

Market Reform and Mortality in Transition Economies

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Summary. — The striking increase in mortality rates in Russia in the early 1990s occurred simultaneously with the government's erratic attempts to introduce market reforms. Other transition economies, such as Poland and the Czech Republic, avoided increases in death rates while they implemented rapid and deep reforms. Is there a link between mortality and the speed or depths of reforms, as suggested by other researchers [e.g. Sachs (1996) *American Economic Review* 86(2), 128–233]? This paper uses aggregate data on 22 transition economies for 1989–94 to investigate this question. While the relationship between an index of reform progress and death rates is ambiguous, death rates in these countries are correlated with measures of reform success, such as GDP growth and the inflation rate. Higher crime rates and higher unemployment rates are also related to larger increases in death rates. © 1998 Elsevier Science Ltd. All rights reserved.

Key words — mortality, transitional economies

1. INTRODUCTION

One of the remarkable characteristics of Russia's mortality crisis is the coincidental timing of the increasing mortality with the introduction of market reforms in that country, particularly with the years of macroeconomic instability that followed the initial reforms. As evidence of this, consider Figure 1, which plots the pattern of rising male standardized death rates along with the inflation rate (in logs) in Russia over the 1989–96 period.¹ The Russian mortality crisis reached its peak in 1992 and 1993, which were also the years of greatest macroeconomic instability in the country as measured by the inflation rate. In 1994 the Russian government for the first time achieved some degree of macroeconomic stability, and the rate of increase in the death rate slowed in that year. The worst of the crisis appeared to have passed by 1995 when the death rate finally began to fall. In that same year Russia attempted its most serious inflation stabilization program (Fischer, Sahay and Végh, 1996), and the inflation rate fell under 200% for the first time since market reforms were introduced. The death rate continued to fall in 1996 as the inflation rate fell below 20%.² In addition to the Russian experience, preliminary evidence across all transition countries indicated that countries that reformed more rapidly or intensely avoided rising mortality,

while the more gradual reformers experienced rising death rates (Sachs, 1996; Shapiro, 1995).

Is it generally true that the nature and success of market reforms is related to rising death rates in transition economies? If so, does Russia's erratic course of reform explain, at least in part, the Russian mortality crisis of the early 1990s? This paper attempts to answer these questions by examining the reform experiences and demographic outcomes in 22 transition economies over 1989–94. A number of economic and social variables are also examined to identify correlates of changes in death rates; and the initial health and demographic conditions in these countries are evaluated as well. To briefly summarize the main finding of the paper, the links between market reforms and mortality across countries are less clear than they originally appeared.

2. MORTALITY AND ECONOMIC REFORM

Before turning to the statistical analysis, it is useful to consider the possible mechanisms through which economic reforms may affect the health of a population. In particular, one would like to identify potential explanations for the discontinuous change in death rates observed in many transition economies — a development in stark contrast to the usual slow evolution of mortality rates in most countries over time.

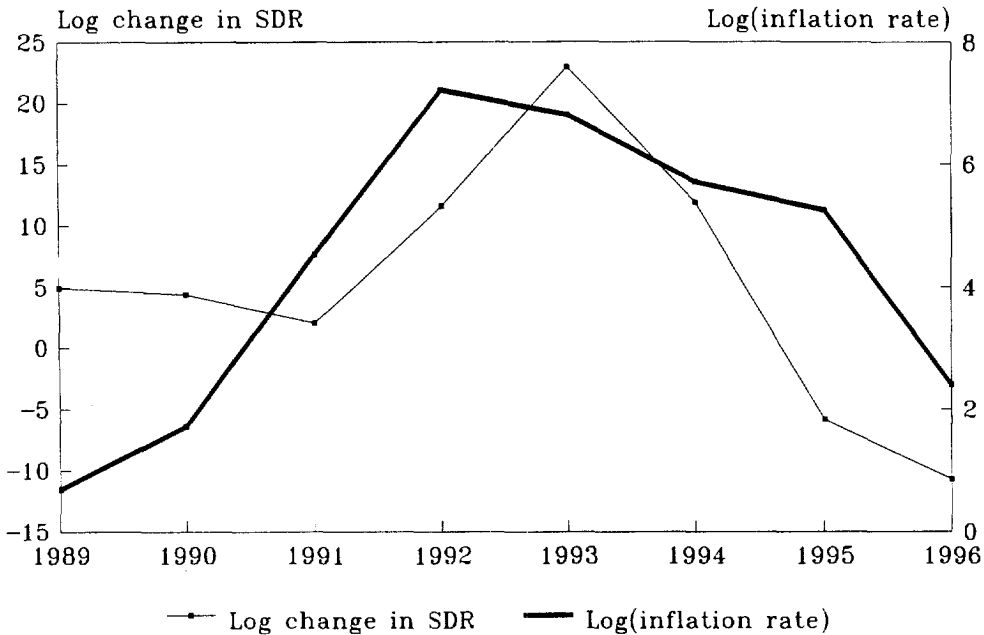


Figure 1. Trend in male standardized death rate and log(inflation), Russia 1989–96.

The gradual change in mortality rates observed in most countries is consistent with the idea that an individual's stock of health can be viewed as a form of human capital: the individual inherits an initial stock of health and invests in health over the lifetime to produce a durable stock of health which depreciates with age (Grossman, 1972a,b). The decision to invest in health is affected by the cost of health inputs (the price of medical services and other consumption goods), income and the return to investment in human capital. The individual's current stock of health reflects not only current health flows but, perhaps more importantly, represents the accumulation of health investments over the individual's lifetime.

Conceptualizing health as a stock implies that economic shocks are unlikely to generate the large discontinuous changes in mortality rates observed in Russia and other countries, since economic policies largely affect current health flows, such as consumption of alcohol and tobacco, and the flow of government health services. With sufficient past investments in health, an economic shock may deplete health capital but is unlikely to deplete it to the point at which it falls below the critical level and leads to rising death rates. Only a sustained erosion in the stock of health would be expected to generate a substantial increase in mortality rates

given past investments in health capital (Anand and Chen, 1996).

Clearly in this framework the distribution of health capital in a population is the critical determinant of the health consequences of adverse economic shocks. If the population is relatively vulnerable — meaning that the distribution of health capital in the population is centered close to some critical level — an economic shock could generate a discontinuous change in the mortality trend. This may be the best approach to understanding mortality trends in Eastern Europe and the former Soviet Union, since the stagnation and, in some cases, sustained deterioration in life expectancy from the 1960s through the 1980s in those countries strongly suggests that these were fragile populations, in terms of health status, on the eve of the economic and political upheavals of the 1990s.³

Given an already fragile population, there are a number of routes through which economic reforms may affect the health status of a population. First, price liberalization combined with large, monetized fiscal deficits in most countries resulted in hyperinflation across the region in the early 1990s, followed by a period of triple-digit inflation in many countries. At the same time, most countries experienced extraordinarily steep declines in GDP — in Russia, for example, the level of GDP had fallen to 55% of its 1989 level

by 1995 (EBRD, 1996)⁴ — as well as substantial increases in unemployment. These rapid and bewildering changes followed decades of what might be called a secure stagnation in living standards and employment across these countries, and thrust the inhabitants into an unpredictable and, in many cases, extremely unstable macroeconomic environment. The uncertain economic future undoubtedly increased stress among the population, which has been shown to contribute to cardiovascular disease and also appears to have specific physiological effects that make individuals more susceptible to diseases. Moreover, increased stress may also induce behavior with adverse health consequences, such as reckless driving and increased alcohol consumption, which in turn increases death rates.⁵ In other words, government implementation of sound economic policies may influence a country's health by minimizing the economic fluctuations that create stress and uncertainty.

Another link between health and economic reforms may occur through changes in relative prices, which induce behavior detrimental to health; in many formerly socialist countries, for example, the price of alcohol fell sharply relative to the consumer price index during the transition period.⁶ In addition, reforms may initially result in a decline in real income during the transition period, which could contribute to increasing death rates through increased poverty and malnutrition among the population.

Finally, changes in public investment in health that occur during economic reforms may affect the country's health. The capacity and effectiveness of the public health infrastructure will be important in maintaining health, but more broadly public investment in health also comprises other state functions that preserve or enhance the health of a country. These include, for example, the provision of an adequate social safety net that enables the poor to maintain a minimal standard of living; and maintenance of an effective criminal justice system (crime directly affects mortality through homicides and drug abuse, and may indirectly affect mortality through the health consequences of stress from high or increasing crime rates).

Thus, economic reforms may affect health in a myriad of ways: through macroeconomic instability that causes stress and uncertainty; through changes in relative prices that affect consumption behavior; through increased poverty and erosion of the social safety net; and through rising crime rates and deterioration of the public health infrastructure. The following

sections of the paper investigate which of these factors appear most important in explaining the mortality experiences of transition countries in the 1990s.

(a) *Mortality and reform rankings*

A number of liberalization indices have been constructed to rank the progress in economic reform achieved by the countries of Eastern Europe and the former Soviet Union. The index used here was created by de Melo, Denizer and Gelb (1997) and measures economic liberalization both annually and cumulatively for 1989–94. The annual index assigns a zero (unreformed) to one (reformed) ranking to countries in three areas: internal markets (price liberalization and demonopolization); external markets (trade liberalization and currency convertibility) and private sector entry. The annual index is a weighted average of these three components, with weights of 0.3, 0.3 and 0.4 assigned to each component respectively. The cumulative liberalization index is the simple sum of each of the annual liberalization indices for each country, and reflects, according to the authors, “the duration as well as the intensity of reforms from 1989 onward” (p. 25).

The cumulative liberalization index can be used to categorize the former socialist countries into groups of countries that have followed similar reform paths. Following de Melo, Denizer and Gelb (1997) “advanced reformers” have a cumulative liberalization index (CLI) greater than three; “high intermediate” reformers have a CLI between two and three; for “low intermediate” reformers the CLI is between 1.3 and two; and for slow reformers the CLI is less than two. Table 1 shows the countries by reform group, arranged in descending order of the cumulative liberalization index. The four countries affected by regional tensions during this period (Armenia, Azerbaijan, Georgia and Tajikistan) are shown separately.

Using these country groupings, Figure 2 graphs the annual log change in male standardized death rates by reform progress during 1989–95.⁷ Based on this figure, it is clear that advanced reformers have avoided the substantial increases in death rates experienced in other countries; for several years these countries even recorded declines in standardized death rates. Within the group of non-advanced reformers, however, increases in death rates were smallest in the countries that undertook reforms most gradually. Some countries that reformed decisively and effectively — such as the Baltic

countries in the “high intermediate” group — not only failed to avoid a mortality crisis, but recorded markedly higher increases in death rates than those experienced in the countries that reformed slowly, or failed to reform at all.

Looking at each country individually, Table 1 reports the log change in the male standardized death rate in each country for the periods 1981–89, 1989–94, and 1989–95. 1981–89 is given to indicate the long-term trend in death rates in these countries previous to the transition period. Standardized death rates fell in most countries of the former Soviet Union in the 1980s; this is likely due in part to the anti-alcohol campaign mounted by Mikhail Gorbachev during 1985–87.⁸ In contrast, all of the East European countries except the Czech Republic and Slovenia experienced increases in death rates in the 1980s.

Turning to 1989–94, it is again evident that the rapid reformers have fared far better than the less rapid reformers in avoiding a mortality crisis. Within reform groups, however, and

comparing all non-advanced reformers with each other, the picture is less clear.

The two most intense reformers, Slovenia and Poland, registered slight decreases in standardized death rates, while the least advanced reformers (by this measure), the Czech and Slovak Republics, recorded sharp declines in death rates — the only countries in the sample to do so in that period. Hungary, in contrast, experienced a 9% increase in its standardized death rate over 1989–94, despite its substantial economic reforms. It is instructive to compare the experiences of Hungary and Poland: rising death rates in Poland throughout the 1980s were reversed in the early 1990s after Poland implemented its radical economic reform program; while in Hungary the long-run trend of rising death rates actually worsened slightly in the same period. While one could argue that the “style” of the economic reforms differed between Poland and Hungary, both countries had achieved macro-economic stability by 1990–91. Yet the mortality outcomes in the two countries differed markedly.

Table 1. Trends in male SDR age 0–64 and reform progress in Eastern Europe and the former Soviet Union

Country	Log change in male SDR, 1981–89	Log change in male SDR, 1989–94	Log change in male SDR, 1989–95	Cumulative liberalization index, 1994
Advanced reformers				
Slovenia	–9.51 ^a	–7.48	–14.58	4.16
Poland	9.09	–5.41	–4.93	4.14
Hungary	8.69	9.01	5.80	4.11
Czech Republic	–5.23 ^b	–10.77	–13.53	3.61
Slovak Republic	5.93 ^b	–14.02	–14.40	3.47
High intermediate reformers				
Estonia	–11.53	41.41	36.48	2.93
Bulgaria	11.37	12.29	na	2.90
Lithuania	–8.74	34.17	30.24	2.72
Latvia	–12.25	51.04	42.58	2.45
Romania	5.41	14.07	16.69	2.29
Low intermediate reformers				
Russia	–16.93	52.86	47.04	1.92
Kyrgyz Republic	–13.65	27.87	28.25	1.81
Moldova	–16.34	26.23	29.41	1.62
Kazakhstan	–17.90	26.55	35.46	1.31
Slow reformers				
Uzbekistan	–9.62	9.90	8.97	1.11
Belarus	–2.08	26.43	31.99	1.07
Ukraine	–10.12	19.86 ^c	na	0.80
Turkmenistan	–9.25	4.92	na	0.63
Affected by regional tensions				
Armenia	7.24	na	3.32	1.44
Georgia	–5.64	na	na	1.32
Azerbaijan	–10.44	25.52	12.20	1.03
Tajikistan	–16.14	12.82 ^c	na	0.95

^a1985–89; ^b1986–89; ^c1989–92.

Sources: WHO Health for All Database (WHO, 1998); de Melo, Denizer and Gelb (1997).

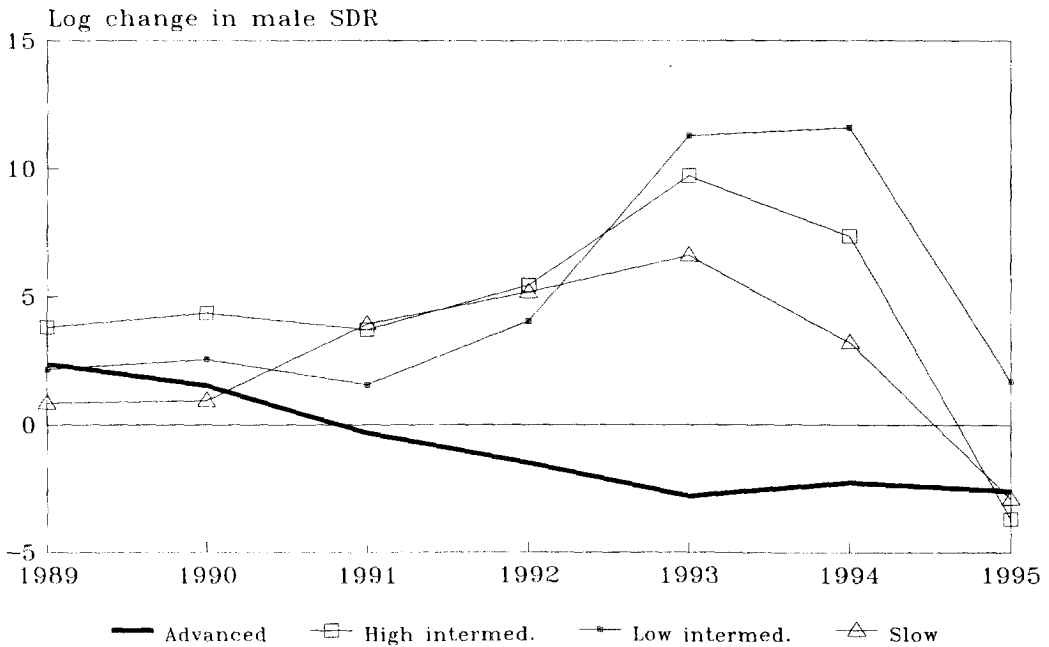


Figure 2. Annual log change in male standardized death rates, age 0-64, 1989-95.

This comparison alone suggests that a simple and strong link between economic reforms and mortality is unlikely to exist.

Many of the other countries experienced strikingly high increases in death rates during 1989-94. While most of the attention has centered on Russia — where the standardized death rate increased by over 50% — the increase in Latvia also topped 50%; and death rates increased by 41% and 34%, respectively, in Estonia and Lithuania. In addition, Moldova, Kazakhstan, Belarus and the Kyrgyz Republic all registered increases in the male standardized death rate of over 25%. The only countries to escape relatively unscathed in that period were Uzbekistan (9.9%) and Turkmenistan (4.9%). While the death rate fell in many of these countries in 1995, it continued its upward trend in Romania, Moldova, Kazakhstan, Belarus and the Kyrgyz Republic in that year.

The near-universal increases in death rates across the former Soviet countries in 1989-94, countries which implemented market reforms in a myriad of different ways, suggests that the hypothesized relationship between economic reform and mortality rates may be weak, if it exists at all. Looking again at Table 1, at first glance there does appear to be a negative relationship between the cumulative liberalization index and changes in death rates. This is

clearly driven, however, by the fastest-reforming East European countries that avoided large increases in death rates: Slovenia, Poland, and the Czech and Slovak Republics. Ignoring these observations and focusing only on the countries of the former Soviet Union, the relationship between changing mortality rates and economic liberalization is, if anything, positive.

This is confirmed by the regressions shown in Table 2. Regressing the 1994 cumulative liberalization index on the difference in log death rates over 1989-94 does indeed turn up a negative and statistically significant relation (panel A). This is the relationship first noted in Shapiro (1995) and Sachs (1996), suggesting that countries that reformed most rapidly and effectively avoided the rising death rates observed in most countries. An important factor, however, is omitted from this equation: given the differing initial conditions between the countries of Eastern Europe and the former Soviet Union (e.g. the longer time period under communism and central planning; the higher share of the military-industrial complex in gross domestic product; the greater reliance on CMEA trade among the latter countries) it is arguable that a dummy variable for countries of the former Soviet Union should be included in regressions of this type. When this variable is included in this regression, the negative relationship between economic

Table 2. *Correlates of changes in male standardized death rates age 0–64, 1989–94*

A. Dependent variable: $\log(\text{death rate in 1994}) - \log(\text{death rate in 1989})$		
Cumulative liberalization index ^a	-0.0713** (0.0302)	0.0682 (0.0465)
Former Soviet Union dummy	—	0.4225*** (0.1292)
Constant	0.3468*** (0.0785)	-0.2439 (0.1964)
R ²	0.188	0.611
N	19	19
B. Dependent variable: $[\log(\text{death rate in 1994}) - \log(\text{death rate in 1989})] - [\log(\text{death rate in 1989}) - \log(\text{death rate in 1981})]$		
Cumulative liberalization index ^a	-0.0766 (0.4578)	0.0891* (0.0464)
Former Soviet Union dummy	—	0.5715*** (0.1240)
Constant	0.4578*** (0.1056)	-0.3108 (0.1805)
R ²	0.125	0.699
N	16	16

^aSource: de Melo, Denizer and Gelb (1997).

*Significant at the 10% level or less.

**Significant at the 5% level or less.

***Significant at the 1% level or less.

liberalization and death rates becomes statistically insignificant (and positive in sign). At least by this measure of reform, the duration and intensity of reforms appear at best to be unrelated to rising mortality rates, and may be positively related to rising mortality rates.⁹

(b) *Mortality and stabilization*

Given the difficulties inherent in assigning subjective scores for economic reform, perhaps the cumulative liberalization index — or any assignment of relative rankings — is inadequate for capturing the economic changes that may have affected health status in these countries. In particular, as noted above, the cumulative liberalization index measures in part the duration of reforms: countries that began reforms in 1990 or 1991 will have a higher cumulative liberalization index than the many countries that began reforms later, in 1993 or 1994, regardless of the intensity of reforms in the latter countries. Rather than the duration of reforms, mortality rates may be related to the outcomes of reforms, and specifically whether a country has achieved macroeconomic stabilization. Under this scenario, mortality rates in formerly socialist countries rose amid the tremendous uncertainty

and stress that characterized the pre-stabilization period in these countries. Because the advanced reformers had all stabilized by 1990–91,¹⁰ their populations avoided the prolonged period of instability that characterized many of these countries. Indeed, by 1994 the advanced reformers had returned to positive economic growth (see EBRD, 1996) — still a distant goal for most other countries that only began to implement stabilization programs in 1993 or 1994. If this line of reasoning is plausible, it implies that changes in death rates across countries should be analyzed according to stabilization time rather than chronological time: if rising death rates are indeed related to stabilization itself and the postponement or failure of stabilization programs, death rates should rise before stabilization — particularly in the year preceding stabilization in which most countries experienced hyperinflation and sharply declining GDP — and fall back to pre-reform levels soon after stabilization.

Borrowing a technique used in Fischer, Sahay and Végh (1996), Figure 3 plots the changes in death rates by date of stabilization for several groups of countries. The horizontal axis measures “stabilization time,” where T indicates the year in which a country implemented a stabilization program and $T+j$ indicates the period j

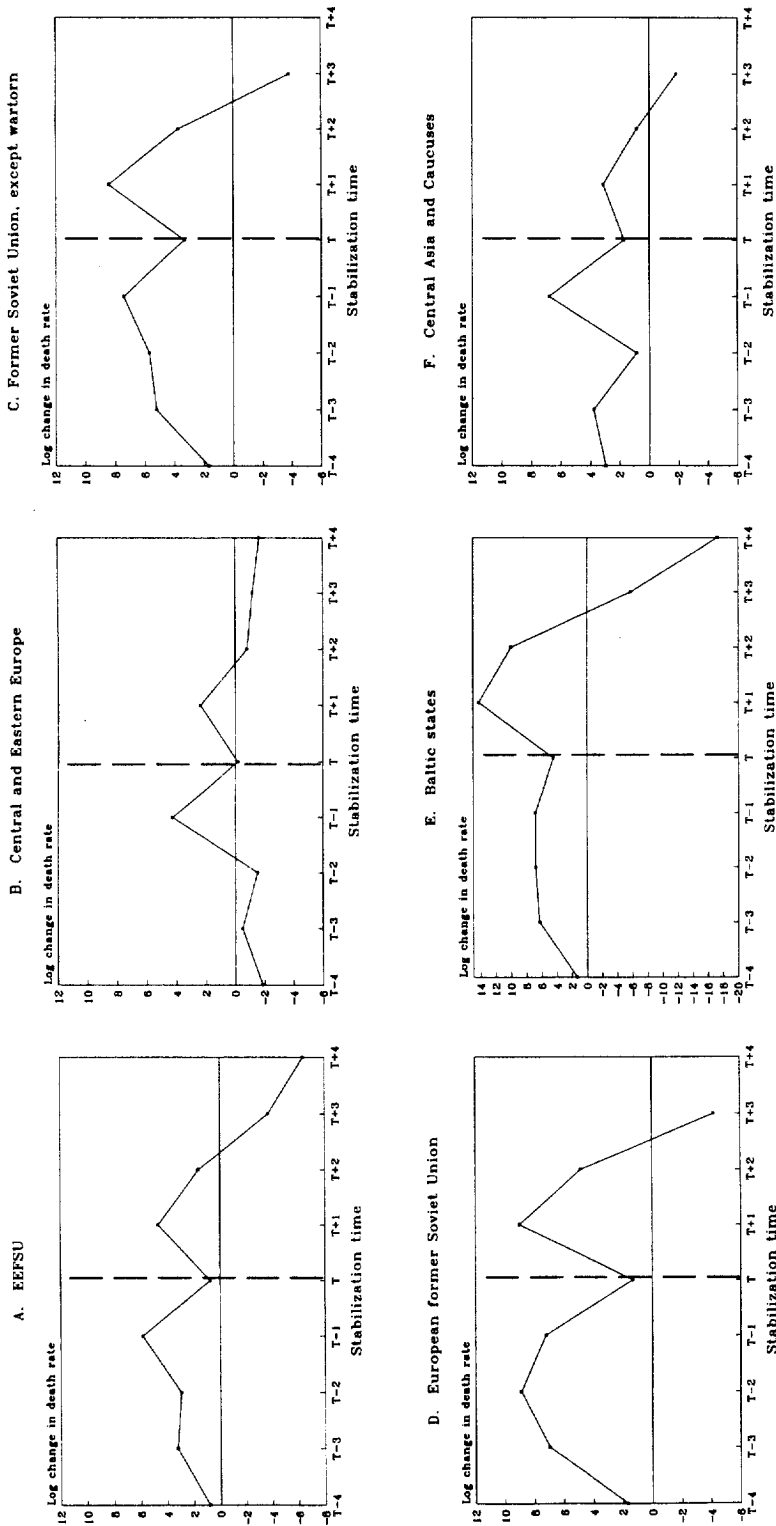


Figure 3. Change in death rates by stabilization date.

years preceding or following the date of stabilization. Note that, in the $T+3$ and $T+4$ periods, the trends are largely driven by the advanced reformers, for which there are more years of “post stabilization” observations. The underlying data for these graphs are given in Table A1.

Figure 3(a), the top left graph, shows the average annual log change in death rates for all countries in the sample by date of stabilization. Death rates rise in the years before stabilization, with the largest increase occurring in the year before stabilization; death rates stop rising in the year in which these countries implemented stabilization programs. The slowing of the rate of increase in mortality in the year of stabilization is remarkably consistent across countries, and seems to suggest that stabilization and mortality are indeed related. In the first and second years after a stabilization program is implemented, however, the average death rate rises again before falling in the third and fourth years after stabilization. Clearly the relationship between mortality and stabilization is more complex than hypothesized.

The other graphs in Figure 3 summarize the trends in countries that began the 1990s with similar initial conditions. Figure 3(b) plots the log change in death rates in the seven Central and East European countries; within this group stabilization appears to be reasonably correlated with death rates, following the predicted pattern. Death rates rose significantly in the year before stabilization, then returned to the pre-reform levels in the year of stabilization and barely change after that year, although death rates increased slightly in the year after stabilization. This graph suggests that mortality is actually influenced by instability in the macroeconomy.

For other groups of countries, however, the evidence is less compelling. In the former Soviet Union as a whole [Figure 3(c)], death rates rose at an increasing rate in the years before stabilization — perhaps reflecting the more gradual stabilization in many former Soviet countries — and the rate of increase slowed in the year a stabilization program was implemented. Surprisingly, however, death rates rose sharply again in the year following liberalization before beginning a renewed downward trend.

This pattern also characterizes the countries of the European former Soviet Union¹¹ [(Figure 3(d)) and the Baltic states [Figure 3(e)], the two groups that experienced the greatest increase in mortality of all the countries under study here. The rise in death rates peaks one or two years before stabilization, increases again in the year of stabilization (but at a decreasing

rate), then rises sharply again in the year after stabilization before the rate of increase slows and finally begins a downward trend. Particularly in the Baltic countries, which stabilized relatively quickly and effectively in 1992, the tremendous increase in death rates in the following year is puzzling, and suggests that factors other than macroeconomic instability are related to rising death rates. The pattern of death rates in the Baltics and European former Soviet Union also suggests that macroeconomic instability may affect the health of the population with a lag.

The last graph in Figure 3 shows the trend in death rates in the countries of the North Caucasus and Central Asia.¹² While a number of these countries were torn by ethnic unrest in these years, nevertheless mortality rates in these countries follow a pattern similar to that in other countries: death rates increased dramatically in the year before stabilization, rose again (but at a decreasing rate) in the year of stabilization and the following year, and then begin a downward trend.

To summarize, while the hypothesized relationship between macroeconomic instability and mortality appears to hold in some of the countries under study, it fails to explain mortality trends in the countries in which the increased death rates are most alarming, as well as puzzling. The experience of the Baltic countries is particularly bewildering: most observers agree, for example, that Estonia stabilized nearly as quickly and effectively as did the five “advanced reformers” of Eastern Europe, and did so only a year later than much of the latter group. Why did Estonia nevertheless experience a 40% increase in standardized death rates during 1989–94? The lack of a clear correlation between stabilization and mortality across countries suggests that other factors related to the transition, such as rising crime rates, increasing poverty rates, and the deterioration of the health care system may better explain the variation in death rates across countries. The direct influence of GDP growth and inflation on mortality rates should be investigated as well.

(c) *Macroeconomic and social correlates of rising death rates*

Tables 3 and 4 summarize the results of regressions that examine the correlation between changes in death rates and changes in macroeconomic and social indicators for 1989–94. Table 3 reports correlates of the changes over 1989–94 only; in these regressions the dependent variable is adjusted for the trend in death rates

in each country in 1981–89.¹³ Table 4 summarizes the results of regressions using annual changes in log death rates as the dependent variable. In both tables, the regressions include a dummy variable for countries of the former Soviet Union; Table 4 includes dummy variables for 1990–94 as well. Note that the coefficients shown in the tables are for each independent variable regressed separately on the dependent variable. In other words, the first column of Table 3 summarizes the results of eight different regressions, rather than a single regression. Both tables also report the correlates of deaths due to cardiovascular disease and due to external causes, which are the two most important causes of death in these countries.

According to these results, one of the variables that is most consistently correlated with changes in death rates across these countries is GDP growth. It is negatively and significantly correlated with the change in death rates over the whole period (Table 3) and annually (Table 4), and is significantly related to deaths due to cardiovascular disease and to external causes in most specifications. In addition, the inflation rate

— arguably one of the best indicators of macroeconomic stabilization — is positively and significantly associated with greater increases in death rates (Table 4), and appears to be highly correlated with deaths due to cardiovascular disease. As suggested by the graphs in Figure 3, the best fit between the inflation rate and changes in death rates is with a one-year lag in the inflation rate, although the current-year inflation rate is statistically significant as well.

While the GDP and inflation indicators suggest that macroeconomic stability is an important factor in mortality change, the positive and significant coefficient on the change in the annual liberalization index appears to contradict this result: countries that undertook the greatest degree of reform in this period (by this measure) appear to have experienced the highest increases in death rates. This is puzzling because several studies have shown that measures of reform progress such as the one used here are positively related to GDP growth and negatively related to inflation (Fischer, Sahay and Végh, 1996; de Melo, Denizer and Gelb, 1997). Perhaps this measure of reform is correlated not only with

Table 3. *Correlates of changes in standardized death rates, men age 0–64, 1989–94^a*

Dependent variable: [log(SDR ₁₉₉₄) – log(SDR ₁₉₈₉)] – [log(SDR ₁₉₈₉) – log(SDR ₁₉₈₁)] ^b	All deaths	CDV deaths	External deaths	Number of observations
Change in cumulative liberalization index ^c	0.4674*** (0.1332)	0.2032 (0.2252)	0.9154** (0.3707)	16
Cumulative decline in GDP, 1989–94	–0.0038*** (0.0010)	–0.0023 (0.0019)	–0.0088*** (0.0030)	16
% change in crime rate per 10000 population	0.0007** (0.0003)	0.0002 (0.0004)	0.0014 (0.0009)	16
Change in share of expenditures spent on food	–0.0131 (0.0090)	–0.0254*** (0.0063)	–0.0020 (0.0248)	13
% change in doctors per 10000 population	–0.0069*** (0.0022)	–0.0048 (0.0033)	–0.0115** (0.0052)	15
Change in private sector share of employment	0.0091* (0.0045)	0.0138*** (0.0042)	–0.0011 (0.0128)	10
Change in unemployment rate	0.0286** (0.0127)	0.0101 (0.0168)	0.0860*** (0.0226)	15
Standardized death rate, 1981	0.0006 (0.0005)	0.0010** (0.0004)	–0.0001 (0.0012)	16

^aStandard errors corrected for heteroskedasticity are given in parentheses. Coefficients are for each variable regressed separately on the dependent variable. All regressions include a dummy variable for countries of the former Soviet Union.

^bData for Ukraine are for the changes over 1989–92; early period changes are for 1985–89 (Czech and Slovak republics) and 1986–89 (Slovenia).

^cSource: de Melo, Denizer and Gelb (1997).

*Significant at the 10% level or less.

**Significant at the 5% level or less.

***Significant at the 1% level or less.

Data sources: CMEA, 1990; EBRO, 1996; Goskomstat, 1996; WHO Health for All; World Bank, 1996.

measures of macroeconomic success, but also with measures of social instability or disruption that are in turn related to rising mortality rates.

One indicator of the disruption in the working person's life is the extent of privatization of state-owned enterprises. While undoubtedly a beneficial development for the economy as a whole and a clear indicator of reform progress, privatization may also create additional stress and uncertainty for individual workers. This interpretation of privatization may explain the positive and significant correlation between the increase in private sector share and rising cardiovascular death rates shown in Tables 3 and 4. While there are too few observations on this variable to draw firm conclusions on this point, the striking relationship between these two variables indicates that the upheaval of a way of life entrenched for many decades may have resulted in increased stress-related deaths.

A similar relationship may hold between crime and death rates. Most countries have experienced substantial increases in crime rates since the late 1980s, and rising crime has been impli-

cated as one of the factors behind the increase in death rates in Russia and other countries. In the specifications shown in both Tables 3 and 4, increases in the crime rate are positively and significantly related to increases in death rates. Surprisingly, crime rates appear to influence cardiovascular deaths rather than deaths due to external causes, suggesting that increased crime may affect mortality through the additional stress it creates within a population. Similarly, higher unemployment rates also appear to be related to greater increases in death rates. It is unclear from these results, however, whether unemployment is related more to deaths from cardiovascular disease or to deaths from external causes.

Another measure of economic hardship that may be related to mortality is the average share of family expenditures spent on food, an indicator commonly used as a proxy for economic hardship.¹⁴ The sign on this variable is negative in all specifications, which is unexpected, and is statistically significant in one of the specifications shown in Table 3. While this

Table 4. *Correlates of annual changes in standardized death rates, men age 0-64, 1989-94^a*

Dependent variable: log(SDR in year T) - log(SDR in year T-1)	All deaths	CDV deaths	External deaths	Number of observations
Change in cumulative liberalization index ^b	0.0609 (0.0465)	0.0590 (0.0500)	0.1481* (0.0858)	101
GDP growth rate	-0.0012** (0.0006)	-0.0016** (0.0008)	-0.0029* (0.0015)	121
Log(annual inflation rate, year T-1)	0.0088** (0.0037)	0.0109*** (0.0039)	0.0074 (0.0062)	116
% change in crime rate per 10000 population	0.00011*** (0.00003)	0.00009*** (0.00003)	0.0001 (0.0001)	118
Change in share of expenditures spent on food	-0.0017 (0.0020)	-0.0014 (0.0023)	-0.0021 (0.0054)	62
% change in doctors per 10000 population	-0.0017 (0.0013)	-0.0017 (0.0016)	-0.0031 (0.0030)	108
Change in private sector share of employment	0.0056 (0.0034)	0.0081*** (0.0027)	0.0041 (0.0079)	41
Change in unemployment rate	0.0059*** (0.0024)	0.0095*** (0.0028)	0.0031 (0.0048)	100
Standardized death rate, 1981	0.0001 (0.0001)	0.0001 (0.0002)	0.0005 (0.0003)	104

^aStandard errors corrected for heteroskedasticity are given in parentheses. Coefficients are for each variable regressed separately on the dependent variable. All regressions include a dummy variable for countries of the former Soviet Union, and dummy variables for the years 1990-94 (1991-94 for regressions in the first row, for which 1990 data are not available).

^bSource: de Melo, Denizer and Gelb (1997).

*Significant at the 10% level or less.

**Significant at the 5% level or less.

***Significant at the 1% level or less.

Data sources: CMEA, 1990; EBRO, 1996; Goskomstat, 1994, 1996; WHO Health for All Database; World Bank, 1996.

is a somewhat troubling result, it may simply be due to the relatively few observations available for this variable.

Finally, a crude measure of the status of the health care system — the number of doctors per 10,000 population — is used to test the correlation between the decline of the health care system and death rates. While the number of doctors per capita has been falling slowly in most countries during the transition period, this does not appear to be a significant factor in the mortality crisis of the 1990s. The sign on the coefficient is negative as predicted and is statistically significant in two of the three regressions shown in Table 3. The coefficient is, however, statistically indistinguishable from zero in the regressions shown in Table 4.

To summarize the results of these tests, the most consistent correlates of rising death rates in transition countries are the GDP growth rate, the inflation rate, the crime rate and the unemployment rate. The particularly strong correlation between deaths from cardiovascular disease and the inflation rate, the crime rate and the unemployment rate suggests that the stress created by the reforms in many countries may be an important factor in the mortality crisis, as first suggested by Shapiro (1995) and Cornia and Panizza (1995). If this is indeed the case, the policy implications for governments are clear: getting one's macroeconomic house in order and regaining control of law and order will not only improve living conditions overall, but may prevent stress-related deaths.

3. OTHER SOURCES OF RISING MORTALITY

Perhaps many of the countries of Central Europe have avoided rising mortality in the transition period not because they have followed the "right" prescription for economic reform, but because they simply had better starting conditions in terms of the health status of their populations. As discussed above, the demographic consequences of economic shocks are likely to depend at least in part on the initial stock of health of a population; the impact of adverse shocks may be mitigated by a higher initial stock of health. The populations that experienced rising mortality in the 1990s may simply have been more vulnerable to economic shocks due to previous living conditions and health care. If this is the case, one would expect that countries with higher levels of death rates on the eve of reforms would be the same

countries that experienced the greatest increase in mortality rates in the early 1990s.

To test this idea, the level of the male standardized death rate in each country is used as a regressor in the regressions shown in Tables 3 and 4. Although positive in sign, the coefficient on this regression is statistically insignificant in most specifications, although it is statistically significant in Table 3 for cardiovascular deaths. While differences in initial health status is an appealing explanation for the variation in death rates across these countries, it does not appear to be an important factor in explaining the difference in outcomes.

Another approach to dissecting the puzzle of mortality in transition economies is to more closely examine countries that began the period with similar initial conditions, pursued broadly similar reform strategies, and yet experienced distinctly different outcomes in terms of mortality. Such groups of countries would include, for example, the three Baltic states, which all pursued relatively rapid reforms yet recorded increased death rates in 1989–94 ranging from 34% in Lithuania to 51% in Latvia. Similarly, the three large countries of the European former Soviet Union — Russia, Ukraine and Belarus — all began the 1990s sharing similar industrial structures and population structures, pursued more gradual reforms, yet experienced increases in death rates ranging from 26% in Belarus to 53% in Russia.

Looking within these groups of countries, few differences between countries stand out. Do Russians and Latvians drink more, perhaps, than Belorussians and Lithuanians? While data on alcohol consumption in these countries during the transition period may be unreliable, Table 5 reports official per capita alcohol consumption in 1990. In the countries of the European former Soviet Union, there is little correlation between the level of alcohol consumption in 1990 and the change in death rates during the transition: Russian alcohol consumption was less than Belorussian (although higher than Ukrainian) and Latvian alcohol consumption was slightly higher than Lithuanian but much lower than Estonian. Russian alcohol consumption is, however, believed to have increased sharply during the transition period: Treml estimates that all alcohol consumption (from official as well as unofficial sales and production) increased by over 20% between 1989–93 (Treml, 1997). Differing changes in relative prices across countries, or differing conditions of reform may have induced differences in drinking behavior across countries that may explain some of the

variations in death rates. For the moment, at least, the link with alcohol consumption will remain conjecture until more data on the latter become available.

A less obvious difference within these groups of countries lies in the ethnic composition of the population. In particular, the share of Russians in the native population varies widely (Table 5), from 82% in Russia itself to 9.4% in Lithuania (note that, of these countries, Russia experienced the highest increase in death rates from 1989–94 while Lithuania recorded the lowest increase). Indeed, as shown in Figure 4, changes in death rates during the transition period appear to be strongly and positively associated with the share of Russians in the native population; the coefficient on this regression is significant at the 1% level. The relationship holds both within the former Soviet Union and including the few observations available for the Central and East European countries, and also holds if one adjusts the dependent variable for the 1981–89 trend in crude death rates. Surprisingly, this appears to be one of the strongest statistical relationships in the data.

It is difficult to imagine how one might explain this relationship. One possibility is that the minority population in these countries (i.e. Russians) had more difficulty adjusting to the changes of the reform period, particularly amid the increased nationalism expressed as these countries gained their independence. This idea, however, would not explain why the increased death rate was greatest in Russia, of all places. Besides (perhaps) a greater propensity to drink excessively, might Russians have some characteristic or tendency that increases their death rate and lowers their life expectancy relative to other groups? Recent studies have shown that greater despair or hopelessness among middle-aged men is associated with higher risk of heart disease and heart attack, as well as earlier onset of artery disease, even controlling for risk factors such as alcohol consumption and smoking.¹⁵ Are Russians more pessimistic than their neighbors? Scattered evidence does indicate that Russians have a lower life expectancy than other peoples living in the same country, both in Russia itself and in the former Soviet republics. For example, in 1989 in almost all republics, including the

Table 5. *Population characteristics*

	% Russian population, 1989 ^a	Alcohol sales per capita, 1990 ^b
Central and Eastern Europe		
Bulgaria	na	na
Czech Republic	0.04	8.9
Hungary	na	11.1
Poland	na	na
Romania	0.17	na
Slovak Republic	0.04	na
Slovenia	na	na
European former Soviet Union		
Belarus	13.2	5.7
Estonia	30.4	6.0
Latvia	34.0	5.3
Lithuania	9.4	5.2
Moldova	13.0	3.3
Russia	81.5	5.6
Ukraine	22.1	4.0
Central Asia and Caucasus		
Armenia	1.6	2.9
Azerbaijan	5.6	1.5
Georgia	6.3	3.2
Kazakhstan	37.8	4.1
Kyrgyz Republic	21.5	2.9
Tajikistan	7.6	1.3
Turkmenistan	9.5	2.7
Uzbekistan	8.3	2.2

^aOr closest available year.

^bMeasured in liters of 100% pure alcohol consumed.

Sources: Goskomstat (1990); WHO (1998) Health for All database.

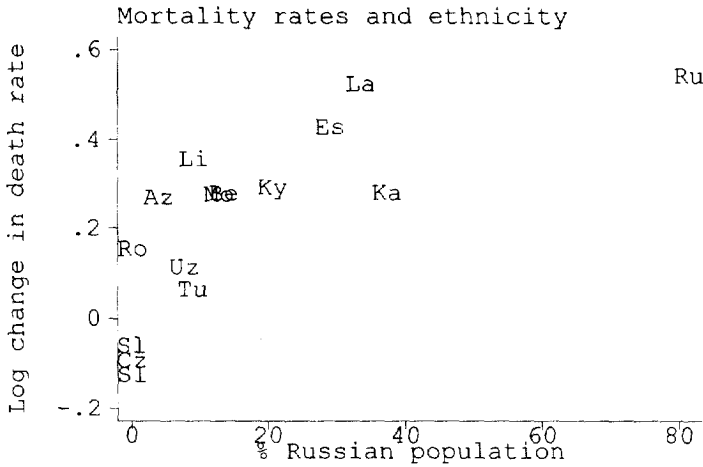


Figure 4. Mortality rates and ethnicity.

Russian republic itself, Russians had fewer remaining years of life expectancy at age 45 than other nationalities. The only exception was in Belorussia, in which Belorussian men had 26.7 years of remaining life expectancy at age 45, while Russian men living in Belorussia had 27.6 remaining years of life expectancy (Interstate Statistical Committee of the CIS, 1995). Limited data on death rates by nationality also indicate that Russians have higher death rates than other groups. In the Soviet Union in 1978–79, for example, the death rate of the entire population was 10.6 deaths per 1000 population; the death rate for Russians was 10.7 per 1000 population. By 1988–89, this gap had widened to 10.7 deaths per 1000 for the Soviet Union as a whole, and 10.9 deaths per 1000 for Russians (Goskomstat, 1990). While the positive correlation between the share of Russians in the native population and the change in death rates is clearly intriguing, it remains conjecture at this point.

4. CONCLUSION

Despite the preliminary evidence that rising mortality in transition economies appeared to be correlated with the speed and depth of market

reforms, this relationship seems to hold only within some of the countries of Eastern Europe. Within the former Soviet Union, rapid and intense reformers — the Baltic republics in particular — have experienced even larger increases in mortality rates than some of the more gradual reformers. On the other hand, it is also clearly untrue that radical economic reforms have an unavoidably devastating impact on mortality. Decisive and effective economic reforms are associated both with declining mortality rates (as in Poland and Slovenia) and with astonishingly large increases in death rates (as in the three Baltic republics). Some macroeconomic and social indicators are correlated with rising death rates — the GDP growth rate, the inflation rate, the crime rate and the unemployment rate — and may affect the country's health by increasing or decreasing the stress associated with day-to-day life. The lack of a clearly identifiable source of rising mortality in transition economies, however, indicates a need for further research, perhaps focusing more carefully on explaining differences across countries with similar initial conditions and reform strategies.

References given below and marked * were used as statistical sources.

NOTES

1. Death rates are standardized death rates per 100000 population. All demographic data used here are from the WHO (1998) Health for All database (January 1998 version), available from the WHO website.

2. For a useful summary of hypotheses and evidence on the causes of Russia's mortality crisis, see Chen, Wittgenstein and McKeon (1996).

3. For discussions of earlier trends in mortality and life expectancy in Eastern Europe and the former Soviet Union, see Anderson and Silver (1989, 1990), Blum and Monnier (1989), Bobak and Marmot (1996), Compton (1985) and Eberstadt (1990).
4. Note, however, that output declines are overstated due to the difficulty of measuring private sector growth in these countries.
5. Shapiro (1995) and Cornia and Paniccia (1995) argue that stress related to the economic reforms is an important explanatory factor in rising mortality. "Stress" arises when individuals perceive a discrepancy between the demands of a situation and their physical or psychological capacity to respond to these demands (Shapiro, 1995).
6. In Russia, for example, the overall consumer price index increased by 2041 times from December 1990 to December 1994, while the price index for alcohol increased by 639 times during this period (Goskomstat, 1994).
7. Countries affected by regional tensions are included in Figure 2, either as "low intermediate" or "slow" reformers depending on their CLI (see Table 1).
8. See Shkolnikov and Nemtsov (1997) for a description of the effects of the anti-alcohol campaign on death rates and life expectancy in Russia.
9. The results are even weaker using the EBRD's reform rankings for 1994: the coefficient on this reform

index is insignificant both including and excluding the former Soviet Union dummy variable. A dummy variable for countries affected by regional tensions is statistically insignificant in all of these regressions.

10. With the exception of Slovenia, which implemented a stabilization program in February 1992. Table A1 gives the date each country implemented its "most serious" stabilization program, as defined in Fischer, Sahay and Végh (1996).

11. These countries are: Belarus, Estonia, Latvia, Lithuania, Moldova and Russia (Ukraine is omitted due to missing data).

12. These countries are: Armenia, Azerbaijan, Kazakhstan, the Kyrgyz Republic and Uzbekistan. Turkmenistan is excluded because, as of 1995, it had not yet adopted a stabilization program. Tajikistan and Georgia are excluded due to missing data.

13. The results are similar if the dependent variable is not adjusted for the previous trend. Results are also very similar using female standardized death rates as the dependent variable.

14. Consistent series for poverty rates across countries before 1992 are unavailable because communist governments denied the existence of poverty in most countries, so the statistical agencies did not attempt to measure it.

15. Study by Susan Everson *et al.* (1997) in *Arteriosclerosis, Thrombosis and Vascular Biology*, August 1997; reported in the *New York Times*, September 3, 1997.

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APPENDIX: TABLE A1. LOG CHANGE IN MALE STANDARDIZED DEATH RATE BY STABILIZATION TIME^a

	Stabilization date	T-4	T-3	T-2	T-1	T	T+1	T+2	T+3	T+4
Armenia	Dec. 1994	5.76	-0.70	5.95	4.61					
Azerbaijan	Jan. 1995	3.74	14.43	0.39	5.95	-13.33	-6.16			
Belarus	Nov. 1994	3.35	5.23	5.09	10.76	2.01	5.56	-3.98		
Bulgaria	Feb. 1991	2.45	2.11	1.13	-0.03	-1.85	6.92	3.23	4.01	
Czech Rep.	Jan. 1991	-3.08	-1.78	-0.36	6.52	-6.74	-3.17	-5.66	-1.72	-2.76
Estonia	June 1992	0.65	4.64	8.51	5.30	3.55	11.47	12.59	-4.93	-19.60
Georgia	Sept. 1994									
Hungary	March 1990	-0.48	-2.43	-2.21	6.50	2.85	0.89	5.25	1.87	-1.83
Kazakhstan	Jan. 1994	1.58	1.22	1.41	18.25	4.09	8.91	3.94		
Kyrgyz Rep.	May 1993	3.45	0.61	0.27	0.98	12.19	13.82	0.38	-9.24	
Latvia	June 1992	2.07	8.66	7.72	5.63	7.93	17.89	11.86	-8.46	-20.43
Lithuania	June 1992	1.41	5.54	4.14	9.45	1.84	13.30	5.44	-3.93	-11.63
Moldova	Sept. 1993	0.48	6.19	4.90	0.27	-1.68	16.56	3.19	-7.87	4.88
Poland	Jan. 1990	-0.80	0.00	-1.71	3.55	2.17	4.36	-4.40	-6.26	-1.27
Romania	Oct. 1993	-0.97	1.40	-0.03	7.02	2.73	2.95	2.62	2.08	
Russia	April 1995	2.03	11.59	22.96	11.87	-5.82	-10.72			
Slovak Rep.	Jan. 1991	1.24	0.37	4.32	2.01	-2.19	-5.04	-6.31	-2.49	-0.38
Slovenia	Feb. 1992	-8.34	-2.23	-5.98	2.06	-0.10	2.37	-5.83	-7.10	-4.13
Tajikistan	Feb. 1995									
Turkmenistan	None									
Ukraine	Nov. 1994									
Uzbekistan	Nov. 1994	0.29	3.34	-3.65	4.29	5.64	-0.93			
Averages:	All	0.82	3.23	2.94	5.83	0.74	4.65	1.59	-3.67	-6.35
	Central Eur.	-1.87	-0.49	-1.53	4.27	-0.16	2.39	-0.80	-1.19	-1.67
	Baltics	1.38	6.28	6.79	6.79	4.44	14.22	9.96	-5.77	-17.22
	FSU — all	2.26	5.52	5.25	7.03	1.49	6.34	3.04	-3.13	-4.25
	FSU ex war	1.70	5.22	5.71	7.42	3.31	8.43	3.71	-3.83	-5.20
	Eur. FSU	1.67	6.98	8.89	7.21	1.31	9.01	4.85	-4.20	-7.80
	C. Asia, Cauc	2.96	3.78	0.87	6.82	1.72	3.13	0.86	-1.85	

^aSource of stabilization dates: Fischer, Sahay and Végh (1996).