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## The Devolution of Centrally Planned Economies<sup>1</sup>

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Estimates of the opportunity for catch-up growth reveal that the centrally planned economies performed relatively well in the early postwar period, but that their performance compared to that of the market economies deteriorated over time. The theory of encompassing interests explains why the gains to a dictator from a more productive domain can initially lead to rapid growth. Yet as time goes on, groups of subordinates overcome the difficulties of collective action and collude, especially by restricting the information given to the center. This collusion generates an institutional sclerosis that is even more pronounced than that observed in market economies. *J. Comp. Econom.* June 1991, 15(2), pp. 239-265. University of Maryland, College Park, Maryland 20742. © 1991 Academic Press, Inc.

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Allen W. Dulles, director of the Central Intelligence Agency, said today that it was important to take Soviet economic ambitions and claims seriously . . . "If the Soviet industrial growth rate persists at 8 or 9 per cent per annum over the next decade, as is forecast, the gap between the

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two economies in 1970 will be dangerously narrowed . . ."

*New York Times*, November 14, 1959

## 1. INTRODUCTION

Modern economic theory gives relatively little attention to the evolution of economies and to secular change. As others have noted, economic theory is more like Newton's physics than like Darwin's theory of evolution; it tends to take tastes, technologies, and institutions as given and then to examine the efficiency of resource allocation within a static framework.

Not surprisingly, the lack of focus on evolution has also been true of analyses of centrally planned economies and of comparisons of these economies with market systems. Economists have often analyzed the advantages and disadvantages of Soviet-type economies, but generally they have not examined the way in which these economies evolve or considered the possibility that central planning would work relatively well over one time horizon and relatively badly over another. Despite Marx's commendable emphasis on economic evolution, Marxist analyses of Soviet-type societies also have not succeeded in developing an impressive understanding of how these economies change over time.<sup>2</sup>

The present inquiry into the evolution of centrally planned economies is inspired by previous work of the authors on the aging process in market economies. One of us has argued that, whereas firms or coalitions for production can be organized quickly, coalitions that seek distributional advantage through cartelization and lobbying take a long time to emerge because they have to overcome the difficulties of collective action (Olson, 1982). This implies that long-stable societies with unchanged borders tend to develop an "institutional sclerosis" that limits their economic growth. The other author has found that this process appears to work within industries in that, even in a long-stable environment, the growth of new industries is apparently not greatly handicapped by coalitions, unlike in long-established industries (Murrell, 1983).

We ask whether or not the centrally planned economies are exempt from this aging process. Clearly, the big lobbying organizations, independent trade unions, and similar sorts of formal organizations characteristic of Western democracies have not been part of Soviet-type societies. But less formal and conspicuous groups and collusions have been, as Brzezinski and Huntington

<sup>2</sup> Marx described his work as doing for social life what Darwin's theory of evolution did for biological life and he asked Darwin if he would mind having *Das Kapital* dedicated to him. Yet, apart from saying that the dictatorship of the proletariat would evolve into a classless, stateless society, Marx said almost nothing about how socialist societies would evolve.

(1964, p. 75) observed: ". . . the Soviet system has lost some of its freedom to mold the society, especially since it can no longer entirely disregard the complex industrial and urban interests, which have developed considerable institutional and group cohesion." Do these less conspicuous interests produce an aging process analogous to that in Western societies? If so, do the centrally planned economies lose more or less output as they age? We offer a framework for analyzing the evolution of Soviet-type societies and use it to answer these questions.

There is one way in which the time dimension has surfaced in previous analyses of Soviet-type societies, when capital accumulation is considered. These societies have usually had higher rates of investment and savings than market economies. This high savings and the related emphasis on heavy industry, surely made the early growth rates of the Soviet-type economies higher than they would otherwise have been. Our theory of the evolution of Soviet-type societies, presented in Sections 5 and 6, shows that the high savings rates follow directly from the incentives facing the leaders of the centrally planned societies.

The theory also shows that, despite the early successes deriving partly from high investment levels, the growth rates of Soviet-type societies slow down over time because of a gradual accretion of informal coalitions and interest groups. In Section 6, we provide a model of the way in which such coalitions and interests reduce the effectiveness of a central planning system. Our conceptual framework similarly explains the puzzling growth of the perquisites and privileges of the "new class" and why the strongest demands for reforms paradoxically originate mainly from the apex and from the base of the social pyramid in the centrally planned societies.

We begin the analysis with an examination of how the relative performance of the centrally planned and the market economies has changed over time. If one type of economic system always performs better than another and its advantage is stable over time, then the divergence in performance is due to inherent differences in the economic systems. By contrast, if the relative performance of the two systems differs substantially as time goes on, then one of the systems must deteriorate more quickly or improve more slowly than the other.<sup>3</sup>

Some may say that the answers to our questions are obvious: the recent repudiation of communist regimes and parties and the absence of anything comparable in the early periods of centrally planned regimes prove that the Soviet-type economies are working less well in recent years than they did earlier. This casual conclusion does not, however, exclude the possibility that

<sup>3</sup> If this second pattern prevails, the two systems could also differ in some inherent respects, but these enduring differences would show up in average long-run performance or in other dimensions of measurement.

random factors, such as accidental differences in the personalities or policies of Soviet leaders, account for the dramatically different political outcomes in different periods. Were the collapses, in 1989, of the regimes that had appeared so imposing in the 1950s the result of a gradual process of decay? We obviously need systematic quantitative evidence on how the performance of the planned and market economies changed over time. To obtain this evidence, we develop a framework that allows us to estimate how far an economy has fallen short of its potential growth rate and how much that shortfall has changed over time. We develop this framework in Sections 2 and 3 and then present the empirical results in Section 4. The latter half of the paper then provides the theoretical conception that explains these results, that is, a theory of the evolution of the centrally planned economies.

## 2. CATCH-UP POTENTIAL AND THE GROWTH FRONTIER

How should the relative performance of the centrally planned and the market economies be measured? The performance of an economy is measured both by the level and by the rate of growth of per capita income, and each of these measures is biased in the opposite direction from the other.

If all economies and economic systems had the same starting point, then levels of per capita income would be the proper measure of their economic achievements. The same state of basic scientific knowledge is available to all of the nations of the world, since this knowledge is inherently a nonexcludable and nonrival public good. Most commercially useful technologies and ideas are also only imperfectly patentable and cannot normally be kept secret for long. Endowments of natural resources differ across countries, but even a casual glance at the developed and developing countries suggests that these differences explain very little of the variation in levels of development. Therefore, we assume that potential income, the per capita income level that would be achieved with ideal institutions and policies, is much the same for all of the countries of Europe.

The starting points of the economies at issue have, on the other hand, often been different. In 1945, the economies of East Europe had per capita incomes lower than that of the United States, for example. Thus, it would be unfair to judge the performance of the centrally planned economies simply by the observation that their current per capita incomes are below the United States' level.

Since some countries have a lower starting per capita income but about the same potential per capita income, their opportunity to grow, the rate of growth they could achieve if they had ideal arrangements and policies, is greater. Thus the rate of economic growth is a measure of performance that is biased in favor of the countries with a low starting point, just as the level of per capita income is biased in favor of those with a high starting point. To

measure the extent to which countries have realized their economic potential, we must adjust their rates of growth to account for the greater possible increases in per capita income of the countries that are farther below their potential. We must, in other words, take the opportunities for catch-up growth into account.

We do not treat catch-up as an explanation or theory of growth, but only as a measure of the opportunity for growth. Because of this, and our emphasis on institutions and policies as determinants of economic performance, our approach differs considerably from the prior catch-up literature (e.g., Baumol (1986) and Abramovitz (1990)). We assume that low-income countries on average have institutions and policies that are less favorable to economic performance than those of high-income countries. We also would not be surprised if there were some degree of persistence in the quality of economic institutions and policies. Under these assumptions there will be a negative correlation between the quality of institutions and policies, on the one hand, and the opportunity for economic growth, on the other. The net outcome of the countervailing influences can then easily be a positive relationship, a negative relationship, or no relationship at all between levels and rates of growth of per capita income.

Our argument therefore predicts that the highest rates of economic growth will be in that subset of the relatively low-income countries that have lately obtained institutions and policies that are relatively favorable to economic growth and that the highest income countries will not have very high rates of economic growth. But we make no hypothesis about any general relationship between the levels and rates of growth of per capita income across all countries of the world.

The predictions of our argument are confirmed by experience ever since the industrial revolution in Great Britain. The fastest rates of economic growth in the second half of the 19th century were in a subset of the countries that then had per capita incomes significantly lower than that of Britain, but not in Britain itself. After the United States became the country with the highest per capita income, its growth rate has also not been as high as that of some less prosperous countries. The fastest rates of economic growth in the last couple of decades have also not been in countries that have a per capita income almost as high as that of the richest country, but in a subset of the relatively low-income countries, most notably the "gang of four" on the Pacific Rim. At the same time that some relatively low-income countries attain the highest growth rates by prompt adoption of the technologies and arrangements of high-income countries, there has not been any clear tendency across the world as a whole for low-income countries to grow much more rapidly than high-income countries. This pattern of evidence is entirely consistent with our argument that low-income countries always have greater opportunities for growth than high-income countries, but that many

low-income countries do not have the institutions and policies needed to take advantage of these opportunities.

In accord with the foregoing perspective, we compare the extent to which centrally planned economies, on the one hand, and market economies, on the other, have achieved their potential rates of economic growth. We do this by estimating the opportunity for catch-up growth and then relating actual growth rates to these estimated opportunities. We begin our analysis of whether the centrally planned economies were exempt from the institutional sclerosis that afflicted the market economies by determining whether their capacity to take advantage of their opportunities for growth deteriorated gradually over the postwar period.

### 3. ESTIMATING THE CATCH-UP FRONTIER

The simplest catch-up model is

$$g_{it} = \alpha + \beta y_{it} + e_{it}$$

where  $g_{it}$  is the percentage rate of growth of country  $i$  during time period  $t$ ;  $y_{it}$  is the relative level of per capita GDP of country  $i$  at the beginning of time period  $t$ ;  $\alpha$  and  $\beta$  are parameters; and  $e_{it}$  is an error term. To capture the catch-up potential in a consistent manner across time periods,  $y_{it}$  is formulated as the ratio of country  $i$ 's level of per capita GDP at the beginning of time  $t$  to the per capita GDP of the country with the highest technological level at the beginning of  $t$ . For the years covered by our sample, this country is obviously the United States.

Since we view the true catch-up model as a frontier relationship, we attempt to find the potential for growth of a country with few institutional barriers to growth. The large majority of countries will fall well below the frontier. Therefore, we assume that the error term,  $e_{it}$ , is distributed over the range zero to minus infinity.<sup>4</sup> This assumption also emanates from our earlier hypothesis that institutional factors are of overwhelming importance in determining a country's actual growth performance.<sup>5</sup> It is likely that truly

<sup>4</sup> For a discussion of the various types of assumptions that could be made see, for example, van den Broeck et al. (1980).

<sup>5</sup> The case for this assumption was enhanced during some experimental attempts to apply a two-component error model to the catch-up data. That model, given the error distribution specifications commonly used, works best when the one-sided component of the error term is such that observations bunch close to zero. Our data did not conform to this type of bunching. Nor do we expect this type of bunching given some elementary observations concerning the closeness of countries to their catch-up potential. It seems that most people's observations would be the same as ours: that the real challenge of comparative growth analysis emanates from the fact that there are so few countries that match the performance of West Germany in the 1950s or 1960s or of Japan in the last 40 years and that there are so many countries that fall considerably below this level of performance.

random factors are rather small in importance, especially when one chooses a sample of countries from within a fairly narrow geographical region that has some common cultural heritage.<sup>6</sup>

If we also assume that the factors retarding growth are independent of the country's relative level of per capita GDP, the error term is distributed independently of  $y_{it}$ .<sup>7</sup> Then, as Judge et al. (1985, p. 827) point out, the  $\beta$  term in the above equation can be estimated using least squares. However, it is not possible to differentiate between the mean of the  $e_{it}$  and the parameter  $\alpha$ : the real world does not generate enough information to fix the level of the catch-up relationship. The reason for this indeterminateness is simple. It is eminently plausible that all of the countries in the sample are below the frontier. Given this, there is no information in the sample concerning the extent to which all countries lie below the frontier. We can only estimate variation in the degree to which each is below the frontier.

There is a means of sidestepping this indeterminacy that is quite satisfactory for the present purpose. First, we obtain initial estimates of the slope and intercept of the catch-up relationship using ordinary least squares without imposing the restriction that the error terms must be nonpositive. Call these  $\hat{\alpha}^0$  and  $\hat{\beta}$ . The estimate of  $\beta$  from such a procedure is satisfactory, but the estimate of the intercept of the frontier relationship must be revised. The initial step in this procedure is to calculate estimated error terms as  $\hat{e}_{it} = g_{it} - \hat{\alpha}^0 - \hat{\beta}y_{it}$ . We then assume that the country with the best catch-up-adjusted growth performance actually lies on the growth, i.e., the catch-up possibility, frontier. Then we find the country and time period for which  $\hat{e}_{it}$  is largest. Call this the  $ks$  observation. The final estimate of  $\alpha$  is found as  $\hat{\alpha} = \hat{\alpha}^0 + \hat{e}_{ks}$ .

Although this procedure does not necessarily capture the true frontier, which no country might have obtained, the estimate does seem reasonable in terms of the objectives of the present exercise. The catch-up frontier in this definition depicts a level of performance that is manifestly attainable; at least one country in the sample has achieved a frontier level of growth. Thus the estimates of lost output that we present in the ensuing pages at least do not exaggerate the extent of the problems on which we focus.<sup>8</sup>

<sup>6</sup> The one major exogenous factor that might be important at the economywide level is the supply of natural resources. However, one has the impression, contrast East Asia to Latin America, that this plays a rather small role in determining growth performance in the modern world.

<sup>7</sup> This is an important assumption whose basis is discussed in subsequent sections.

<sup>8</sup> Several countries, with differing systems and at different levels of development, are close to the catch-up frontier. Moreover, in the present exercise, we restrict the sample to European countries. It seems unlikely that one can argue that there is one deviant country in this group that performs at a level that is simply unattainable by the other countries, whatever the structure of their institutions. If one included the East Asian countries in the sample, the frontier would be placed in a much higher position, thus emphasizing the intrinsic attainability of this lower frontier obtained from European data.

The description of the procedure so far has assumed that the institutional effects on performance are independent of beginning per capita incomes,  $y_{jt}$ . Given our previous arguments, this assumption might not be plausible. In a period of slowly evolving institutions, the deleterious effects of those institutions on previous growth, and therefore beginning per capita income, will be similar to the effects on future growth. Hence, the correlation of  $\epsilon_{jt}$  and  $y_{jt}$  is likely to be present in a sample of countries for which relative stability is a feature of both past and present.

We largely avoid this troublesome correlation by the way in which we draw our sample. We focus on a period of time and a region in which there was institutional destruction that was, from our economic perspective, exogenous. Such exogenous institutional destruction would have tended to destroy the correlation between the growth retardant effects of an existing set of institutions and the beginning level of per capita income,  $y_{jt}$ . The institutional destruction at issue was that which resulted in Europe from the Second World War. Hence, we have chosen to examine the growth performance of European countries beginning in 1950. We include all European countries for which the appropriate data on GDP per capita existed from 1950 onward.<sup>9</sup> This gives 26 countries, 18 market economies and 8 centrally planned economies. They are listed in Table 1.

This sample is, from a geographical and cultural point of view, fairly homogeneous. Homogeneity is important because our idea of a frontier catch-up relationship implies that all countries could, with ideal institutions and policies, ultimately attain similar levels of per capita income. More generally, this assumption means that exogenous factors are not crucial in determining a country's actual growth performance. The more similarly situated the countries, the more realistic this assumption. The disadvantage of restricting the sample to Europe is that the information in some pertinent observations

<sup>9</sup> Some of the European countries were neutral and Great Britain was neither occupied nor defeated in World War II, and thus some of the countries in the example largely escaped the institutional destruction. For these countries, the beginning level of per capita income and institutional impediments to growth may well have been correlated. Some of these countries, Portugal, Spain, and Ireland, were not relatively high-income countries in the Europe of 1950, whereas others, Switzerland, the United Kingdom, and Sweden, were, and this reduces the extent of the problem. Another possible difficulty arises from the fact that the centrally planned countries had, on average, per capita incomes lower than those of the market economies of Europe in 1950 and also in 1965. Thus there was some slight association between an institutional difference that might have affected growth rates and initial levels of per capita income, but it is difficult to see from the data how this could have introduced any very large error into our estimates. Another possibly offsetting consideration is that all of the centrally planned economies, but only some of the market economies, suffered major institutional destruction because of World War II and its aftermath. These and other difficulties suggest that our estimates must be taken as rough approximations, but there is no reason to suppose that they call the basic qualitative conclusions of this paper into question.

in other parts of the world is not exploited. However, a thorough worldwide inquiry into the opportunity for catch-up growth that makes the proper allowances for heterogeneity is a large task of only moderate importance for the present purpose, so we restrict ourselves here to the more nearly homogeneous European sample.

It is generally agreed that the best data for international per capita income comparisons are those of Summers and Heston (1988), which we use.<sup>10</sup> Unfortunately, there are uncertainties about how accurate any existing data series is in comparing the per capita incomes of the Soviet-type and market-type economies. If the data are systematically biased about the relative rates of economic growth or the relative per capita incomes levels of the two types of economies, this could introduce significant biases into our estimates. There is nothing we can do to eliminate this problem, but we see that our basic qualitative conclusions hold even if the best-known criticisms of the data we use are accepted.

In order to answer the question we posed earlier about whether there was any change over time in the relative performance of the centrally planned and market economies in taking advantage of their varying growth opportunities, growth figures were calculated for two periods of equal length, 1950–1965 ( $t = 1$ , in the above notation) and 1965–1980 ( $t = 2$ ).<sup>11</sup> Hence, there is a total of 52 observations. It is natural to ask whether the catch-up relationship changes between time periods, and this is also a question of some interest in the existing literature (see Dowrick and Nguyen, 1989). In contrast to previous research, we take it as our maintained hypothesis that the frontier catch-up relationship has not changed over time, although the average catch-up relationship might have changed, for reasons offered by Olson (1982).<sup>12</sup> It is important, when one is trying to estimate the extent to which countries have lived up to their potential, to keep these two types of relationships, and changes therein, separate.

Given that each country appears in the sample twice and given that many of the growth retardant factors present in a country in time period 1 are likely to be present also in time period 2, one must take into account intercorrela-

<sup>10</sup> We used the figures on real GDP per capita in 1980 international dollars, which were the only ones available for both market and planned economies.

<sup>11</sup> The Summers–Heston data run from 1950 to 1985. The reasons for the choice of the 1950–1965 and 1965–1980 time periods are given in the Appendix. The Appendix also calculates the identical results for the 1950–1970 and 1965–1985 time periods, which we view as less reliable for reasons discussed therein. The essential qualitative features of the two different sets of results are identical.

<sup>12</sup> It is not possible to test this hypothesis, given present data availabilities. The slowdown of all countries cannot be distinguished from a change in the frontier. As it turns out, however, our statistical analysis shows that even the average frontier relationship does not change between 1950–1965 and 1965–1980. This is consistent with the results of Dowrick and Nguyen (1989).

tions among the error terms. That is,  $e_{1i}$  will be correlated with  $e_{2i}$  for each  $i$ . The standard technique under such circumstances is Zellner's seemingly unrelated regression estimator, which was used to estimate the catch-up relationship.<sup>13</sup> The estimate of  $\beta$  was 97 ( $t$  statistic of 15.59) and that of  $\hat{\alpha}^0$  was 118 ( $t$  statistic of 6.91).<sup>14</sup> The value of  $\hat{\alpha}$  was then obtained by positioning the final frontier so that it passed through West Germany's observation for 1950-1965. Using the Bulgarian or East German observations would have given essentially the same results. This implied adding 0.52 to  $\hat{\alpha}^0$ . The following estimate of the catch-up frontier then results:

$$g_{it} = 170 - 97y_{it}$$

For purposes of interpretation, one should remember that  $g_{it}$  is the percentage increase in GDP per capita over a 15-year period and  $y_{it}$  shows the beginning relative level of per capita GDP on a scale from zero to one. Thus, for example, a country with a per capita GDP at the United States' level would be on the frontier with 73% growth over a 15-year period, 3.7% per annum, but a country with a per capita GDP at half the level of that of the United States would have a frontier growth of 121%, 5.4% per annum.

#### 4. THE CHANGING RELATIVE PERFORMANCE OF PLANNED AND MARKET ECONOMIES

The frontier catch-up relationship can now be used to interpret the performance of individual economies and in particular to compare the behavior of market economies and centrally planned economies. We begin with growth performance from 1950 to 1965, which is summarized in Table 1. The second column of this table lists the average per annum growth rates achieved over the 15-year period by each country. The third column tabulates the growth rates that would have put each country on the catch-up frontier. The fourth column shows how far the country fell below its catch-up potential. In order to obtain a more vivid impression of the effect on economic welfare of the shortfall from potential growth, the last column of the table shows lost production as a percentage of actual production, the percentage by which 1965 per capita GDP would have been higher had each country achieved its catch-up potential. Thus, from that last column of Table 1, one sees that the failure to achieve catch-up potential cost the European market economies over 29% of their potential output in 1965. Moreover, for individual economies the effect is even more striking. British citizens might have been 50%

<sup>13</sup> Seemingly unrelated regressions are a generalization of least squares. Hence, the previous comments on the appropriateness of least-squares methods also hold for this technique.

<sup>14</sup> The  $R^2$  between observed and predicted values was 0.50 for the 1950-1965 observations and was 0.46 for the 1965-1980 observations.

TABLE 1  
ACTUAL GROWTH RATES COMPARED TO FRONTIER GROWTH RATES, 1950-1965

	Actual growth rate	Predicted catch-up growth rate	Growth rate shortfall	% Increase in 1965 per capita GDP if country had achieved frontier catch-up growth during 1950-1965
Austria	4.80	5.86	1.06	16.30
Belgium	3.07	5.32	2.25	38.33
Denmark	3.22	4.93	1.71	27.97
Finland	3.95	5.65	1.70	27.60
France	3.89	5.48	1.60	25.68
Greece	5.28	6.44	1.15	17.77
Iceland	3.23	5.26	2.02	33.76
Ireland	2.53	5.98	3.45	64.27
Italy	4.90	6.03	1.13	17.48
Luxembourg	1.65	4.37	2.73	48.73
Netherlands	3.35	5.35	2.00	33.23
Norway	3.32	5.15	1.83	30.17
Portugal	4.64	6.46	1.82	29.48
Spain	5.07	6.16	1.08	16.62
Sweden	3.26	5.06	1.80	29.67
Switzerland	3.33	4.59	1.26	19.95
United Kingdom	2.29	5.06	2.76	49.19
West Germany	5.67	5.67	0.00	0.00
Market economy average	3.75	5.49	1.74	29.23
Bulgaria	6.05	6.30	0.25	3.65
Czechoslovakia	3.06	5.48	2.42	41.58
East Germany	5.91	5.95	0.03	0.47
Hungary	3.78	5.91	2.13	35.58
Poland	2.87	5.92	3.06	55.17
Romania	4.79	6.40	1.61	25.65
USSR	4.05	6.01	1.96	32.31
Yugoslavia	4.92	6.39	1.47	23.23
Planned economy average	4.43	6.05	1.62	27.20

better off and Irish citizens more than 60% richer had their countries performed to potential.

The most important conclusion from Table 1 from the point of view of the present exercise comes from observations on the comparative growth performance of the centrally planned economies and market economies. If the underlying Summers-Heston data are accurate, there is, in fact, little to distinguish the performance of these two sets of economies between 1950 and 1965. Two planned economies, East Germany and Bulgaria, performed

about at potential; two, Poland and Czechoslovakia, performed very poorly. However, on average, the centrally planned economies were approximately the same degree below their catch-up potential as the market economies. One natural interpretation of the data for this period is that the higher rates of savings and investment of the Soviet-type economies were sufficient to compensate for any relative weakness that there may have been in their economic systems.<sup>15</sup> Unless the data greatly understate the beginning relative income levels or overstate rates of growth of the centrally planned societies, these societies did about as well at exploiting their opportunities for growth from 1950 to 1965 as did the market economies. There may be a bias across economic systems in the underlying data, but the cross-country variation in performance within each type of economic system is so large compared to the variation in performance across the two economic systems that it seems unlikely that any plausible bias in the data would totally alter this result. Thus it appears that, when they are first adopted, Soviet-type economies can achieve approximately the same growth performance as can Western market economies.

We now turn to the operation of the systems over the period 1965 to 1980, summarized in Table 2. The method of construction of the information in the second through fifth columns of this table is exactly the same as that for Table 1. By comparing the fourth columns of the two tables, we can see that the performance of the market economies relative to the catch-up frontier does not appear to change.<sup>16</sup> But this is clearly not true for the centrally planned economies, whose growth rate is now 2.48% per annum below the frontier, in contrast to only 1.62% below in the 1950-1965 time period. The only country with significantly improved performance was Yugoslavia, where important reforms had been implemented at the beginning of the 1965-1980 period.<sup>17</sup>

<sup>15</sup> Comparable figures on investment are not available in the detail required for the formal integration of investment costs into the present exercise.

<sup>16</sup> At this point, one can see the value of comparisons guided by the catch-up frontier and also some limitations of our sample of catch-up countries. In comparing the first columns of each table, one notes that actual growth rates in the market economies have declined by over 10%. But since these countries are relatively richer than the United States in 1965 than 1950, their opportunities for catch-up growth are less and some decline is expected. At the same time, if the theory we use in this paper is correct, there was more sclerosis in the European economies after 1965 than in the earlier period and this made these countries exploit their opportunities less well. Since we used the experience of these countries to estimate the slope of the frontier catch-up relationship, this consideration could somewhat distort our estimate of the slope. The post-1965 European countries were relatively richer than the United States and also more sclerotic, and thus we may have somewhat underestimated the catch-up opportunities of the higher income countries. This problem could not call our basic conclusions in this paper into question, but it does imply that the quantitative calculations must be taken as approximations.

<sup>17</sup> Poland showed marginal improvement, but it had been the worst performer in 1950-1965 and also was paying for its improvement with a vast accumulation of debt, which began wreaking its vengeance only at the end of the period covered by this statistical exercise.

TABLE 2  
SLOWDOWN AND ITS COSTS IN MARKET AND PLANNED ECONOMIES, 1965-1980

	Change in growth in 1950-1965 to performance, 1965-1980	% Increase in 1980 per capita GDP if country had achieved frontier catch-up growth during 1965-1980	Growth rate shortfall	Predicted catch-up growth rate	Actual growth rate	
	-4.94	23.66	1.48	5.32	3.83	Austria
	-5.56	37.53	2.20	4.50	2.30	Belgium
	-2.88	26.13	1.62	5.22	3.61	Denmark
	2.88	18.79	1.20	5.00	3.80	France
	1.00	19.73	1.77	6.18	4.92	Greece
	6.07	27.86	1.71	4.90	3.20	Iceland
	13.62	42.83	2.49	5.91	3.42	Ireland
	4.69	24.45	1.53	5.57	4.05	Italy
	12.36	28.99	1.76	4.53	2.77	Luxembourg
	5.57	38.09	1.72	4.98	3.26	Netherlands
	15.45	12.09	0.79	4.74	3.95	Norway
	5.40	23.44	1.48	6.27	4.79	Portugal
	-10.35	29.98	1.83	5.75	3.92	Spain
	-8.82	43.68	2.50	4.65	2.15	Sweden
	-17.96	43.98	2.50	4.01	1.52	Switzerland
	2.96	45.64	2.60	4.97	2.37	United Kingdom
	-27.01	27.01	1.66	4.74	3.09	West Germany
	-0.19	29.29	1.76	5.13	3.36	Market economy average
	-45.05	30.70	2.85	5.85	2.99	Bulgaria
	-4.86	50.75	2.84	5.23	2.39	Czechoslovakia
	-35.14	35.84	2.13	5.19	3.07	East Germany
	-15.12	58.51	3.19	5.61	2.41	Hungary
	1.71	54.10	3.01	5.79	2.79	Poland
	-6.02	34.34	2.07	6.17	4.11	Romania
	-8.60	45.79	2.62	5.71	3.08	USSR
	5.96	16.84	1.10	6.14	5.05	Yugoslavia
	-13.39	43.36	2.48	5.71	3.24	Planned economy average
	-16.16	47.15	2.67	5.65	2.98	(without Yugoslavia)

The effects of slowdown are depicted in the last two columns of Table 2. The penultimate column shows the difference between the amount by which a country fell below its catch-up frontier in 1950-1965 and the same figure for 1965-1980. This is a measure of the decline in growth performance, adjusted for the fact that the growth performance of a relatively richer country would be expected to decline somewhat. Growth performance for the centrally planned economies fell by nearly one percentage point per annum. The last column depicts the costs of this slowdown. The per capita GDPs of the East European countries would have been over 13% higher in 1980 had these countries achieved the same level of growth efficiently during the 1965-1980 time period as they had during 1950-1965. If we exclude Yugoslavia, which during 1965-1980 was neither a market-capitalist economy nor a planned economy, the comparisons show even stronger differences between the two sets of economies. The shortfall in the catch-up adjusted per annum growth rate of centrally planned economies grew from 1.62 to 2.67% and these economies show a loss due to slowdown of 16% of GDP in 1980.

What features of the growth record in Tables 1 and 2 differentiate the performance of the market economies and centrally planned economies? It is apparently not the ability of the economic system to reach the frontier at some stage in the system's life cycle, as evidenced by relative performance in 1950-1965, but rather the extent to which performance declines over time. These results suggest that the centrally planned economies are by no means exempt from a sclerotic process analogous to that which we have observed in market economies (Olson, 1982; Murrell, 1983). Indeed, the foregoing evidence suggests that the decadence is more serious in Eastern Europe than in the Western democracies. It is, moreover, extremely unlikely that this finding could be an artifact of any shortcomings in the underlying statistics; the statistics would need to understate the relative performance of the Soviet-type economies much more, or to overstate it much less, as time went on to account for this result.

We argued earlier that a systematic evaluation of whether the centrally planned economies were falling farther behind their economic potential as time went on might help us understand whether the dramatic recent events in East Europe were overwhelmingly due to random factors, such as changes in political leadership, that might, in turn, have had no relation to Soviet economic performance. Though random factors obviously played a role, the foregoing results suggest that there was an important systemic element in the political changes in East Europe. Our comparisons suggest that it is plausible that many people were persuaded in the 1940s and 1950s that the centrally planned economies would ultimately surpass the market economies, but that in more recent years the observation of these economies naturally generated a sense that they were flawed or decadent. As a famous student of the French Revolution, Albert Mathiez, pointed out, "Revolutions, genuine rev-

olutions, not those which simply change the political forms and members of government but those which transform institutions and alter property relations, advance unseen for a long time before bursting into the sunlight impelled by some fortuitous circumstance."<sup>18</sup>

## 5. THE MECHANISM OF GROWTH

Why does the performance of centrally planned economies decay over time? We cannot go into every reason here, but we offer a conception or model that explains the main reason why Soviet-type societies ran down over time and at the same time provides insight into why and how they grew as rapidly as they did in their early years. We start with the logic that explains the earlier relatively rapid growth.

While distortions of incentives in Soviet-type economies have been widely discussed, one incentive that was once extraordinarily favorable to their economic growth has been overlooked. In a traditional Soviet-type society, there is often one person who faces an incentive to make the economy grow rapidly stronger than that faced by anyone in a typical democracy. This person is the leader with dictatorial power. Consider Stalin. At least to an approximation, he controlled the Soviet Union just as the owner of a firm in a market economy controls his firm. He had, as it were, a property right in his society that democratic politicians did not have in any of the societies of the West. Just as the owner of a firm has an incentive to make the firm as valuable and productive as possible, so Stalin had an incentive to make the domain he owned as productive and wealthy as he could. Clearly, his power, prestige, and international influence were increased if the Soviet economy performed better and diminished if it performed less well.

In more general terms, any leader with complete control over a society has an "encompassing" interest in the productivity of that society. An encompassing interest in a society is any interest whose stake is large in relation to the society as a whole (Olson, 1982). The big labor union or the one dominant business organization in Austria, Norway, or Sweden tends to pay more attention to the countrywide impact of its policies than does the typical union or trade association in Britain or the United States. The reason is that its membership encompasses such a large part of the income-earning capacity of the society that this membership will get much of the gain from any improvement in national productivity and bear much of the loss from any social inefficiency. By contrast, each of the lobbying and cartelistic organizations in the English-speaking countries normally includes such a minute percentage of the society that it is rational to ignore the impacts of its policies on the national economy. To the extent that Stalin could, after providing for

<sup>18</sup> As quoted in de Soto (1989, p. 231).



the maintenance of the labor force, choose to dispose of Soviet output as he pleased, he had a totally encompassing interest, and thus a powerful incentive to make his domain as productive as possible.

By and large, the foregoing argument also applied, until fairly recently, to the other centrally planned societies and also to any periods in which societies were in fact controlled by politburos of small membership. The number of members in each Politburo was so small and their memberships, most of the time, were so stable that they could normally overcome the difficulties of collective action and act approximately as optimizing bodies. So if a General Secretary did not own the society, a Politburo of small membership did, and this body then had an incentive to maximize economic performance.

It is obviously better to be the leader of a powerful and wealthy domain than of a poor and weak one. This is evident from the behavior of the dukes and kings of earlier times and from the efforts of leaders of the Warsaw Pact countries to play a major role on the world stage. The influence of a leader in world affairs depends decisively on a country's industrial, scientific, and military strength but not necessarily on the level of welfare of its consumers. For example, the USSR has in most of the postwar years been approximately as influential as the United States, notwithstanding the far lower quantity, quality, and variety of consumer goods available to its citizens, and this is mainly because it appeared to have the industrial and scientific base and military capacity needed to be a superpower.

Even anticipated future increases in a country's power have a considerable present value in current international competition, especially if the official ideology agrees that the society is the portent of the future and that rival social systems are destined for the dustbin of history. In large part, for this reason, the proprietors of the centrally planned societies, because of their encompassing interest, devoted larger percentages of output to savings and investment than the market economies did and gave relatively more emphasis to science, technology, and heavy industry. The long tenures that the leaders of the Soviet-type societies enjoyed until recently also provided an incentive for an unusually high level of investment. The consumers and voters in a society with an effective democracy and a market economy save only to the extent that they believe the discounted future utility of the monies invested will exceed the utility that they would have received from the consumption foregone. Autocratic leaders will, of course, also be concerned about their own current consumption, but even if their sumptuary styles should be exceptionally grand, the resources needed to provide for their personal consumption are bound to be small in relation to the output of a nation; it is the leaders' interest in power, prestige, and international influence that is important.

In a secure dictatorship, then, the consumption of ordinary citizens need be no higher than the leader determines is necessary to ensure a healthy and

productive workforce. The remaining resources will be devoted to increasing the satisfaction the General Secretary obtains from both the present and the prospective strength and prestige of his domain. Thus the encompassing interest of the leader of a Soviet-type society implies a higher rate of savings and investment and, for both this reason and others, a higher growth rate than the society would have had in the absence of this encompassing interest.<sup>19</sup>

What can the leader of a centrally planned economy do, besides increase savings and investment, to achieve his goal of a productive society? Abstracting from well-known difficulties, we can say that the leader of a communist society could have enterprise managers and other subordinates estimate all of the relevant production functions and then, with this information and the leader's objective function, the economic planners could calculate the optimal allocation of resources. Given the leader's interest in growth, technology, and investment, this optimum allocation would devote a high level of resources to technological advance and investment. The leader should then have subordinates impose this optimal allocation on society. Since conditions always change and technological possibilities continually expand, the planners should constantly recalculate and the administrators implement new allocations, and thereby obtain rapid economic growth.

The leader, however, cannot obtain or process all of the information needed to achieve an optimal allocation, much less one that adapts optimally to the rapidly changing opportunities. Of course, a centrally planned economy does not have to be optimal to match the imperfect market economies of the real world. Yet, to be even moderately productive and dynamic, it must not only obtain a vast amount of information, but also process at the center information about enterprise production functions that, in a market economy, would only have been needed by the relevant firms. Actual conditions can be observed and performance monitored in the needed detail only at the front line of the production processes and this information has to be passed up through layer after layer of bureaucracy. The orders worked out in light of this information also have to be passed down through all of these layers of officials. When, as in agriculture and retail distribution, the economic activity takes place over large amounts of space, the gathering and transmission of information is made more difficult by the distances involved. The information losses also increase with the size of a bureaucracy, since misunderstandings at each layer of the hierarchy are normally passed on to all successive layers, even with the best efforts of all concerned.

For fundamental reasons, the best efforts of all concerned are not put forth. Each subordinate's chances of promotion or bonuses are lowered if a

<sup>19</sup> Of course, the pursuit of military strength will tend to reduce the growth rate of an economy, *ceteris paribus*. However, our argument implies that the leaders of communist societies will have pursued both military strength and industrial growth at the expense of consumption.

superior learns of his mistakes, his shirking, and his other forms of on-the-job consumption. There is accordingly an incentive not to transmit, or even actively to conceal, information about any shortcomings that can be successfully hidden. There is also an incentive to overstate the difficulties faced and to understate potential production. The incentives to distort information operate and cumulate at every level of a hierarchy, so they increase nonlinearly with the size of the bureaucracy and are bound to be exceptionally serious in a centrally planned economy. The more one reflects about these problems the clearer it becomes that there must be some countervailing factor, or the centrally planned economies would not have survived for any time.

Competition among bureaucrats is such a countervailing factor. At times the leader's strong incentive to increase production is reflected in actual performance because competition among subordinates generates information and limits the amount of misrepresentation. Just as bureaucrats have an incentive to conceal their own failures and underreport the potential of the resources allocated to them, so they also gain when their colleagues' mistakes, and the full potential of the resources allocated to these colleagues, become known. When there is bureaucratic competition, each official must be more cautious in underreporting the potential productivity of the resources allocated to him, because bureaucratic rivals may have been allocated some identical resources. Understating the productive capacity of such resources may make rivals look better. The astute superior can accordingly use competition among subordinates to gain access to their more detailed knowledge and to draw out estimates of potential production better than those that he could obtain without competition.

Independent communist party representatives in enterprises, as distinguished from the official administrators of the enterprises, can augment the regular bureaucratic competition and provide additional information to the leadership. The party representatives in a factory can operate to some extent in the way the inspectorate or "censorial system" in imperial China worked. That is, they can sometimes provide a relatively independent source of information about the performance and the potential of enterprises and widen the set of competitors for higher ranking posts.

Bureaucratic competition can reveal a good deal of information when several subordinates are faced with approximately the same conditions, but it cannot contribute so much when they do not. Suppose that the base period potential of all enterprises in an industry is known, perhaps because information from before central planning began is available, and that identical new resources are then given to all of the enterprises in the industry.<sup>20</sup> Bu-

<sup>20</sup> This phrasing of the planners' problem corresponds closely to "planning from the achieved level," which seems to be the basis of much of the practical methodology of planning in centrally planned economies.

reaucratic competition can then be used effectively to determine how much extra output should be expected from the new resources. By contrast, bureaucratic competition cannot provide much information about the impact enterprise-specific conditions should have on performance or about how well one industry is doing compared with another.

In short, though a Soviet-type society faces formidable information and incentive problems, bureaucratic competition can sometimes limit these problems and thereby make it possible for the leader of the society to obtain relatively rapid economic growth. The exceptionally encompassing interest of the leader of the society gives him an incentive to seek extraordinarily high levels of investment and to require any reallocations of resources, however harsh, that appear to be needed for rapid economic growth. The increases in output that result from this encompassing interest aided by bureaucratic competition can, at times, wholly or partly offset whatever losses in output arise from central planning. Our model can therefore help to explain why Soviet-type economies have, at times, done reasonably well in exploiting their opportunities for catch-up growth. Indeed, if the per capita income data underlying the results in Table 1 are accurate, the centrally planned economies did just as well from 1950 to 1965 as the market economies of Europe.

## 6. THE SOURCES OF SLOWDOWN

Ideally, the same theory that explains the relatively rapid catch-up growth of the centrally planned economies in the early postwar years also ought to explain the failure of these economies to take advantage of the great opportunities for catch-up growth that they still have. The present theory does this. Note that the preceding argument implicitly assumed that the collusion of subordinates does not constrain or limit bureaucratic competition. For the early period of a planned economy, or a period after a purge, cultural revolution, or other total shake-up of a society, this is a fairly realistic assumption. But it is clear from the logic of collective action (Olson, 1965) that, in stable environments, collusion and other types of collective action increase over time. We show that this eventually deprives the leader of a Soviet-type society of the capacity to obtain the increasing productivity that his encompassing interest gives him an incentive to seek.

The gain from collusion is a collective good for those benefiting from collective action: those who do not bear the costs reap the gain from the good as much as those who do bear the costs. Thus it often pays to be a free rider. In small groups, continued bargaining is required to get group-optimal levels of collective action, since the group must work out agreements whereby each will act in the collective interest. In larger groups the even more difficult task of working out selective incentives must be overcome before collective action can occur. The enterprise managers in many industries in a centrally planned economy are a small group, and this means that they can organize in

less time than they could if their numbers were large. On the other hand, the discouragement or prohibition of organizations or groups independent of the state and the party in communist societies, especially those that weaken the control of the leader of the society, require inconspicuous and informal, if not secret, collusion, and this makes collective action emerge more slowly than it otherwise would.

As time goes on in a communist society, more groups, and especially small groups of high-ranking and middle-level administrators and enterprise managers in particular industries, are able to collude. Given the nature of such societies, it is difficult to obtain systematic evidence of this mainly informal organization. Nevertheless, there is every indication of the accumulation over time of a greater capacity for collective action that, while much more discreet, is functionally similar to the sclerotic process that is going on in the West. For example, Hough and Fainsod (1979, pp. 446-448) describe the workings of the Soviet Union's upper levels in the following manner:

Despite the frequent conflicts between the Central Committee officials and those that they supervise, westerners clearly should be giving more attention to the cooperative side of the ambivalent relationship between supervisors and supervised. . . . By appointing personnel with specialized knowledge and experience to the posts in [the top party and governmental bodies], the leadership evidently hoped to obtain independent advisers with sufficient expertise to judge the ministerial reports and proposals and hence to give themselves the ability to judge performance accurately and to decide policy for each branch on the basis of real freedom of choice.

Yet, the question arises whether the use of specialized personnel in the Central Committee Secretariat and apparatus has not meant the penetration of the values of the specialized elite into the political leadership as much or more than the enhancement of political control over the policy process—that is, whether the familiar pattern of the regulated coming to dominate the regulators has not developed in the Soviet Union as well as the West.

How does the growing power of the ostensibly regulated subordinates affect economic performance? Montias (1982, pp. 12-14) describes how the concerted power of officials in ministries, associations, and enterprises in Poland was instrumental in producing the economic collapse of the late 1970s:

The "ministerial lobbies," as they are now called, successfully pressed for more investments and more imports for the enterprises under their direction long after it had become obvious that increases in either would have nefarious consequences for the economy. . . . [I]t may be objected that it was up to the Planning Commission to counteract these many-cornered pressures. But the Commission, staffed for the most part with professional economists without a political base, had little authority. There is growing evidence that crucial decisions were made without its participation or in the face of its disagreement. . . . There was the thesis, first spread by the lobbies and later taken up by the political authorities, that all major projects can only be realized—in part if not in whole—on the basis of cooperation with capitalist enterprises. Reinforcing this thesis were motives of self-interest. Representatives of foreign-trade corpora-

tions, production ministries, and associations, according to an article in the house organ of the Ministry of Foreign Trade, "vied with each other in the quest for attractive trips abroad."<sup>21</sup>

Similarly, Szalai's (1991) paper describes the process by which the collective action of the large enterprises in Hungary became a dominant, and detrimental, force in the setting of policy.

It would be nice to know, in detail, the different ways in which small groups of high-ranking and middle-level administrators and enterprise managers could gain from their inconspicuous and even tacit collective action. There is no opportunity in this paper to describe the myriad ways that collusion can operate to slow down a centrally planned economy.<sup>21</sup> But one paradigmatic illustration may nonetheless convey a sense of the process and facilitate research in a wider range of examples.

Consider advances in knowledge that can increase the productive potential of a whole industry. If the leader of the country knows how much extra production could be obtained because of these advances, then quotas would be increased accordingly and resources reallocated in order to reap the maximum gain from the advance. But the leader of the society and his central planners cannot have full knowledge of the technological improvements available in each period to every industry. They are dependent on the experts and managers in the industry itself. It is in the collective interest of the managers of enterprises in the industry, and of the manager of the industry as a whole, that the productive potential of these advances should be underestimated by the central leadership.

So long as the extra production that the industry leaders and enterprise managers are required to obtain from additional resources is not in fact the maximum obtainable, and only they, if anyone, know this maximum, it will also be in their collective interest to receive more resources, because these resources can also be used in part to secure their personal objectives. These resources might be used to supplement the income, leisure, or power of the management or the workers of enterprises. Or the resources might be critical in maintaining some of the existing employment, including managerial employment, in this industry. Thus, when collusion becomes commonplace, the managers of the establishments in an industry have an incentive to act in concert to monopolize the information on the extra output obtainable from

<sup>21</sup> Brada (1989) has suggested that much of the slowdown in Eastern Europe can be attributed to the effects of macroeconomic policy. We view this explanation as complementary to ours. Policy is, at least partially, endogenous, reacting to economic performance, perhaps a slowdown in growth, and shaped by economic interests, perhaps coalitions of managers. We suggest that the power of industrial coalitions to override planners might be one cause of the need for deflationary policies. Moreover, these policies might be more costly than they would otherwise be because of the blunting effect of coalitions.

allocated resources. Moreover, their immediate superior can also gain more resources for his purposes by participating, at the expense of the center, in the collusion. He similarly has an incentive, at least when the resource allocation to his domain may be reduced, to join his subordinates to resist the resource reallocations a society needs if it is to be dynamic and efficient.

By an analogous argument, it is clear that enterprise managers, as a group, could also gain from conspiring to lower the expectations of output change due to enterprise-specific investments and changes. In contrast to the cases discussed in the prior paragraph, however, the subordinates, in this case have a conflict of interest with their industry manager, since this manager will get more output, and thus free resources, at no cost to himself if he can prevent the collusion among his subordinates that hides information on enterprise-specific changes. There is also an analogous process at the level of colluding workers in individual work groups, though the amount of information of which workers have a monopoly is relatively small and therefore less significant. Still, at all levels, the incentive to increase output that arises from the encompassing interest of the leader of the society will be countervailed by increases in the capacity for collective action.

Eventually, the devolutionary process that our theory predicts reaches the point where the dictatorship of the General Secretary and even of the Politburo largely disappears. The higher ranking subordinates gain so much power that they become the constituents of the General Secretary and the Politburo and, ultimately, the people who determine who becomes General Secretary and who enters the Politburo. The last stage of communism is not the stateless and classless society that Marx forecast, but rule by a rather large aristocracy of upper level bureaucrats. When this stage is reached, the encompassing interest of the dictatorial leader that has been the motivating force for growth and productivity in the traditional Soviet-type society disappears. The class of officials to whom power has devolved is then too large to engage in productive collective action. When this stage is reached, no one owns the society, and no one has an incentive to make it work. So economic performance deteriorates even further. In time, the system must collapse or be fundamentally transformed.

The foregoing theory not only helps explain why the centrally planned societies, even more than the market economies, fall farther behind their potential output as time goes on, but also illuminates other features of the evolution of Soviet-type societies. Consider, for example, the puzzling growth of perquisites and privileges for middle- and upper-level administrators and functionaries. Communism is, in principle, an egalitarian ideology, so purely ideological considerations would call for no more perquisites and other privileges for administrators than are needed to recruit the right people for administrative roles. The leader of the society also loses some of the surplus that could be used to strengthen and enrich the society, and thereby

increase international power and prestige, when there is slack in the productive system and consumption of surplus by the new class. Even so, over time, the middle- and upper-level nomenklatura have come to obtain more privileges, just as the argument here predicts.

This vision of the devolution of a Soviet-type society also makes testable predictions about the sources of demand for market-oriented reforms in Eastern Europe. If not for the problems described here and the evolution of the losses from them, the top leaders would tend to be extremely conservative. If they own a society that serves their interests ideally, they would have no interest in reforms. Their personal staffs and the intellectuals who advise them would, to some extent, also be cautious about reform.

But, even before Gorbachev, there has been a substantial interest of leaders of some of the centrally planned economies in market reform, though, of course, not usually in democracy. As Jan Winiecki (1990) has pointed out, there are many proposals for reform that are sabotaged, especially by administrators at upper-middle and middle levels. Once the people in each industry or sector at these levels have colluded, they and the planning officers are often the major losers from competitive market reforms. It is the leader and the consumers who are the gainers.

Thus the argument here predicts that it is, paradoxically, the people at the top and at the bottom, and intellectuals who are not well placed to appropriate the surplus resources controlled by administrators of large resource-using units, who will be most interested in market reforms. It is those who are in the best position to gain by collusion and planning officials who will have the most to lose from market-oriented reforms.

#### APPENDIX: THE RESULTS OF 1950-1985

As Section 3 indicates, we chose to include in our sample all of the European countries for which there were Summers-Heston (1988) data from 1950 on because of the exogenous institutional destruction in Europe resulting from World War II and its aftermath and also because of the relative homogeneity of the European countries. We emphasized the problems that could occur when the institutional effects on performance are not independent of initial per capita income and pointed out that our own theory implied that sometimes these two variables would not be independent.

Our strategy of focusing on all countries in Europe for which there was the needed data was generally appropriate in the earlier decades after the institutional destruction of World War II, but it was not apt for the most recent years, when the institutional sclerosis our theory emphasized became very serious throughout Europe, especially in the centrally planned economies. Therefore, though the Summers-Heston data set covers the years from 1950

to 1985, the analyses summarized in Tables 1 and 2 omit the last five years of the is data set.

These were also turbulent years for the world economy: a large recession affected most market economies as adjustments were made in the face of the 1979 oil price increase and the onset of uncertainties connected with the repayment of Third World debt. These problems particularly affected Eastern Europe, as evidenced by the Polish crisis and the, sometimes draconian, measures implemented to solve debt problems. In many ways, the year 1985 could be viewed as the one in which the effects of these problems reached their height. Thus, any data analysis that showed a slowdown in a period ending in 1985 would hardly be surprising.

Additionally, we expect that the economies that were most effective in reacting to the events of the 1980s were those least burdened by institutional sclerosis. These economies could be those with the highest per capita incomes, given that their lack of institutional sclerosis would have also aided their relative growth performance over the previous 30 years. Therefore, it is likely that the catch-up equation would fail to hold for any data that focused solely on the 1980s. In terms of our econometric discussion in the text, the correlation of  $e_{ij}$  and  $y_{ij}$  would be particularly high during the early 1980s. Hence, the analysis in the text concentrates on the two 15-year periods ending in 1980: 1950-1965 and 1965-1980.

We did, however, repeat the analysis for time periods that included the early 1980s. The qualitative features of the results emphasized in the text remain the same, as can be seen by comparing Tables 3 and 4 to Tables 1 and 2. However, two features of the results that did change, and that are not evidenced in the tables, must be emphasized. First the fit of the equations, as measured by  $R^2$ 's, declined considerably.<sup>22</sup> This was especially the case for the data covering the second time period of the analysis, i.e., 1965-1985 vis-à-vis 1965-1980. Obviously, the years 1980-1985 evidenced considerably different economic behavior than the three previous decades. Regression exercises not reported here, in fact, show that the catch-up equation fails for these years; richer countries grew more quickly. This can exactly be explained by the factors discussed above, that the dominant effect in growth patterns in the 1980s is not catch-up through technological diffusion, but rather ability to react and change in the face of crisis. Those countries that had less institutional sclerosis and had grown faster in the previous years would have both higher per capita incomes in the 1980s and greater ability to react to the crisis.

<sup>22</sup> It is not exactly appropriate to compare  $R^2$ 's across equations which have different dependent variables. However, to the order of approximation needed here, such comparisons are unlikely to be misleading.

TABLE 3  
ACTUAL GROWTH RATES COMPARED TO FRONTIER GROWTH RATES, 1950-1970

	Actual growth rate	Predicted catch-up growth rate	Growth rate shortfall	% Increase in 1970 per capita GDP if country had achieved frontier catch-up growth during 1950-1970
Austria	4.73	5.32	0.59	11.89
Belgium	3.39	4.97	1.57	35.18
Denmark	3.08	4.71	1.63	36.89
Finland	4.12	5.19	1.07	22.58
France	4.17	5.07	0.90	18.77
Greece	5.64	5.71	0.07	1.39
Iceland	2.73	4.92	2.19	52.55
Ireland	2.90	5.40	2.50	61.61
Italy	4.91	5.44	0.53	10.62
Luxembourg	2.00	4.35	2.34	57.51
Netherlands	3.61	4.98	1.38	30.21
Norway	3.18	4.85	1.68	38.12
Portugal	5.18	5.72	0.54	10.75
Spain	5.03	5.52	0.49	9.73
Sweden	3.15	4.80	1.65	37.24
Switzerland	3.19	4.49	1.29	28.27
United Kingdom	2.32	4.79	2.47	61.14
West Germany	5.18	5.20	0.03	0.48
Market economy average	3.81	5.08	1.27	29.16
Bulgaria	5.62	5.62	0.00	0.00
Czechoslovakia	3.08	5.07	1.99	46.63
East Germany	5.20	5.38	0.18	3.58
Hungary	3.48	5.35	1.87	43.11
Poland	2.96	5.37	2.41	58.75
Romania	4.47	5.69	1.22	26.05
USSR	4.19	5.43	1.23	26.49
Yugoslavia	4.93	5.68	0.74	15.14
Planned economy average	4.24	5.45	1.21	27.47

The second changed feature of the results is that they lead one to reject the hypothesis that the equations for the two time periods 1950-1970 and 1965-1985 are identical.<sup>23</sup> This is hardly surprising in view of the facts discussed in the preceding paragraphs. However, it does mean that using data from the 1980s is hardly appropriate for estimating frontier catch-up relationships.

<sup>23</sup> Log likelihood tests were used to judge whether the equations are identical.

Thus, we do not place as much weight on the results reported in Tables 3 and 4 as we do on those in Tables 1 and 2.

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TABLE 4  
SLOWDOWN AND ITS COSTS IN MARKET AND PLANNED ECONOMIES, 1965-1985

	% Loss in GDP Change in growth in 1950-1970 to 1965-1985	% Increase in 1985 per capita GDP if country had achieved frontier catch-up growth during 1965-1985	Growth rate shortfall	Predicted catch-up growth rate	Actual growth rate	Planned economy average (without Yugoslavia)
Austria	-1.09	38.08	1.68	4.96	3.28	2.73
Belgium	-4.05	42.50	1.84	4.78	2.94	2.53
Denmark	-6.65	49.04	2.06	4.43	2.36	4.11
Finland	-12.07	39.13	1.72	4.90	2.47	2.86
France	-17.60	41.33	1.80	4.75	2.25	3.47
Greece	-38.52	40.51	1.78	5.54	2.25	5.28
Iceland	-2.57	60.28	2.44	4.69	2.18	1.99
Ireland	0.11	62.34	2.52	4.69	2.18	2.04
Italy	-30.13	44.86	1.93	5.13	2.25	2.82
Luxembourg	1.86	52.92	2.19	4.44	2.25	4.88
Netherlands	-17.42	55.09	2.27	4.74	2.47	4.91
Norway	14.49	20.53	0.97	4.59	2.80	2.09
Portugal	-32.86	47.51	2.03	5.60	2.82	4.88
Spain	-35.03	48.95	2.08	5.25	2.82	5.16
Sweden	-28.25	68.05	2.67	4.11	2.76	4.84
Switzerland	-0.71	63.34	2.54	4.74	2.20	5.28
United Kingdom	-41.38	42.15	1.82	4.59	2.76	5.35
West Germany	-15.87	48.57	2.04	4.84	2.80	5.35
Market economy average	-15.88	72.50	2.82	4.91	2.80	5.35
Bulgaria	-73.64	73.64	2.87	5.32	2.45	5.35
Czechoslovakia	-43.24	48.89	2.07	4.88	2.82	5.35
East Germany	-25.50	82.62	3.12	5.16	2.04	5.35
Hungary	-17.76	88.79	3.29	5.28	2.04	5.35
Poland	-16.76	88.79	3.29	5.28	2.04	5.35
Romania	-23.28	57.60	2.37	5.22	2.86	5.35
USSR	-12.91	30.64	1.40	5.51	4.11	5.35
Yugoslavia	-30.87	62.87	2.50	5.23	2.73	5.35
Planned economy average	-28.62	67.48	2.66	5.19	2.53	5.35