate as an anchor to control inflation and a high level around which the central bank manages its monetary or interest rate policy'. See Bresser-Pereira, Oreiro, and Marconi (2014).
2. I am understanding neoclassical economics as the economics of general equilibrium and rational expectations. Thus, it is not the same as mainstream economics, whose core is today neoclassical economics, but includes areas of thought not fully consistent with this core, as game theory, new institutionalism and behavioural economics.
3. Popper (1957), with his defence of sophisticated falsificationism, and Lakatos (1974), with his proposal for a 'protection belt' for the core of scientific theories, proved to be disciples of the Vienna circle by offering justification for theories that have little correspondence to reality.
4. In the classical school, David Ricardo was an exception.

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Notes on contributor

Luiz Carlos Bresser-Pereira is emeritus professor of Getulio Vargas Foundation. He was finance minister (1987) and minister of federal administration of Brazil (1995–98). His more recent books are *Globalization and Competition* (Cambridge, 2010), *Developmental Macroeconomics* (Routledge, 2014, with José Luis Oreiro e Nelson Marconi), and *The Political Construction of Brazil* (Lynne Rienner, 2016).

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