A Theory of Economic Reform

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ABSTRACT

Discussions of socialist economic reform focus on two sharply differentiated policy strategies: one a rapid, sweeping approach, as embraced by Poland; the other an evolutionary approach as seen in China. Our contribution to the theory of economic reform proposes an integrated explanation of these seemingly contradictory perspectives based on microeconomic approaches to modeling the firm's investment decision. We focus on four issues: the meaning of reform output; the production process that translates policies into gains in material welfare; the costs, both direct and indirect, associated with reform policies; and the impact of uncertainty on reform decisions. We illustrate the relevance of this model with a comparison of reform strategies in Poland in China, and conclude by reviewing opportunities for estimation and simulation analyses that can add systematic empirical dimensions to the assumptions and alternatives revealed by the model of "reform as investment."

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1. INTRODUCTION

1.1 Recent discussions of socialist economic reform focus on two sharply differentiated policy alternatives. Recommendations for economic reform in the former USSR and Eastern Europe emphasize rapid transition to a market economy. Representative of this approach is a report on the Soviet Union prepared by several international organizations which concludes that gradual reform can only postpone inevitable costs of restructuring, while reducing the likelihood of achieving the desired outcome (IMF 1990, p. 19). These views are widely shared. Ericson (1991, p. 25) concludes that "partial reforms will not suffice" to change the Soviet-type economy; to succeed, "reform must be disruptive on a historically unprecedented scale." Dhanji (1991) offers a particularly clear perspective, arguing that the experience of Hungary and Poland shows that there is "no plausible alternative" to simultaneous changes in many segments of economy and society.

1.2 The discussion of reform policies in the Chinese context is quite different. In offering Chinese state enterprises "A Direction for Reforms," a World Bank report makes no mention of privatization (1989, 2:49-52). Whereas "early and comprehensive price decontrol" is "essential" in the Soviet case (IMF 1990, pp. 24-25), the Bank warns China of the "shock from sudden decontrol" and urges gradual extension of a price liberalization process that has already spanned more than a decade (World Bank, 1990, pp. xviii (quote), 59-67).

1.3 What can explain these contradictory perspectives? Politics surely provides part of the answer. Sweeping reform appears politically feasible, perhaps even obligatory in Eastern Europe and the former USSR, but not in China. Even if political factors influence national strategies, reform surely involves issues susceptible to economic analysis. Whether prescriptions for sweeping reform or evolutionary change turn out to be appropriate to all, some, or none of the socialist states, we urgently require an analytic framework for studying the economic aspects of the reform process. The dissonance between the strategies recommended to the reform-minded socialist states of Europe and Asia indicates the absence of such a logical structure. We propose to fill this void with an analytical framework to inform the choice among alternative strategies for economic reform.

1.4 Our model of reform strategy is based on what we regard as a close analogy between the considerations affecting a government's choices on reform policy and a firm's investment decisions. A business enterprise selects investment projects for the purpose of maximizing its own expected net worth subject to constraints arising from technology, adjustment costs, and uncertainty. Reform-minded governments choose policy initiatives (analogous to investment projects) designed to maximize the expected present value of social welfare subject to constraints arising from reform production relations, the financial and social costs of reform, and uncertainty about reform outcomes and the policies best suited for attaining reform objectives.
1.5 We view the higher average living standards which result from greater economic productivity as the output or product of reform. Reform production relations indicate functional relationships that map reform instruments onto the set of attainable reform outcomes. We use the language of production theory to describe the relation that links policy inputs and reform outputs. From this perspective, we raise the following questions: do we find extensive substitutability among inputs to the reform process? Are there economies or diseconomies of scale, intensity or speed in the reform process? Are there economies of scope or jointness in the sense that reform measures designed to raise one type of efficiency (e.g. allocative efficiency) also facilitate improvements in other dimensions of efficiency (e.g. X-efficiency or technical change)? What initial conditions, analogous to the efficiency parameter in production, affect the relation between reform inputs and efficiency change?

1.6 If reform were costless, governments could maximize the present value of social welfare by implementing reform at once. But reform involves several varieties of costs. Direct costs refer to outlays needed to formulate, implement, and monitor reform initiatives, as well as the larger outlays required by enterprises to adjust to the post-reform environment. Indirect costs may include short-term declines in output or productivity if established producers and allocative mechanisms decay prior to the emergence of new producers, new institutions, or new distribution networks. The indirect cost of reform also includes social costs arising from reduced security, rising unemployment, and greater disparities in living standards. Implementing any specific policy also involves the sacrifice of possible benefits associated with delay.\footnote{Pindyck (1991, p. 1110) notes that "the ability to delay an irreversible investment expenditure can profoundly affect the decision to invest."} Thus every reform input exacts a price. Are the costs associated with reform convex in the sense that they increase with the speed of reform and furthermore rise at an ever-increasing rate? Are the costs associated with individual policies separable and fixed regardless of the specific policy mix, or are there bundles of reform measures that, if implemented simultaneously, can reduce the cost of reform?

1.7 Uncertainty figures prominently in the analysis of policy decisions by an enterprise or a nation. The firm cannot be certain about the future demand for its products, nor can it anticipate the exact consequences of building specific techniques into investment projects. Reform-minded governments face parallel uncertainty about future "states of nature" as well as the exact outcome of specific reform instruments. In addition, since both investment projects and policy initiatives require a gestation period that separates decisions from results, changing circumstances may bring about unexpected, and perhaps unwelcome consequences even if specific actions achieve their intended
outcomes. What is the strategic consequence of the knowledge that a government might come to regret previous decisions that, in retrospect, might best have been postponed?

Figure 1
1.8 This paper proposes a framework for modeling economic reform strategy that derives from microeconomic approaches to the analysis of investment decisions. Our discussion focuses on four issues: the meaning of reform output; the production process that translates policies into higher levels of material welfare; the costs, both direct and indirect, associated with reform policies; and the impact of uncertainty on reform decisions. We illustrate the relevance of the model with a comparison of reform strategies in China and Poland, and conclude by reviewing opportunities for estimation and simulation analyses that can add systematic empirical dimensions to the assumptions and alternatives revealed by the model of "reform as investment."

1.9 Although our study of Asian economies predisposes us toward gradualism, this research convinces us that the case for any particular reform strategy rests on specific assumptions which may fit certain contexts, but are unlikely to apply everywhere. Alternative paths do exist. In dealing with socialist economic reform, as with any other policy arena, recommendations to follow particular sets of policies make little sense without careful analysis of alternatives. The striking absence of debate about alternative reform strategies lends weight to this seemingly banal observation. This paper seeks to establish an analytical framework that highlights the assumptions underlying various reform strategies and thereby strengthens the basis for evaluating and debating alternative approaches to economic reform.

2. The Output of Reform

2.1 Pursuing the analogy with the profit-maximizing investment behavior of the firm, we portray reform-minded governments as attempting to control the mix of policies and the speed of reform implementation in order to maximize $V$, the present value of social welfare:

$$\max_{t} \Phi \int_{0}^{\infty} \{e^{-\delta t}[S(t) - C(t)]\} dt \ [1]$$

where $S$ represents society’s average standard of living, $C$ represents the full cost of policy implementation, $\delta$ is the discount rate, $t$ indicates time, and $\Phi$ is the expectation operator.

2.2 Socialist economies have raised output chiefly through a massive expansion of investment which has limited the growth of living standards. Against this background, it seems natural to identify increased productivity -- defined as the ratio of socially useful output per combined unit of capital, labor and intermediate inputs -- as the proximate objective of reform. Specifically, we
assume that the state pursues productivity growth as a means toward raising future living standards, which are measured as:

\[ S_t = S_0 e^t \]  \hspace{1cm} [2]  

where \( S_0 \) represents the average standard of living when reform begins. The trend rate of productivity change, \( g \), which the state seeks to maximize, is determined by changes in three varieties of efficiency:

\[ g = f(E_i), \quad i = 1, 2, 3 \]  \hspace{1cm} [3]  

2.3 According to Equation [3], increased productivity growth can arise through three distinct, but interrelated channels: (i) improved allocative efficiency (\( E_1 \)); (ii) increased technical or X-efficiency (\( E_2 \)), and (iii) accelerated introduction of superior goods, technologies and organization (\( E_3 \)).

2.4 Figure 1 illustrates these three efficiency channels. \( Q, Q', \) and \( Q^* \) are isoquants that reflect different technologies for using labor (\( L \)) and capital (\( K \)) to produce a specific amount of a particular product. The ray \( OH \) shows the expansion path for least-cost production under existing relative factor costs (we ignore the complications of changing factor prices or non-neutral technical change). The isoquants \( Q \) and \( Q^* \) represent best practice in periods \( t \) and \( t+1 \), respectively. \( M, N, \) and \( R \) indicate the positions of three firms at time \( t \); \( M', N', \) and \( R' \) represent the circumstances of the same firms at time \( t+1 \). At time \( t \), the firm shown at \( M \) is inefficient both allocatively (because it is off \( OH \)) and technically (because it fails to attain current best practice along \( Q \)). The firm shown at \( N \) is efficient in a static sense in period \( t \), since it straddles both the frontier isoquant \( Q \) and the expansion path \( OH \). However, firm \( N \) is dynamically inefficient because it fails to move to the new isoquant \( Q^* \) in period \( t+1 \). Only firm \( R \), which moves to \( R' \) in period \( t+1 \), attains maximal efficiency in each of three dimensions.

2.5 In principle, only technical change can support a sustained rise in living standards. Nonetheless, resource reallocation can produce significant benefits, as in the case of the United States during 1929-1967 and in Western Europe and Japan since World War II (Denison 1979, p. 65; 1967, p. 215; Denison and Chung 1976, p. 38). Possible gains in static efficiency from reshuffling resources may be larger in countries emerging from decades of central planning. China's farm output, for example, jumped more than 50 percent in six years after the start of reforms that replaced collective farming with a market-driven system of family farming despite a decline in labor input and a notable absence of investment (Sicular 1991, 1: 342, 356). Total factor productivity in the most efficient of 120 Chinese ferrous metallurgy enterprises was eight times greater than in the least
efficient firm (Jefferson 1990). Casual observation of the reform process in Eastern Europe indicates that the greatest near-term gains in productivity may come from liquidating the least competitive firms and using local best practice to upgrade the efficiency of the remaining enterprises. Because of their potential importance as sources of productivity gains during the early stages of reform, changes in static efficiency occupy an important place in our analysis.

3. The Reform Production Function

3.1 In our model, the state pursues its objective of accelerating productivity growth by selecting a package of specific reform measures and choosing the intensity for applying each policy. Formally, we view the state as seeking to increase the growth rate of aggregate productivity through a reform production function:

\[ g = f(E) = f[f^2(A; X_j, I_j)] = g^2(A; X_j, I_j) \] \[4\]

where \( i = 1,2,3 \) and \( j = 1,2,\ldots,n \)

3.2 The state makes a set of off-on, i.e. \{0,1\}, policy decisions corresponding to the elements of \( X \), the vector of potential policy instruments, and implements the policies selected for inclusion with a degree of intensity represented by elements of the vector \( I \). Implementation of this policy package, conditioned by a set of technical, social, and institutional factors summarized in the efficiency parameter \( A \), affects aggregate productivity through its impact on the separate efficiency channels labeled \( E_i \).

3.3 In the reform production function, the marginal product of each individual policy \( X_j \) depends on four factors: the substitution elasticity, the scale parameter, economies of scope, and the efficiency parameter. We characterize equation [4] in terms of standard properties of production functions:

(a) substitutability. Is it easy to substitute among the elements of \( X \), the vector of reform measures? Are certain reform instruments essential? If so, the marginal rate of substitution between these and other instruments is low, and returns to reform packages that lack these essential ingredients are small or rapidly declining. Sweeping reform proposals implicitly assume fixed proportions in the reform process while advocates of partial reform assume extensive substitutability.

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2 This disparity persists after adjusting for spurious differences arising from pricing conventions, non-industrial inputs, etc. Prior to such adjustments, interfirm productivity differentials were as high as 37:1.

3 For conflicting empirical findings, see Murrell (1991, pp. 68-71) and Hare (1991, pp. 199-200).

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(b) economies associated with the scale or intensity (I) of reform. Does raising the intensity with which a given policy menu is implemented produce a more than proportionate increase in efficiency and productivity? Is there a time dimension to economies of scale? Can intensive reform that dismantles the existing system of planned production and distribution involve diseconomies of scale or even negative short-term productivity consequences? Proponents of sweeping reform anticipate that major restructuring can overcome thresholds and reap the benefit of important scale economies; they see little prospect of prolonged negative yields from high reform intensity. Advocates of gradual reform disagree, arguing for a strategy of "growing out of the plan" (Naughton 1986, p. 622; 1991).

(c) economies of scope. Reform aims to improve three types of productivity-enhancing efficiency. Are these elements of efficiency unrelated, so that separate reform instruments are required to promote each objective, or are they bound by economic and institutional links that permit individual reform measures to have multiple efficiency consequences? Advocates of sweeping reform implicitly downplay the importance of economies of scope while proponents of partial reform rely on their existence.

(d) the efficiency parameter embodies the effect of initial conditions and feedbacks on the reform process. Does a nation’s historical, geographic or cultural proximity to market systems and private ownership affect the impact of specific reform measures? Are the comprehensiveness and intensity of reform limited by the capacity of the nation’s physical, social, legal and administrative infrastructure? Is the efficiency parameter static, or can we expect to observe significant learning process as reform unfolds? Is it possible that differences in initial conditions may tip the balance in favor of gradual or sweeping reform?

3.4 We now examine in greater depth the consequences of each of these properties for the choice among alternative reform strategies.

A. Substitutability: In production theory, substitution possibilities range from the Leontief case of rigid input proportions to the additive case in which inputs are perfect substitutes. In terms of our model, the issue concerns the magnitude of the direct elasticity of substitution between any two elements of the policy vector, \( X_j \) and \( X_k \), holding output constant, i.e.

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\varepsilon_{jk} = \left[ \frac{\partial \log (X_j / X_k)}{\partial \log (f_{X_j} / f_{X_k})} \right] \]

[5]
3.5 Many commentators visualize the reform process from the Leontief perspective. Dhanji (1991), for example, argues that reform is "a 'seamless web' in which every element is intimately related to every other." As a result, "because reforms are all of a piece, countries do not enjoy the luxury of doing one thing at a time. . . . it is important to act on. . . . many fronts at once." This implies little or no substitutability among policies. The omission of certain "essential" components is likely to truncate the beneficial consequences of other policy initiatives. Advocates of piecemeal reform, however, implicitly believe that certain policy innovations can stand alone, independently generating gradual and partial productivity gains.

3.6 Viewing specific policy initiatives as "essential" to successful reform recalls earlier debates about the historical significance of rising domestic savings or other precursors of sustained growth in per capita output for nations following in the wake of England's industrial revolution. This "prerequisites" approach failed to withstand the criticism of opponents armed with comparative historical data. Alexander Gerschenkron (1962, p. 50) pointed to "the great elasticity and variability in the industrialization processes" of nineteenth-century Europe and to "the lack of something that might be regarded as a general set of prerequisites of industrial development." Albert Hirschman added evidence from the twentieth century, and concluded that "whenever development occurs, it does so invariably in the absence of one or several . . . 'required' components or preconditions" (1962, p. 41).

3.7 The extent of substitutability among individual policies has direct implications for the appropriate breadth or comprehensiveness of reform programs. If there are extensive opportunities for substitution, reform efforts can focus initially on one sector or aspect of economic activity and gradually enlarge their range. If substitution is difficult or impossible, reform must be comprehensive from the start. This dichotomy mirrors debates of the 1950s between advocates of balanced and unbalanced growth. Rosenstein-Rodan (1943) and Nurkse (1953) proposed a "balanced" or comprehensive approach to development planning that would simultaneously build a whole range of industries and the infrastructure to support them. Without a comprehensive investment program, they feared that the absence of critical supply and demand linkages would render isolated projects unviable. Hirschman (1958) insisted that proposals for "balanced growth" overlooked the critical scarcity of decision-making capacity. He argued that nations should concentrate their resources on the sequential development of a few key sectors, relying on bottlenecks to provide signals to guide successive generations of policy decisions and investment projects.

3.8 Along with the views of Gerschenkron and Hirschman, international experience in trade liberalization, where "few, if any, core elements of reform. . . . seem decisive" (Papageorgiou et al 1990, p. 9) resonates with the idea that different policy combinations might provide alternative paths
to reform success. Proponents of gradual reform can also turn to recent Chinese experience for evidence that, in the presence of substitutability among different policies, tangible economic gains need not await comprehensive reform. Fifteen years of reform have brought vibrant growth and clearly visible gains in living standards despite the government's failure to abandon planning, eliminate subsidies, privatize industrial enterprise, enact effective bankruptcy legislation, or take other steps widely seen as essential to reform success in other nations.

3.9 Recent Chinese experience also illustrates important complementarities among reform policies. Because it lacked an integrated bond market, flexible interest rates, and a well-established central banking system, the Chinese government relied extensively on direct price controls and enterprise regulation in its effort to reestablish macroeconomic stability during 1988-90 following several years of accelerating inflation. This necessitated the partial reversal of earlier reforms that had relaxed official controls on enterprise decisions about pricing, procurement, and product mix. China's difficulty in continuing micro-level reform in the absence of macro-economic stability is not the only example of complementarity among policies. Dwight Perkins (1991b) suggests that price reform may produce little benefit without suitable changes in incentive arrangements. But to say that successful reform depends on improved incentives is not the same as calling for a rapid shift to free markets and private ownership. Revised profit sharing or bonus arrangements for workers and managers may sharpen incentives enough to reap many of the benefits anticipated from price reform.

3.10 More generally, we may suggest the existence of certain broad prerequisites to reform success (e.g. better incentives), each of which might be attainable through a variety of policy combinations (e.g. profit-sharing or privatization). This combination of important complementarities spanning broad reform categories with opportunities for substitution among specific instruments suggests the following functional form for the production of greater efficiency:

\[ E_i = \min \{f(A; X_{ij}, I_{ij}), f(A; X_{ij}, I_{ij})\} \quad [6] \]

where \( E \) is a vector incorporating three dimensions of efficiency and \( X_{ij} \) and \( X_{ij} \) are bundles of reform measures, each of which addresses one of several complementary areas (e.g. prices and incentives) that constitute the broad prerequisites of successful reform.

B. Scale (intensity): Once government has chosen to implement a specific policy package, scale economies exist if the beneficial consequences of these measures increase at a growing rate as the intensity of application (I) rises. In formal terms, scale economies are present if

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*Fischer and Gelb (1991, p. 101) offer a similar perspective.*

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\[ g''(l) > 0; \ g^{2''}(l) > 0. \]  

3.11 Scale economies certainly exist, especially in the initial stages of reform: third-world experience with macroeconomic stabilization and China's agricultural decollectivization illustrate the importance, perhaps even the necessity, of sweeping change at some stage of the reform process. But decreasing or even negative returns are also possible, particularly near the start of a comprehensive reform program, if the erosion or abandonment of traditional allocation patterns for material inputs, labor, credit, and final products outreaches the effective functioning of new distribution networks (Brada and King 1991).

3.12 Anne Krueger's analysis of rent-seeking speculates on the presence of thresholds that may figure prominently in determining the outcome of partial reform efforts. She suggests that as growing state intervention stimulates firms to pursue rent-seeking rather than market-oriented activity, "there might be some point along the continuum beyond which the market fails to perform its allocative function to any satisfactory degree" (1974, p. 70). This seems to imply that injecting successive doses of market forces into an economy formerly controlled by bureaucratic resource allocation may open the door to substantial market influences before unregulated market transactions come to dominate enterprise behavior.

3.13 But where can we expect to find these turning points? Advocates of rapid, sweeping reform, echoing arguments proposed by advocates of the "big push" or "critical minimum effort" approach to development planning (Rosenstein-Rodan 1943, 1961) anticipate that reform programs are likely to fail unless they incorporate high degrees of intensity and comprehensiveness. Gradualists envision lower thresholds beyond which productivity growth might rise over some (perhaps limited) range of rising reform intensity.

3.14 China's recent experience indicates that the appearance of market prices that credibly reflect scarcity relations and individual preferences may elicit important changes in behavior long before systems of planned allocation disappear. Under China's "dual track" price system for industrial goods, almost every enterprise makes marginal transactions involving both outputs and material inputs at increasingly uncontrolled "market" prices. Even though central planning, state-controlled prices for officially mandated sales, and subsidies for weak state-owned firms all continue, the existence of markets has intensified competition, drained resources from the state's planning system, reduced industrial profits, and eroded state revenues. These changes, in turn, appear to have created considerable pressure to improve static efficiency and accelerate innovation, both within and outside

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5 On this episode, see Reynolds 1987, Naughton 1992, and Wiemer forthcoming.
the state sector. From the perspective of scale economies, however, this history suggests that once a substantial proportion of inputs and outputs are transacted at market prices, further expansion of the market may produce diminishing efficiency gains. Other Chinese experiments with incomplete reforms, including the partial shift of industrial investment funding from budgetary appropriations to bank loans (Naughton 1986) and the partial retention of foreign exchange earnings by exporters and local governments (Lardy 1992), seem to confirm that incomplete measures can sometimes capture much of the potential gain expected from full reforms.

3.15 A further limitation on scale economies arises from a possible trade-off between the intensity of reforms and the quality of their implementation. The former Soviet Union may not be alone in suffering from what Sachs (1991, p. 101) refers to as "the utter degradation of the old administrative structure. Even when the state continues its normal everyday work, overloaded policy-makers can fall into elementary but costly errors. As Hirschman has stressed in the development context (e.g., 1958, p. 25), one crucial scarcity involves the capacity to formulate and effectively implement innovative policies.

C. Economies of Scope: Economies of scope arise when inputs contribute to the production of more than one output, so that the cost of joint production is less than the combined cost of producing the outputs separately. As Nadiri writes in the New Palgrave, "When several outputs are produced from a single production process... it is a technological phenomenon of 'intrinsic jointness'." (1987, 2: 1028).

3.16 Conceptually, we distinguish three separate reform outputs. These outputs, shown in Figure 1, are gains in allocative efficiency (movement along MY, technical or X-efficiency (movement along MZ) -- both forms of static efficiency -- and improved dynamic efficiency (movement along Rr). To what extent might a reform designed to promote one variety of efficiency-induced productivity change affect either or both of the others?

3.17 In the extreme case of non-jointness, single reform measures motivate isolated movements along MZ (X-efficiency gain), MY (allocative efficiency gain), or RR' (technical progress). At least three reform instruments are required to affect all three dimensions of productivity increase. Under extreme jointness, a single measure motivates movements along the path MR'. If partial jointness exists, certain reforms affect only one dimension of productivity, while others affect two or even all three dimensions.

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6 China's central government agreed during the mid-1980s to revenue-sharing arrangements that limited the growth of its own nominal spending capabilities; at the same time expansionary monetary policy virtually ensured that inflation would erode the purchasing power of the central government's disposable income.
3.18 Some reform instruments (e.g. patent and licensing law) may substantially affect only one productivity objective (technical change). Others may produce significant spillovers. An increase in the profit retention rate or implementation of a bankruptcy law designed to achieve greater technical efficiency, for example, may also contribute measurably to allocative efficiency and technical change. Similarly, partial pricing autonomy for state enterprises, perhaps intended to improve allocative efficiency, can also add fresh incentives for innovation.

3.19 The presence of economies of scope suggests that a limited set of well-chosen reforms can have a substantial impact on the full range of productivity objectives. Partial reforms instruments may yield gains in all three efficiency dimensions; sweeping, comprehensive reform packages may not be needed for the simultaneous achievement of gains in allocative efficiency, technical efficiency and technical change.

D. Efficiency Parameter: The efficiency parameter, represented as $A$ in Equation [4], affects the marginal product of factor inputs in production; it also conditions the effectiveness of the vector of policy inputs in the production of reform. The efficiency parameter may include both fixed and dynamic elements. That is:

$$A = f[A^*, L(t)]$$ [8]

3.20 In Equation [8], $A^*$ represents the set of initial conditions that affect the consequences of reform, causing identical reform programs to be effective in one circumstance and less effective in another. Important differences in initial conditions among countries might arise from (i) an historical legacy of markets and private ownership, (ii) proximity to a familiar cultural milieu where economic patterns embody the objectives of reform, and (iii) physical, social, legal and administrative infrastructure. $L(t)$ represents learning-by-doing, a process through which reform activity equips governments with a better understanding of reform options and a clearer picture of the set of desirable and attainable post-reform institutional arrangements, and teaches individuals and enterprises to respond more effectively to opportunities arising from reform initiatives. The elements of $A$ are described below.

Historical legacy: The system of central planning spanned four decades in China and Eastern Europe, but nearly twice as long in the former Soviet Union. As a result, China and Eastern Europe are more likely than the former USSR to retain elements that may contribute to market-oriented development, including attitudes, experience, and institutional arrangements. We expect that a given reform package, mounted with a particular degree of intensity, may have greater effect in China and Eastern Europe than in Russia or Ukraine. China, for example, called on elderly veterans of pre-1949 banking to reform domestic finance and rebuild links with world financial markets. In this
sense, the threshold level for effective reform may be higher in the former Soviet republics than in either China or Eastern Europe.

**Geographic and ethnic proximity:** Extensive contact with a social milieu that combines familiar cultural attributes with economic success can lubricate the reform process in a similar fashion. Western Germany provides Germany’s eastern regions with an unambiguous model of the post-reform order. Commercial codes and civil laws are in place, and the availability of financial resources, skills and attitudes, easily transmitted through the medium of a similar culture and common language, promise to accelerate the impact of reform in eastern Germany. For China, the presence of Hong Kong, Taiwan and of large, prosperous overseas Chinese communities throughout the Pacific Rim makes China’s partial liberalization of foreign trade and investment far more effective than a comparable policy would be in Russia, Albania, or Rumania (Chen, Jefferson, and Singh forthcoming). A kindred economic model, as well as a favorable historical legacy, can substantially enhance the marginal product of reform.

**Infrastructure:** Economic reform occurs within a complex physical, social, legal and administrative setting. The absence of functional systems of finance, contract enforcement, regulation, taxation, transportation and communications can slow the process of reform.\(^7\) Since the risk, as well as the reality, of unemployment, falling real income, or market failure creates resistance to change, particularly if reform is expected to be sweeping and intense, an undeveloped social insurance system may deny reformers the public support needed to embark on bold initiatives. Finally, the design and implementation of the core economic reforms as well as the routine aspects of government depend on the skill and dedication of a nation’s public administrators, who almost by definition lack experience in every dimension of reform.

**Learning-by-doing:** Advocates of sweeping reform implicitly believe that the recipe for reform is known and transferable among reform-minded countries. The reform package can be shaped with a minimum of local experience. At the other extreme, evolutionists, typified by the Chinese emphasis on the need for reform "with Chinese characteristics," view each nation’s circumstances as unique and therefore in need of a special mix and sequence of reforms. If the gradualist vision is correct, reform might best begin through a series of experiments which give rise to knowledge and experience that can inform the planning of more sweeping changes. Without this orderly feedback, sweeping reform multiplies the likelihood of costly blunders.

3.21 The steepness of a nation’s learning curve depends on the capacity and willingness of government to gather feedback, process the data effectively, and use the information constructively. Participation of the World Bank, IMF and other sources of technical and financial assistance may

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\(^7\) Citing African examples, Klitgaard (1990, p. 171) observes that "Big economic reforms have taken place; prices and exchange rates are 'got right.' But food production has not taken off," because "market institutions, government regulations, and economic infrastructure remain deficient."
contribute to this process. If governments can evaluate the impact of initial reform efforts and make suitable corrections and modifications, they can accelerate the pace of reform without sharply increasing the risk of chaos or disaster.

3.22 We have attempted to identify key properties that define the economic and institutional relationships between various instruments of reform and productivity change, the immediate output of the reform process. However, the description of opportunities cannot provide the full complement of information required to design an appropriate mix and time path of reform measures. To accomplish this, we must specify the costs as well as the benefits of reform.

4. The Dual, Reform Costs, and Uncertainty

4.1 Reports indicating the possibility of mass hunger or of a military coup in the wake of Russia's massive reforms of January 1992 demonstrate the importance of analyzing the costs as well as the benefits of new policies. To do this, we may invoke the duality that links production and cost functions. The mathematical dual of the reform production function discussed above is the reform cost function set out in equation [9]. The dual formulation assumes that the state chooses a trend rate of productivity growth $g^*$ and then selects the least-cost reform package $(X_j, I_j)$ to attain $g^*$ by minimizing:

$$C = f(w_j, I_j) + f(I_j, A) \quad [9]$$

subject to the constraint

$$g^* = f(E_j) = f(f^2(A; X_j, I_j)) \quad [4a]$$

4.2 In Equation [9], $C$ represents the full cost of the reform program; $w_j$ indicates the direct resource cost of implementing the $j$th element of the reform policy vector $X$ at the unit level of intensity, including outlays undertaken at the microeconomic level in response to new circumstances created by policy innovations. The second term of the cost function, $f(\cdot)$, denotes the indirect cost component, which depends on the intensity of reform $(I_j)$ and the efficiency parameter, $A$, reflecting initial conditions and learning.

Direct costs of reform appear in the first term on the right side of equation [9]. Any reform policy involves direct financial outlays ($w_j$) by the state. The government must pay for technical and administrative support needed to design, implement, and monitor its reform initiatives. Investment outlays may also be required. Transferring credit allocation from ministries to banks, for example,
calls for an extensive network of bank branches equipped to collect, process, and store financial information.

4.3 Reform policy at best only creates the conditions for improved productivity at the enterprise level. Taking advantage of new opportunities to raise productivity, whether based on new machines or a new policy environment, typically requires extensive retooling of equipment and organizational systems as factories expand or contract, revamp product lines and production processes, and modify management, inventory, sales, or personnel systems. We include the expense of such changes in the category of direct reform costs. Theories of investment attribute these costs, which, in the context of socialist reform, will far outstrip the outlays required to implement new policies, to "the reorganization and retraining involved in the absorption of new equipment" (Nickell 1978, p. 25).

Indirect reform costs appear in the second term on the right side of equation [9]. They fall into two categories: adjustment costs and social costs.

Adjustment costs reflect the possibility of brief or even extended reductions in output if reform erodes or destroys long-standing systems of procurement, distribution, etc. before new arrangements can fully replace them. These costs correspond to the "myriad teething troubles experienced with new plant" at the micro-economic level (Nickell 1978, p. 25) and to the "J-curve" phenomenon in which a country's trade balance may deteriorate in the initial aftermath of currency devaluation because prices shift more rapidly than quantities. Thus radical reform in Eastern Europe has produced sharp initial declines in employment, output, and productivity (Brada and King 1991). The same tendency appears in New Zealand, which "took a bigger dose of economic reform and restructuring in the 1980s than most other countries" and has suffered five years of stagnant output and high unemployment in its wake (Economist June 15, 1991, p. 36).

Social costs arise from dislocations associated with the transition to a new economic structure, and from the permanent changes in individual, household, occupational, and regional income and wealth that accompany major reforms. Extensive changes in the economic system will endanger, or at least threaten, the life chances, career plans, human and financial assets, occupational security, social position and intergenerational mobility prospects of a large fraction of the populace. Reform of socialist systems is likely to bring about large increases in insecurity, inequality, and downward mobility. These prospects impose psychic and financial costs whose political consequences may constrict the range of feasible policy options, especially, but not exclusively under conditions of political democracy. Social costs represent an important aspect of reform that has no counterpart in the microeconomic theory of business investment. The state must confront problems that individual enterprises are typically free to ignore.
4.4 Direct costs associated with new investments are conventionally represented as a convex function \( f(\cdot) \) of the level of investment, which in our framework means that the growth of direct costs accelerates with rising reform intensity:

\[
\begin{align*}
    f'(0) &= 0; \\
    f''(I) &> 0 \text{ for } I > 0; \\
    f'''(I) &> 0 \text{ for } I > 0
\end{align*}
\]  \[10\]

4.5 In the reform context, convexity of direct costs, which consist mainly of restructuring the stock of physical and organizational capital, may offer important advantages to a gradual approach. A rapid and comprehensive reform which requires immediate abandonment of large segments of society’s existing complement of equipment and social networks may extract an unnecessarily high price. An alternative schedule that spreads reforms over several years, or a Chinese-style dual pricing system in which the share of planned production contracts in a predictable way, might permit a phased transition involving gradual replacement of assets, while motivating long-lived investments consistent with underlying scarcities. In this sense, expectations and credibility enter as critical ingredients in strategies of gradual reform that can serve as partial substitutes for immediate, sweeping change.

4.6 The convexity of the adjustment and social costs combined in the expression \( f(\cdot) \) depends partly on the flexibility of social institutions and economic organizations and partly on society’s degree of risk aversion. Both elements will differ among nations. Economists generally assume that people are risk averse, suggesting that the indirect as well as the direct cost of reform may be a convex function of intensity, with costs accelerating as intensity rises. For China, we have some evidence of extreme risk aversion: one survey found that only 11.7 percent of urban respondents expressed willingness to "accept the risk of being out of a job" in exchange for quadruple wages (Reynolds 1987, p. 156). The peoples of East Europe, on the other hand, appear more willing to accept the severe dislocations associated with intensive reform.

4.7 Social cost involves perceptions and expectations as well as realities. Furthermore, social costs depend on the specific composition of the reform package. In China, for example, labor market reform potentially includes three elements: greater managerial autonomy in hiring and dismissing workers, reform of factor prices to lower the inappropriately high relative cost of urban labor, and reform of the social insurance system (Jefferson and Rawski 1992). A reform initiative limited to increasing managerial autonomy would produce extensive layoffs and high social costs. An enlarged policy package combining added autonomy with price changes that made labor-intensive techniques

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8 Japanese acceptance during the 1930s of military dictatorship in place of democratic politics is often attributed to the consequences of the Great Depression, even though the actual economic impact was slight, with aggregate expenditure falling in only one year (Berger 1977; Nakamura 1987).
more attractive would diminish the net increase in unemployment. Simultaneous measures to expand social services outside the enterprise would further reduce the indirect cost of labor-market reform.

4.8 This example suggests that careful policy design can reduce both the level and the steepness of the reform cost function. The possibility that a single reform could reduce overall welfare invites further study of possible extensions of second-best theory to the analysis of optimal reform strategy.

**Uncertainty:** If governments and citizens are risk averse, as we expect, the existence of uncertainty may fundamentally alter the design of optimal reform programs in directions that we can infer from the analysis of portfolio choice in the presence of alternative investment vehicles.

Portfolio theory suggests several implications for reform strategy:

(a) Diversify the reform program. If a risk-averse investor intends to commit a fixed sum to a market populated by many share offerings having identical expected returns, the best choice, combining the highest expected return with the least variability, is to assign an equal sum to each share offering. The same principle of diversification applies to governments contemplating investment in reform, even though there is no market that can equalize the returns to different policy initiatives. There are, however, potentially significant qualifications surrounding the principle that policy diversification will reduce the variability of outcomes. If there are substantial scale economies associated with specific policies or if the quality of implementation will decline as the range of policy initiatives expands, then the optimum may fall short of full diversification. Policy complementarity, on the other hand, reinforces the principle of diversification in the reform environment. Unless the political system is highly elastic or a single reform effort promises an exceptionally high net return, the presence of uncertainty argues for implementing a variety of reform initiatives at moderate levels of intensity rather than "corner solutions" that push a few policy changes to the limit.

(b) Consider partial reforms. Governments, like individual investors, have limited assets, including political capital as well as discretionary income. Recent events in Eastern Europe have convinced even ardent advocates of rapid marketization that reform will be a lengthy process (Dhanji 1991). Just as the cost of eradicating pollution escalates dramatically as the target approaches zero contamination, efforts to eliminate rather than ameliorate specific distortions will incur high costs by restricting opportunities to attack other obstacles to higher efficiency and productivity.

(c) Seek ways to limit uncertainty and costs. Experimental changes, such as high intensity reform within a limited geographic area or across a limited number of enterprises, allows governments to evaluate the merit of specific policy instruments while limiting both direct and indirect costs. Such experimentation may reduce the risk of major policy blunders by
clarifying the expected level and statistical distribution of returns to specific initiatives. Moreover, this learning process, represented by L(t) in Equation [8], can permit governments to adjust reform strategies to enhance their likely benefit, limit costs and reduce uncertainty.

4.9 Approaching the problem of reform from the dual perspective yields important insights. Reform costs, which depend on the whole reform program rather than individual policy elements, as well as uncertainty, figure in the resolution of the government's problem of creating a reform investment strategy that maximizes the expected present value of society's welfare. A government might sensibly select a reform program that promises a modest long-term rate of productivity growth in order to escape the potentially disastrous short-term costs associated with programs that might lead to higher productivity gains. In choosing between strategies of evolutionary or rapid reform, governments must fashion ways of limiting costs and distributing them over a time path that is consistent with society's tolerance for social dislocation. The introduction of uncertainty leads to the expectation that, under rapid or gradual reform, policy packages should be diverse, avoid extremes, make use of experimentation, and incorporate opportunities for responding to initial experiences.

5. Application: Growing Out of the Plan (China) or Scrapping the Plan (Poland)

5.1 The contrasting experiences of China and Poland illustrate the relevance of our analysis to concrete reform issues. Poland initiated the current wave of radical reform in Eastern Europe, while China is the best example of extended transition. Poland has largely scrapped state planning and the associated controls over production targets, material allocations, and commodity prices. China retains the essential mechanisms of planning on a diminished scale, allowing both state and non-state enterprises to purchase inputs and sell outputs in rapidly expanding and relatively uncontrolled commodity markets. Poland has largely abandoned official management of foreign trade and plans extensive privatization of state firms. China shows no sign of implementing parallel changes. International organizations and the world financial community seem to support Poland's abrupt reforms as well as China's gradualist approach.

5.2 Does this signify "schizophrenia about socialist reform" (Singh 1991) or is there good reason to anticipate sharply differentiated reform strategies in the two nations? Our analysis focuses on differences in initial conditions, available reform techniques, tolerance for reform costs, and uncertainty to explain why one might have predicted that Poland would choose a radical reform approach while China might opt for gradualism.

Initial conditions. Differences in international circumstances, domestic economic structure, and proximity to kindred models act to foreclose the gradual reform option for Poland, but not for China. Poland is a small open economy dependent on imports of basic resources (e.g. natural gas used as
industrial fuel). Lacking strategic importance, shorn of the protection formerly offered by Comecon, and burdened with large external debts, reform "success" for Poland depends crucially on achieving a rapid expansion of hard currency exports to finance essential imports and to demonstrate some capacity to service external debt. Industry, the obvious source of export growth, is burdened with a legacy of tight central control and substantial concentration (Farrell 1991). Relaxation of control will create pockets of extensive market power unless accompanied by simultaneous efforts to stimulate competition.

5.3 China began its reforms with a relatively self-sufficient economy. Rapid growth of grain output following the replacement of agricultural collectives by household farming, which began in 1979, essentially freed the reform process from short-term foreign exchange constraints. Furthermore, China's size and strategic role attracted a surge of international credits from governments, banks, and international organizations in the early years of reform.

5.4 The domestic structure of China's economy is also conducive to a broad menu of reform strategies. Chinese agriculture is neither highly mechanized nor closely dependent upon the cooperation of centrally-controlled industries. This allowed rural reform to precede major restructuring of urban industry. China's rural industries, developed during the 1960s and 1970s (Perkins et al 1977) provided a ready outlet for the immense labor resources freed up by the abolition of collective farms. Even without the reform-induced expansion of rural industry, China's long-standing policy of building a "full set" of industries in nearly every province left a legacy of low industrial concentration. In China, unlike Poland or Russia, relaxation of industrial control promises competition rather than monopoly.

5.5 A unique aspect of China's reform prospect reflects the remnants of China's pre-World War II capitalist development (Rawski 1989), vastly enlarged by post-War success in Taiwan, Hong Kong and Singapore, which hover near China's borders and around the Pacific Rim, providing easy access to the international markets, skills, investment finance and to the cultural attitudes of successful market economies. The resulting benefits magnify the effect of partial reforms to a degree that no transitional economy other than the former East Germany can expect.

Reform techniques. In China, initial conditions encourage sequences of mutually reinforcing reforms that may cumulate over a period of years into substantial changes in microeconomic behavior and aggregate results. The shift to family farming spurred the accelerated growth of rural industry, which in turn contributed to the demise of the state's monopoly over industry (Naughton 1992). With profits (and hence, government revenues) shrinking, state industries face a considerable hardening of budget constraints even though the government remains committed to planning and state ownership. In effect, this sequence of events has emerged as a partial substitute for privatization of state industry.
5.6 Poland’s rural sector is neither large enough nor sufficiently flexible to crack the market power of state-owned industries. Furthermore, the urgent need for rapid development of hard-currency export capabilities creates a high threshold for success that effectively forces Poland in the direction of radical change. The need for rapid achievement of challenging export objectives precludes the sort of policy substitution available to the Chinese. Poland must eradicate any obstacle that seriously threatens export development. Export growth requires macroeconomic stability. The need for stability dictates the abolition of (most) subsidies. In the absence of subsidies, export expansion is unlikely without uncontrolled prices. Even with flexible prices, Poland’s high level of industrial concentration allows many firms to earn substantial profit by "exploiting" an unreformed domestic market. To avoid this, Poland must intensify competition in the domestic market. Competition could come from division and privatization of state firms. Since this would require years to implement, and time is of the essence, Poland turns to a policy of free trade.

Costs of reform. Poles seem willing to bear substantial economic costs from reforms that promise to eradicate a widely despised socio-political system. During the initial phase of Poland’s "big bang," a democratically elected government received the mandate required to initiate sweeping reform. The Chinese, by contrast, especially in the cities (which wield disproportionate political influence), place considerable value on the limitation of income inequalities and the avoidance of destabilizing change.

Uncertainty. China and Poland face different levels of uncertainty concerning the purpose of reform and the effectiveness of specific policy instruments for achieving reform objectives. China is groping toward a vaguely defined mix of market allocation and state guidance that its leaders describe as "socialism with Chinese characteristics." China’s leaders seek the efficiency outcomes associated with market forces but reject the idea allowing the outcome of atomistic competition to determine the distribution of income or the pace and direction of structural change. This suspicion of both the Western and East Asian varieties of capitalism inclines the Chinese to preface large-scale reforms with local experiments.

5.7 The Poles, by contrast, have much firmer conceptions about the kind of social and economic arrangements they wish to create. The Balcerowicz Plan, implemented in January 1990, "seeks to make Poland not unlike the rest of Europe and to base economic development on tested and reliable policies of developed Western economies" (Gomulka 1991, p. 87). Unlike the Chinese, Poland’s leaders and citizens seem quite certain about the means as well as the objectives of reform.

5.8 In summary, we find that Poland’s import dependence, absence of hard currency reserves, and limited access to foreign credits create a situation in which we can identify a core of complementary policies which, if implemented simultaneously and intensively, offer the only hope of generating rapid improvements in economic performance. The clarity of purpose - becoming "like the rest of Europe"
- and the willingness of Poland's citizens to absorb high costs in the name of reform also encourage policy-makers to contemplate large-scale, risky reforms with potentially high payoff. Given Poland's internal and external circumstances, gradualism offers little hope. An extended transition is unlikely to achieve the threshold of "success" before the patience of international suppliers wears out. Gradualism also threatens to fritter away a valuable resource - the public's willingness to suffer in the name of economic reform.

5.9 China faces nothing comparable to the pressures that encourage, perhaps even compel the Polish authorities toward radical change. There is no export imperative, no obvious time constraint, and no immediate need to use trade liberalization to combat domestic market power. In the absence of intense demand for a quick turnaround, lacking a clear vision of the appropriate ends and means for reform, and with a public unwilling to shoulder the cost of wrenching change, it is hardly surprising that China's leaders incline toward gradualism.

5.10 This discussion is not intended to justify the specific reform strategies implemented by either China or Poland. China may be proceeding to slowly; Poland too fast. What this analysis does show is that a comparison of Poland and China from the perspective of our model of reform-as-investment reveals a web of relationships that encourage or even compel Poland to adopt a more rapid and more comprehensive approach to reform than China's. We see no possibility of reversing these arguments and overturning the conclusion that a rapid and comprehensive reform strategy was more likely and more promising for Poland than for China. This example illustrates the capacity of our analytic framework to integrate a wide range of policy options within a single coherent logical structure.

6. Conclusions and Implications

6.1 Economists have developed an extensive body of theory for analyzing the static efficiency costs of specific market distortions. We also have an apparatus, the theory of the second best, for evaluating the static efficiency consequences of imposing or eliminating individual distortions in the presence of additional distortions. There is, however, no general theory relevant to the design of economic reform policies that attempts, either sequentially or simultaneously, to ameliorate or remove multiple distortions, and, by doing so, to raise productivity through improvements in dynamic as well as static efficiency.

6.2 This lack of theoretical perspective is partly responsible for the conflicting policy advice offered in response to the recent explosion of interest in economic reform among the socialist nations of Europe and Asia. Although differences in history, geography, and politics provide ample basis for anticipating varied reform approaches in nations as diverse as China, Germany, Mongolia, Poland,
Bulgaria, and Russia, the "schizophrenia" evident in the international financial community (Singh 1991) indicates that policy recommendations are frequently offered, considered, and accepted without systematic consideration of plausible alternatives. In short, we see a widespread absence of economic analysis in the study of socialist economic reform.

6.3 The central objective of this paper is to develop a framework for policy analysis that is broad enough to accommodate a full range of potential outcomes, to expose the implicit assumptions underlying recommendations for sweeping and for gradual reform strategies, and to establish terms of debate for comparing the relative merits of existing and prospective policy constellations for reform-minded governments. To do this, we view reform policy through the lens of the microeconomic theory of investment.

6.4 Pursuing the analogy with investment theory, we portray governments as seeking to maximize the present value of expected social welfare, for which our proxy is productivity growth arising from improved static, technical, or dynamic efficiency. The state faces constraints arising from limited physical and human resources, from external circumstances, historical legacies, political conditions, and public attitudes, perceptions, and expectations. By considering the selection and implementation of reform policies from an investment perspective, we encounter, in a systematic fashion, every major issue related to the evaluation of reform programs. These issues include the nature of the process by which reform policies (inputs) are transformed into productivity gains (outputs), the direct and indirect cost of reform efforts, and the impact of uncertainty on the design, sequencing, and implementation of reform policies.

6.5 Our analytic framework offers more than a heuristic device for organizing the comparison of alternative reform strategies. The present approach also suggests two avenues of empirical research, simulation and estimation.

Simulation: The use of simulation seems particularly appropriate for investigating the sensitivity of important variables to parameter variation. Relevant parameters might include (i) the relative weights assigned to rising living standards and to social stability; (ii) the discount rate applicable to future living standards; (iii) parameters that define the form of the production and cost functions, including substitution elasticities and parameters related to economies of scale and scope; (iv) the vector of parameters defining initial conditions and the learning-by-doing function; (v) the

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9 Our analysis is limited to economic issues and therefore excludes, for example, the consequences of efforts by government leaders to secure their own political or financial positions.

10 More generally, one might investigate the consequences of additional changes in the objective function, such as over-weighting income changes accruing to low-income regions or social groups.
shape of the cost function; and (vi) the degree of uncertainty. Each parameter affects the optimal mix, intensity and time path of reform, but these outcomes may be most sensitive to variation in a limited subset of these parameters.

6.6 Simulation analysis seemingly offers the potential to establish comparative orders of magnitude of benefits and costs within the reform process. A computable general equilibrium framework, for example, might be used to compare the welfare consequences of price reform (modeled by pursuit of inappropriate objectives under scarcity prices) and incentive reform (profit maximization at pre-reform prices). The value of such studies is illustrated by Repetto’s (1971, chap. 2) discovery that modest delays in the construction of Indian fertilizer plants create social losses in excess of the savings obtained by building according to the best rather than the worst pattern of scale, location, and timing.

Estimation: The reform production function can be viewed as either a macroeconomic or a microeconomic relationship. Reform inputs at the macro level are expected to generate measurable improvements in aggregate productivity. But productivity change occurs in factories and shops rather than government ministries or central bank offices. Ultimately, reform success is a microeconomic phenomenon.

6.7 We can test the relationship between policy initiatives and productivity outcomes using either national aggregates or enterprise data. In practice, the multitude of potential reform measures and the limited set of country observations make it difficult to conduct a statistical analysis at the macroeconomic level. Fortunately, the recent proliferation of enterprise surveys including the data required to measure productivity and to track regulatory changes in a number of transitional economies, can support extensive microeconomic analysis of the reform functions described in this paper.11

6.8 A key issue concerns measurement of the inputs and outputs of reform. In principle, we can decompose enterprise-level productivity change into separate components attributable to changes in allocative efficiency, technical efficiency, and technical change, which we identify as the outputs of the reform process. On the input side, the main difficulty arises in measuring the intensity of various reform instruments. Some reform measures are of a continuous nature, such as the degree of market exposure, profit retention rates, the extent of import protection, and the share of state ownership. Others, particularly those concerning the grant of autonomy, are dichotomous. Examples include the

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11 World Bank (1991a) describes a large cross-national survey effort involving China, Czechoslovakia, Hungary, and Poland. Quantitative studies reflecting the availability of additional survey data for China, Hungary, and Poland, include Komai and Maiti (1984), Byrd and Lin (1990), Schaffer (1990), and Groves et al (1991). Professor Barry Ickes informs us that enterprise survey data also exist for the former USSR.

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authority to export and import directly, rather than through foreign trade companies, or to hire and dismiss workers. A third set of reform measures may be described through the use of indexes. The relationship between an enterprise and its supervisory body, for example, may be coded on a scale reflecting the degree of intervention by the government authority.

6.9 The work of Christensen, Jorgenson, and Lau (1973) permits the use of a flexible production function to approximate multiple output technologies. Quadratic terms in the flexible function also permit the investigation of the scale or intensity effects of individual reform instruments, while interactive terms can reflect the degree of substitutability among specific measures.

6.10 Although both the model and the research directions proposed in this essay focus on the transition problems of socialist economies, the same approach may be applied to any program of systemic reform aimed at reducing distortions that retard the growth of productivity and living standards. Many non-socialist countries maintain large and numerous state enterprises, extensive price controls, substantial barriers to domestic and international trade, disruptive fiscal systems, and unstable macroeconomic environments. As a result, their economies often suffer, although typically to a lesser degree, from the same distortions that have plagued centrally planned economies (World Bank 1991b). Their problems of developing reform strategies closely resemble the challenges facing reform governments in socialist nations (Perkins 1991a). For these nations, as for the socialist states, the reduction of multiple distortions has the potential to produce large welfare gains. In both socialist and non-socialist settings, the consequences of reform, which include costs as well as benefits, unfold in a setting fraught with uncertainty. Each of these elements is essential to either positive or normative analysis of economic reform in any setting.
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