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Porter Model of Economic Development at the Back of an Envelope

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Abstract

The Porter model of economic development links the phases of development with national competitiveness. His model lies at the heart of the Global Competitiveness Index. It appears, curiously enough, that there is nowhere in the economics literature a concise explanation of Porter's narrative model of economic development. This paper not only fills this gap but also draws the line of separation between formal economic models and narrative economic models; provides a rigorous presentation of Porter model of economic development; distinguishes between the Porter development path and the Porter's law of economic development; strips Porter model to its bare essentials in a single picture; and finally, shows that the Porter model satisfies the condition known as the way the world works (www) constraint.

Keywords

Narrative economic model; Porter economic development path; Porter's law of economic development; www constraint

**Michael Porter reaches his conclusions the old fashioned way: he earns them through solid research. The lessons of the book [The Competitive Advantages of Nations] are sharp and deep.
Robert M. Solow**

1. Introduction

The challenge in economic scientific thinking is threefold: deciding which assumptions to make, what sort of logical reasoning to employ, and what procedure to use for testing the models. Without striving for rigour, we can think of economic models or theories as intellectual schemes that allow us to derive propositions from other propositions that we take for granted. The things (propositions) that we take for granted are called assumptions. The things (propositions) that we establish by admissible procedure of reasoning are called conclusions.

A distinguishing feature of a formal economic model is that the conclusions follow from the assumptions with logical compulsion. Economists tend to display a revealed preference for the codification of ideas in clear, internally consistent models. Formal models of economic phenomena are important to reduce key insights to manageable essentials and facilitate communication between economists.

However, the claim “you are not doing good economics if you don’t build formal economic models” does not appear to have universal validity. Adherence to this claim may retard the progress of economics. Formalization is not an end in itself. One can have a convincing non-mathematical model offering sensible policy recommendations about complex phenomena without imposing a formal straightjacket to the core ideas. Porter’s model of economic development, first introduced in Porter (1990), is a case in point. His model makes quite a lot of sense, contains a valid and useful set of core ideas, and is intended as a guide for policy. In Porter’s own words,

National economies exhibit a number of stages of competitive development reflecting the characteristic sources of advantage of a nation’s firms in international competition and the nature of internationally successful industries and clusters. The stages address a nation’s position in those industries subject to international competition, though they also capture the state of competition in many purely domestic industries. It is *not* inevitable that nations pass through the stages.

The stages do not purport to explain everything about a nation or its development process. Some important concerns in development are inevitably left out, and no nation will fit a stage exactly. Instead, the stages are an effort to highlight those attributes of a nation’s industry most important to rising economic prosperity.

(Porter 1990, p. 545) [*Italics in original*]

A careful reading of Chapter 10 of *The Competitive Advantages of Nations* –and subsequent contributions such as, for example, Porter (2002) and Porter (2004)– shows that his analytical framework contains an empirical law of economic development.

Porter’s model of economic development is not what an economist would identify as a formal economic model. Most economists would be inclined to say that the Porter model falls into the category of “narrative economic models.” However, this category of models has not been explicitly defined in the economics literature. Robert J. Shiller (2017) provides a definition of ‘narrative economics,’ namely: “the study of the spread and dynamics of popular narratives, the stories, particularly those of human interest and emotion, and how these change through time, to understand economic fluctuations.” Quite obviously, this definition is not useful for demarcating the notion of a narrative economic model.

Generally speaking, Porter’s model of economic development cannot be found in the standard textbooks on economic development and some policymakers do not appear to realize that they are under the intellectual influence of Michael Porter. This is perhaps somewhat paradoxical for the following reason. It is well known that the *Global Competitiveness Index (GCI)* –introduced in 2004 by the *World Economic Forum*– has become an indispensable starting point for the assessment of national competitiveness and policy formulation. What may not be so well known is that the theoretical foundation of the GCI is the Porter model of economic development. The fact that the Porter model of development lies at the heart of the GCI was explicitly recognized by the architect of the index.¹

It appears, curiously enough, that there is nowhere in the economics literature a concise explanation of the Porter model of economic development. It is the purpose of this exposition to fill this gap. The organization of the paper is as follows. Section 2 draws the line of separation between formal and narrative economic models, and argues that narrative models may be acceptable as analytical tools if they satisfy the condition known as “the way the world works (www) constraint.” Section 3 sketches Porter’s stages of competitive development and brings into sharp focus the Porter’s law of economic development. Section 4 assembles Porter’s core ideas in one picture and provides a brief methodological assessment of the Porter model. Section 6 offers a summary and some concluding remarks.

2. Narrative Economic Models and the www Constraint

Purely verbal analysis was the first phase in the historical development of the economics discipline. However, the recognition that more rigorous formulations were often necessary led to the acceptance of mathematics as an important tool of analysis. Mathematical economics has produced many models extraordinarily useful to organize thinking about issues of practical relevance, such as, for example, economic growth. Formal growth models emphasize the role of the immediate

¹ The GCI was created by Xavier Sala-i-Martin in collaboration with the Forum. See Sala-i-Martin and Artadi (2004).

determinants of growth, namely: investment in physical capital, human capital accumulation – especially formal education– and technological change.²

Economists recognize that it is necessary to go into the black box of the immediate determinants of growth and explore deeper reasons of economic prosperity. It is generally agreed that institutions, culture, geography, and even luck are fundamental determinants of economic prosperity. In particular, institutional change plays a major role in explaining which countries are rich and which are not.³

While the hallmark of formal growth models is a formal structure (based on deductive logic in a fundamental way) set up to analyse logical connections between key variables and derive testable implications, the models of economic development tend to be expressed verbally and the conclusions do not necessarily follow from the assumptions with logical compulsion.⁴

In essence, economists use two kinds of logical reasoning to derive conclusions, namely: ‘logical inference’ and ‘reliable inference.’ *Logical inference* is a process of reasoning in which granted the (logical) truth of the premises the conclusions must be (logically) true. Logical inference includes both formal logic and mathematics. Mathematical reasoning is essentially logical in character but mathematics necessitates the introduction of a concept foreign to formal logic: the concept of ‘infinity’ (the infinitely large and the infinitely continuous). Examples of logical inference in economics abound. Perhaps the most elementary example is profit maximization; if the profit function is differentiable and gives rise to an inverted U profit curve, profit-maximization implies with logical compulsion that marginal revenue must be equal to marginal cost.

In *reliable inference* the reasoning conducive to the conclusions does not possess logical compulsion, but there are reasons to believe that the conclusions are correct. For example, assuming simple empirical notions of economic freedom, private property, appropriate institutions, labour market efficiency, et cetera, economists have empirical, theoretical, and historical reasons to believe that economic prosperity will follow.

A formal model is largely an exercise in formal logic, the deduction of consequences of consistently framed assumptions. More precisely, a *formal economic model* has two defining characteristics: first, the scheme uses logical inference to derive conclusions from a set of assumptions, and second, at least one of the results derived from the assumptions must be empirically testable. For example, the standard model of consumer behaviour assumes that the consumer buys products to maximize her utility subject to a budget constraint. To achieve her aim the consumer solves the familiar constrained-utility maximization problem. The consumer’s reaction to price and income changes is the next step in the development of the formal model. Changes in the parameters (prices and

² The foundations of modern growth economics, from the neoclassical paradigm to the current frontier in growth theory, can be found in the ground-breaking book *Introduction to Modern Economic Growth* by Acemoglu (2009).

³ The last two chapters of Acemoglu (2009) analyse the impact of institutions on long-run development.

⁴ This is not to deny that there are formalizations of verbal models of development. For example, the Big Push paper of Rosenstein-Rodan (1943) was mathematically formalized by Murphy et al. (1989) in a way that is quite close to the original spirit.

income) will normally alter the consumer's equilibrium. The *Slutzky equation* allows us to derive testable implications (such as, for example, the pure substitution effect is negative) that could be conceivably refuted, if only under ideal conditions.

It can be said, speaking broadly, that a *narrative economic model* is a story that integrates simple empirical notions and analytical tools to provide a general explanation of particular economic issues using reliable inference. Typically, a narrative economic model formulates assumptions from direct observation of "the world out there" and derives conclusions based on reliable inference.

Narrative models are not free from difficulties. There are at least three potential drawbacks: first, there is no guarantee that the codification of the core ideas contained in a narrative model would be free from logical gaps; second, a narrative model may be so general as to be useless; and finally, this sort of model may become too procrustean and lead to distortion of facts to fit theory.

Generally speaking, economists are inclined to choose formal models and leave narrative models unchosen. One reason for this exclusion tends to be the lack of mathematical rigour associated with narrative models. However, as Mäki (2013) has pointed out, the identification of 'rigour' with 'mathematical rigour' is unfortunately narrow because it ignores other kinds of rigour such as, for example, rigour in the articulation of concepts derived from empirical observation of the real world.

According to Uskali Mäki (2001), the acceptability of economic models as analytical tools should be based on the consistency between what we know about *the way the world works* (*www*, for short) and the model. This criterion for tentative rejection (acceptance) of models –called *the www constraint*– was first advanced by Mäki (2001). More precisely, the *www constraint* is based on four premises:

- P₁: Comprehension. Economists pursue comprehension of the economy;
- P₂: Workings. Comprehending the economy means to understand how the economy works;
- P₃: Causality. The economy's workings are a matter of causal processes being in place; and
- P₄: Models. Comprehension of the economy is sought by means of models or theories.

It is worth quoting Mäki extensively,

Here is how the *www constraint* works: if it is the case that we understand the world by way of theories which describe its causal functioning, then any doubt about the capacity of a given theory to expose the major elements of such causal functioning amounts to a doubt about its capacity to render parts of the world understandable. Such doubts may lead to various responses, ranging from outright rejection to relative lack of attention. In such cases, the constraint functions negatively: beliefs about its non-satisfaction serve as a ground for exclusion. Even though this negative role of the constraint in providing grounds for exclusion may be particularly important, this does not rule out its positive role in providing supporting grounds for a theory. The general point is that the *www constraint* serves a function in determining the merits and demerits of a theory.

(Mäki, 2001, p. 372)

It should be clear that the premises of the *www* constraint do not specify whether the model under scrutiny is formal or narrative. Consequently, narrative economic models satisfying the *www* constraint may be valid constructs to guide economic decision making. It should also be clear that the positive role of the *www* constraint is useful to assess the *relevance* of an economic model.⁵ The satisfaction (non-satisfaction) of the *www* constraint signal relevance (Irrelevance) of an economic model.

3. Porter's Vision of Economic Development

Porter's (1990) pioneer four-year study of the patterns of competitive success in ten leading trading nations (Denmark, Germany, Italy, Korea, Japan, Singapore, Sweden, Switzerland, the United Kingdom, and the United States) is the origin of his model for economic development. Inspection of Chapter 10 of *The Competitive Advantages of Nations* shows that Michael Porter has a vision of economic development along the following lines. Economic development means that the economy follows a pattern of evolution consisting of different stages accompanied by a specification of both the order in which the economy progresses through the stages and the conditions required for the transition from one stage to another. Porter articulates these three components of development (stages, transitions, and conditions of transition) into a narrative model of economic development as a sequential process.

It is a model derived from direct empirical observation that follows Marshall's dictum to the letter: "It is the business of economics, as almost every other science, to collect facts, to arrange and interpret them, and to draw inferences from them." (Marshall 1966, p. 24). Two essential inferences from Porter's empirical research are as follows: first, economic development can be described in terms of a hypothetical economy that follows three stages of development: stage 1 (factor-driven economy), stage 2 (efficiency-driven economy), and stage 3 (innovation-driven economy)⁶; and second, the prime mover of economic development is the degree of national competitiveness.

3.1. Stages of Competitive Development: Succinct Description

The *factor-driven economy* (or *primary economy*) is focused on resource extraction, assembly, and labour-intensive manufacturing. Firms produce primary commodities or relatively simple products of long-standardized technology designed abroad. Unskilled labour is pervasive. Low labour cost and unprocessed natural resources are the dominant sources of competitive advantage and exports. Primary economies are those that compete on both price and low cost of resources. This kind of economy is highly sensitive to commodity price fluctuations and exchange rate volatility.

In the *efficiency-driven economy* the emphasis is on efficiency in producing standard products.⁷ In this type of economy manufacturing plays a major role. Capital-intensive firms are more dominant.

⁵ The general notion of relevance to be used when assessing economic models can be found in (Mäki 2013, p. 93).

⁶ Porter initially suggested four distinct stages of national competitive development. More concretely, Porter's original terminology is: factor-driven economies (stage 1); investment-driven economy (stage 2); innovation-driven economy (stage 3); and wealth-driven economy (stage 4). (Porter 1990, p. 546)

⁷ Porter (1990) sees stage 2 as driven by the ability and willingness to invest. The above characterization of stage 2 (i.e. stage 2 driven by efficiency) is due to (Sala-i-Martin et al. 2007, p. 7, fn. 19).

Efficiency in producing standard products becomes the key source of competitive advantage, but technological change is largely exogenous for the economy in question (new technology and designs come from abroad although some domestic firms begin to develop the capacity to improve on them). Price competition is the predominant form of economic competition.

Finally, the essential distinguishing feature of an *innovation-driven economy (or creative economy)* lies in the fact that the increase in the standard of living of its residents is primarily based on the production of profitable new ideas. Price competition is still highly relevant for the economy as a whole, but competition through innovation is intense in sectors where technological change is important, such as telecommunications and computers. In this kind of economy, the ability to produce new products at the global technological frontier becomes the dominant source of competitive advantage.

These three stylised types of economies do not purport to capture everything about real economies. No country will fit a stage exactly. Furthermore, there are two transitional phases (from stage 1 to stage 2 and from stage 2 to stage 3) that have to be taken into account in order to articulate the notion of economic development as a sequential process. Given the appropriate circumstances, the hypothetical national economy gradually moves from one stage to another. Or, to put it differently, abrupt jumps between stages are ruled out.⁸

In a nutshell, the process of economic development evolves in five phases: phase A (or stage 1), phase B (transitional phase), phase C (or stage 2), phase D (transitional phase), and phase E (or stage 3). Needless to say, there are many countries in the real world that have gone successfully through these phases and attained a creative economy status.

Porter's model implies a partition of the set of all possible economies, denoted by E^* , into five subsets representing the various types of economies: E_1 (factor-driven economies); E_2 (economies in transition from stage 1 to stage 2); E_3 (efficiency-driven economies); E_4 (economies in transition from stage 2 to stage 3); and E_5 (creative economies).⁹ The intuition behind this partition is clear. It means that, for example, the characteristics commonly found in the economies belonging to E_1 are not identical with those in E_2 , and consequently, it is methodologically improper to mix them indiscriminately. These five types of economies are associated with an equal number of phases of development. A factor-driven economy operates within phase A; an economy in transition from stage 1 to stage 2 operates within phase B; and so on.

3.2. Porter's Law of Economic Development

The usefulness of any economic development model lies in the light which it throws on the way the economic system will change when there is a change in some parameter or explanatory variable. What propels the economy to move from one phase to another? According to Porter, national

⁸ This point is forcibly made by (Sala-i-Martin and Artadi 2004, p. 58).

⁹ A collection $\{E_1, E_2, E_3, E_4, E_5\}$ of sets with union E^* is a *partition* of E^* if the distinct members of the collection have no elements in common (for example, the intersection between the sets E_1 and E_2 is empty, the intersection between E_1 and E_5 is empty, etc.).

competitiveness is the short answer to this simple, yet fundamental question. The degree of competitiveness $C = C(t)$, where t denotes time, plays the role of an explanatory variable in the context of economic development. The entire effect of this variable on the economy occurs over a number of years because structural transformations take place gradually over time. In order to analytically represent the cumulative impact of past transformations captured by $C(t-1)$, $C(t-2)$, $C(t-3)$, etc. on $C(t)$ in its most general form, the explanatory variable can be defined as a sequence

$$C(t) = a_1 \times C(t-1) + a_2 \times C(t-2) + a_3 \times C(t-3) + \dots = \sum_{s=1}^{\infty} a_s C(t-s), \quad [1]$$

where the sequence of lag weights a_1, a_2, a_3, \dots must have a finite sum.¹⁰

Michael Porter brought into sharp focus a factual regularity between competitiveness and economic development: competitiveness and development move in the same direction. Gradual increases in $C(t)$ are the key to economic development because they provoke increases in productivity. It seems natural to call the link competitiveness-development *Porter's law of economic development*. The message conveyed by Porter's law is that economic prosperity is created, not inherited.

Porter's law of development provides a rule of thumb for assessing the implications of improving institutions and policy conducive to increases in competitiveness. While the rule is only a first approximation and might not work very precisely from year to year, it still gives a sensible translation from competitiveness to economic development. Moreover, this law fits nicely with the notion of economic law proposed by Alfred Marshall in his *Principles of Economics*: economic laws are "(...) nothing more than a general proposition or statement of tendencies, more or less certain, more or less definite." (Marshall 1966, p. 27)

4. Pictorial Description and Methodological Evaluation

4.1. Porter Model in One Picture

The Porter model can be assembled diagrammatically. To this end, we first present the structure of the model in tabular form, then translate the table into a curve, and finally, incorporate the explanatory variable $C(t)$ into the picture. Denoting as before the logical time by t and identifying the point in time where the economy moves to the next phase of development by t with a superscript, we can encapsulate the five phases of economic development into a table such as Table 1.¹¹

Identifying an economy $e(t)$ with a positive number (typically, GDP per capita), allows us to represent the subsets of E as half-closed (disjoint) intervals as indicated in Table 1. We can straightaway translate Table 1 into a set-to-set map

$$P: E^* \rightarrow T, \quad [2]$$

¹⁰ If this were not the case $C(t)$ would not have a finite value. Although [1] allows the number of lags to be infinite, in practice a finite lag version has to be imposed.

¹¹ The notation for time intervals in the third column of Table 1 follows the standard mathematical convention to denote *half-closed intervals*, namely: the set of one dimensional points x such that $a \leq x < b$ is denoted by $[a, b)$, and the unbounded interval $x \geq a$ is denoted by $[a, \infty)$.

defined as

$$P(E_1) = [0, t^I), P(E_2) = [t^I, t^{II}), P(E_3) = [t^{II}, t^{III}), P(E_4) = [t^{III}, t^{IV}), \text{ and } P(E_5) = [t^{IV}, \infty) \quad [3]$$

where the set T is defined as the union of all the half-closed intervals in the third column of Table 1.

Subsets of the set of all economies E^*	Types of economies	Phases of development (time interval)
E_1	Factor-driven economies	Phase A [0, t^I)
E_2	Economies in transition from stage 1 to stage 2	Phase B [t^I , t^{II})
E_3	Efficiency-driven economies	Phase C [t^{II} , t^{III})
E_4	Economies in transition from stage 2 to stage 3	Phase D [t^{III} , t^{IV})
E_5	Creative economies	Phase E [t^{IV} , ∞)

Table 1
Correspondence between types of economies and phases of development

The map $P: E^* \rightarrow T$ will be called *Porter map*. The intuition behind this map is very simple. Given any economy $e(t) \in E^*$, it is possible to establish the phase in which $e(t)$ is operating. The image of E^* originated by the Porter map is a curve that can be graphically represented in a two dimensional space, measuring the economies on the vertical axis and time on the horizontal axis. The resulting curve (see Figure 1, right panel) will be called *Porter economic development path*. In practice, the shape of this curve may vary from country to country. Figure 1 shows only one possible shape where the inflexion points indicate the end of one phase and the beginning of another: progress is quick within phases of A, C, and E, but slow during the transitional phases B and D.

The degree of competitiveness $C(t)$ can be thought of as a force acting on the economic system. Porter's law of economic development says that, *ceteris paribus*, an increase in the degree of national competitiveness, defined as $C(t+1) - C(t) > 0$, will cause the economy to move in the right direction. This is indicated in Figure 1 where the degree of competitiveness is measured on the most left vertical axis. At time t the hypothetical economy is operating in the transitional phase from stage 1 to stage 2 with degree of competitiveness $C(t)$. It is assumed that a plan of action implemented in the alluded country leads to a new level of national competitiveness $C(t+1) > C(t)$, and the economy becomes efficiency-driven.

One point implicit in Figure 1 should be made explicit. It is not difficult to see that this figure illustrates a rudimentary example of comparative dynamics. The notion of comparative dynamics is very simple. Somewhat roughly, we change something in the economy and investigate the effect of this change on the behaviour over time of the economic system. It is interesting to note that in the last paragraph of his *Foundations* Samuelson wrote:

The further development of analytical economics along the lines of comparative dynamics must rest with the future. It is to be hoped that it will aid in the attack upon diverse problems –from the trivial behaviour of a single small commodity, to the fluctuations of important components in the business cycle, and even to the majestic problems of economic development.
 (Samuelson 1965, p. 355)

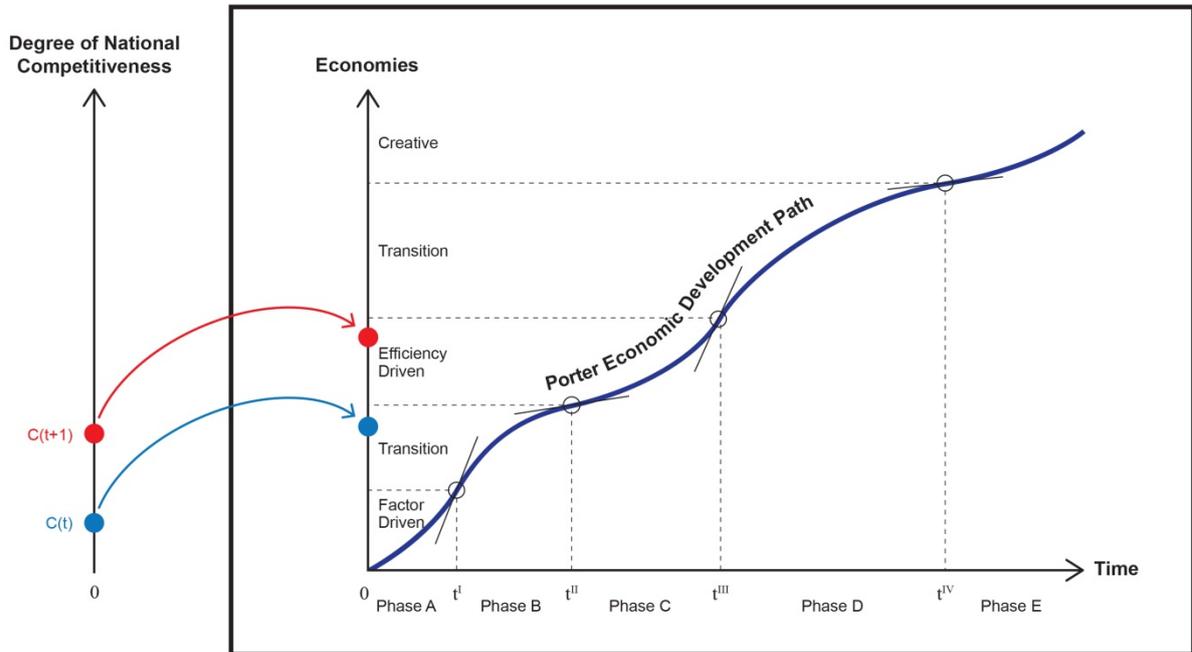


Figure 1
Porter model of economic development

4.2. Assessing the Model

Assessing the Porter model requires the answer to at least three methodological questions. First, does the mathematization of a narrative model automatically transform the model into a formal model? It is clear that the Porter model can be translated into the mathematical language. What may not be so obvious is the fact that the mathematization of economic ideas does not of itself transform a narrative model into a formal model. The crucial reason why the Porter model is not a formal model is that the positive effect of an increase in the degree of national competitiveness $C(t)$ on the evolution of an economy $e(t)$ is an empirical connection, *not* a result derived using deductive logic.

Second, is the Porter model consistent with the *www* constraint? It is not difficult to see that the answer is in the affirmative. In particular, the model helps us understand how economic development materializes in a sequence of economic transformations (consistent with premise P_2) and how the complex causal processes can be captured in a single variable, namely the degree of national competitiveness (consistent with premise P_3).

Finally, is the Porter model relevant? As mentioned before, the *www* constraint can be used to test the relevance (irrelevance) of an economic model. The *relevance* of an economic model is a *relational* property established between a model M and a given purpose N such as, for example, understanding the real world. A model M is *relevant* to N if M has sufficiently significant consequences for N. It seems evident that there is consistency between Porter model and the functioning of the real world. In brief, Porter model is relevant.

5. Summary and Concluding Remarks

Porter's narrative model of economic development consists of two components: (1) Porter economic development path connecting the evolution of a hypothetical economy with five different phases of development; and (2) Porter's law of economic development stating that national competitiveness causes economic development. Porter's law is a statement of tendencies, not a conclusion derived from a set of precisely specified assumptions with logical compulsion. It is an open question whether Porter's narrative model can be transformed into a formal model in a way close to the original spirit.

A large fraction of Porter's vision about economic development is contained in Figure 1. Being schematic, the diagram is not comprehensive, but it does show the most important components of Porter's narrative model. It focuses one's mind on the importance of the degree of national competitiveness as a prime mover of economic development.

Two important policy messages conveyed by the Porter model are as follows. First, the transition from one phase of development to the next is not automatic. For a country to successfully navigate the Porter development path key parts of the institutional and economic environment must change at appropriate times. Such transitions require wholesale transformation of many interdependent elements of economic competition. Second, any economy could become creative, but to maintain this elevated position there has to be incessant business innovation.

As to the acceptance or rejection of the Porter model, the following points can be made. Criteria based on formal elegance or dogmatism should not dictate the acceptance and rejection of economic models. The Porter model can be made accountable to the facts. The *www* constraint typically plays the role of a weaker exclusion device in that it helps to exclude conceptual frameworks that "depict the world in such a way that we have reason to believe that the world *does not* function that way, or, more strongly, that it *cannot* function that way, or, still more strongly, that it cannot function at all, given what we know about it." (Mäki 2001, p. 385) [*Italics in original*]. Quite obviously, Porter's model of economic development cannot be excluded invoking the *www* constraint.

Often, "sharp and deep" lessons embedded in narrative economic models take a long time to enter the economics textbooks. The retardatory factor is that –for good or evil– a necessary condition for an economic insight to be included in mainstream economics is that the insight must be incorporated into a formal model. Michael Porter was perfectly aware of this impediment to the diffusion of new approaches:

The diffusion of ideas is a process that can often take decades, especially with theories that are not part of a well-established tradition. *The*

Competitive Advantage of Nations has this characteristic, in view of its microeconomic approach to competitiveness and economic development. (Porter, 1998, p. xxiv)

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