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Social Costs of Mass Privatization

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Abstract

According to leading economic theorists, creating capitalism out of communism requires rapid privatization. In this article we empirically test the welfare implications of privatization policies in Post-Soviet countries by using cross-national panel mortality data as an indicator of social costs. We find that rapid privatization – whether measured by a novel measure of mass privatization program implementation or Enterprise Bank for Reconstruction and Development privatization outcome scores – is a critical determinant of life expectancy losses, and that when privatization policies are reversed, life expectancy improves. Using selection models, we show that endogeneity understates the social costs of rapid privatization.

Keywords: privatization, postcommunist, mortality crisis.
JEL codes: I12, J18, L33, P36.

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Intro

A central tenet of "transition economics", as propounded by leading theorists Jeffrey Sachs, Andrei Shleifer, and Stanley Fischer, is that rapid privatization is crucial for successful transformation of a planned into a market economy (M. Boycko, A. Shleifer, R. Vishny 1995, S. Fischer and A. Gelb 1991, J. Sachs 1992, 1994).[1] While cross-country empirical research evaluating the effects of rapid privatization policies on economic growth has produced mixed results (J. Bennett, S. Estrin, J. Maw, G. Urga, 2004, N. Campos and F. Coricelli, 2002, E. Falcetti, M. Raiser and P. Sanfey 2002, V. Popov 2000, J. Sachs 1996), relatively few studies have examined their effects on the alarming social costs associated with transition.[2] In this paper, we operationalize rapid privatization using a novel measure of mass privatization program implementation and two measures of small- and large-scale privatization outcomes from the Enterprise Bank for Reconstruction and Development. To capture the social costs of transition we exploit rich cross-country variation in male life expectancy and disease-specific mortality data.

We find that rapid privatization is a critical determinant of life expectancy losses, and that when privatization policies are reversed, life expectancy improves. By using size of titular nationalities, log external debt levels, and regional dummies as instruments, we find that failing to take endogeneity into account understates the relationship between privatization and its associated social costs. We also show that privatization was

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[1] "The need to accelerate privatization is the paramount economic policy issue facing Eastern Europe. If there is no breakthrough in the privatization of large enterprises in the near future, the entire process could be stalled for years to come. Privatization is urgent and politically vulnerable" (Jeffrey Sachs, 1992).

[2] For an exception see Elizabeth Brainerd (1998), "Market reform and mortality in transition countries" *World Development*.

inasmuch economically determined as it was socially determined – conditioned by political interactions with existing social structures.

The remainder of the paper is structured as follows: Section 2 outlines the model specification and identification strategy; Section 3 describes the data; and Section 4 presents the results, followed by a concluding section which discusses some policy implications.

Estimation Strategy

There are three main econometric issues of assessing the effect of privatization on mortality: (i) measurement error, (ii) coding bias and (iii) endogenous selection bias.

First, the Enterprise Bank for Reconstruction and Development (EBRD) has constructed two widely used scales of progress in small- and large-scale privatization from a planned (coded as 1) to a market (coded as 4.3) economy (Table 1). A major limitation to these indices – aside from the evident non-linearity in their effects – is that they measure privatization *outcomes* rather than *implementation.* Countries that failed to fully implement privatization may have done so because the social costs were too great – an effect obscured by only scoring countries which successfully effected privatization more highly.[3] Thus, to assess the full social costs of privatization, measurement of the implementation of privatization, irrespective of privatization outcome, is critical. Second, since EBRD economists who constructed the privatization measures were also key policy advisors, there might be ideological pressure to code successful countries as more

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[3] In several transition countries ambitious privatization agendas were announced by policymakers following early democratic regime changes in the early 1990s. Progress was stymied, or even reversed, after the initial waves of privatization reforms due to popular resistance (See L. King and A. Sznajder 2006).

"privatized", especially since country performance in a given year has already been observed at the moment of coding (E. Falcetti, M. Raiser, and P. Sanfey, 2002, B. Merlevede and K. Schoors, 2004). Third, higher privatization scores strongly relate to other positive transition outcomes such as greater democratization and non-corrupt government regulation. Building these observed and unobserved factors into the privatization measure will bias the direction of the findings in line with their effects on social costs.

To overcome these limitations we have designed a novel measure of mass privatization based upon country descriptions in the EBRD *Transition Report* series and codings used for the EBRD privatization indices. The halfway point on the EBRD large-scale privatization scale, or a coding of 3, involves privatization of more than 25 percent of large-scale enterprise assets (Table 1). We code an indicator for whether a country implemented a program that transferred the ownership of at least 25% of large-state owned enterprises to the private sector through vouchers and give-aways to firm insiders.[4]

More challenging is the need to cope with endogeneity in the policy decision to adopt rapid privatization as a capitalist reform strategy. Our analysis follows a quasi-natural experiment approach, which has been strongly advocated by both statisticians and economists for evaluating the effects of policy interventions (J. Angrist and A. Krueger, 2002, D. Freedman 1999). The key advantage is that country implementation of rapid privatization can be treated as independent, such that outcome differentials across these strata can be directly attributed to the policy. Mass privatization seems to be a promising

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[4] We have also consulted with EBRD and WB transition economists as a second check on the validity of these codings for rapid privatization.

candidate for this framework, particularly since the reform itself was intended to operate

as an 'economic shock,' rapidly inducing the formation of a capitalist class (C. Gerry and

C. Li, 2002).

The independence assumption that underlies evaluation of the treatment effect of

the policy, however, will not be unbiased if policy changes are driven by politicians' and

stakeholders' motives in ways that relate to health outcomes (i.e., $E[D_{it}, Z_{it}] \neq 0$ and $E[Z_{it},$

$H_{it}] \neq 0$). Although recent comparative studies by economists have assumed privatization

and its different methods of implementation to be exogenous policy choices (J. Bennett,

et al 2004. M. Boycko, et al 1995), we proceed by carefully assessing potential sources of

endogeneity using instrumental and selection models.

Endogenous Selection Bias

There are several well-established statistical methods that can be employed to

account for endogenous selection bias (e.g., matching, instrumentation, and statistical

adjustments). It seems straightforward to adapt a "Heckman-type" selection model (J

Heckman, 1979) or "control function" (J. Heckman and S. Navarro-Lozano 2004) to the

problem of selection bias; by means of this a selection equation and an outcome equation

are jointly estimated, assuming a bivariate normal error term in the two equations, to cope

with bias resulting from selection on unobservables. We acknowledge that this strategy

has been critiqued for sensitivity to the model specification, problems with collinearity,

and reliance on distributional assumptions in cases where independent variables for

selection and the outcome equation are the same (A. Sartori 2003, F. Vella 1998, C.

Winship and R. Mare, 1992, C. Winship and S. Morgan 1999). Therefore we generate instruments for privatization based upon findings from the sociology literature in addition to performing tests for their validity.

We argue that policy choices to pursue rapid and extensive privatization were in part conditioned by i) ethnic structures, ii) regional policy diffusion, and iii) debt relationships to the IMF, WB and EBRD. First, we hypothesize that newly independent political elites use mass privatization programs to remove the ethnic Russian managers that had immigrated to the non-Russian republics to fill positions established by Soviet industrialization. Kogut and Spicer suggest a similar dynamic within Russia to oust all-Soviet forces (B. Kogut and A. Spicer, 2005).[5] Second, the theory of mimetic isomorphism, or policy diffusion, suggests that the adoption of policies by leading regional countries, such as Russia, will trigger other countries to follow suit. Lastly, since external advisors played an influential role in advising rapid privatization, their influence would have been the greatest for countries with greater debt levels. We will use the relative size of the ethnic Russian minority stratified into three categories, regional variables, and the log of total external debt as instruments for whether a country implemented rapid privatization as a property reform strategy.[6]

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[5] It is reasonable to infer that relatively fixed historical factors, such as ethnic nationality, preceded rather than followed mass privatization programs.

[6] All instruments z are satisfy the first condition of correlation with treatment d – $Cov[z_{it}, d_{it}]$, but the second condition of uncorrelatedness with heterogeneity in outcomes – $Cov[z_{it}, \varepsilon_{it}] = 0$ – cannot be directly tested.

Data and Methods

Our panel data set covers 25 transition countries from 1989 to 2002, using the
World Bank's World Development Indicators 2005 edition for economic data, the
Enterprise Bank for Reconstruction and Development (EBRD) Transition Indicators for
economic policy variables, and the WHO European Health for All and WHO Mortality
databases for health data. Table 1 summarizes variables composing the basic model and
their correlation matrix. Appendix 1 defines all variables, presents descriptive statistics
and lists data sources.

**Table 1. Descriptions of Rapid Structural Privatization Variables from the
Enterprise Bank for Reconstruction and Development**

Measure of Privatization	Description of Coding	Mean Score	
		1991	2002
Mass Privatization	Scale: 0 prior to implementation, 1 thereafter 0 Country did not implement a program that transferred the ownership of at least 25% of large-state owned enterprises to the private sector through vouchers and give-aways to firm insiders. 1 Country implemented a program that transferred the ownership of at least 25% of large-state owned enterprises to the private sector through vouchers and give-aways to firm insiders.	0	0.44
EBRD Small-Scale Privatization Index[†]	Scale: 1 to 4, 4* (coded as 4.3) 1 Little progress 2 Substantial share privatized 3 Comprehensive program almost ready for implementation 4 Complete privatization of small companies with tradable ownership rights 4+ Standards and performance typical of advanced industrial economies: no state ownership of small enterprises; effective tradability of land	1.41	3.84
EBRD Large-Scale Privatization Index[†]	Scale: 1 to 4, 4* (coded as 4.3) 1 Little private ownership 2 Comprehensive scheme almost ready for implementation; some sales completed 3 More than 25 per cent of large-scale enterprise assets in private hands or in the process of being privatized (with the process having reached a stage at which the state has effectively ceded its ownership rights), but possibly with major unresolved issues regarding corporate governance. 4 More than 50 per cent of state-owned enterprise and farm assets in private ownership and significant progress on corporate governance of these enterprises.	1.12	3.05

	4+ Standards and performance typical of advanced industrial economies: more than 75 per cent of enterprise assets in private ownership with effective corporate governance		

Mortality Data

A potential limitation to the analysis of health data during transition is the validity and reliability of health surveillance. More specifically, there are concerns about shifts in mortality stemming from the development of new monitoring and detection methods, as well as inaccurate or mis-classification of death resulting from the transformation of health systems. Such unobserved relationships or measurement errors may obscure the relationship between health outcomes and privatization programs. Overall, the consensus from scholars is that, despite these limitations, the data during reform periods are sufficiently valid and reliable to permit empirical analyses for comparative purposes (E. Brainder and D. Cutler). More generally, mortality data is regarded as more reliable for comparative analysis than macroeconomic data (R. Filer and J. Hanousek, 2001).

Nonetheless the analysis copes with potential distortions in four ways. First, the variation between countries is removed by controlling for country-specific effects. This method effectively holds constant any country's differential propensity to underreport mortality. As long as the bias over time does not change, comparisons over time will be consistent. Second, a set of dummy variables for each year is used to absorb any classification bias arising from changing international death classification codes, which

would cause sudden breaks in the data.[7] Third, a control for military conflict is used to compensate for underreporting in specific countries during turbulent periods highlighted as problematic by WHO. Fourth, life expectancy data from the WB World Development Indicators are used to predict variations in life expectancy data from the WHO 2007 data as a statistical technique to purge measurement errors, which produces attenuation bias, from variation in the data. As a robustness check, the predicted life expectancy data are used as dependent variables.

Health Production Function

Our main specification follows the standard health-production model, which is based on the concept of an individual-specific health production function originated by Grossman (1972) and later advanced upon by Anand and Chen (1996):

(1) $H_{it} = f(Q_{it}, HC_{it}, D_{it}, N_{it}, Z_{it}, V_{it}, S_{it})$,

where Q_{it} is a vector of economic and policy variables; D is a vector of demographic characteristics; HC_{it} is non-health human capital; N_{it} is a vector of dietary and nutritional inputs; Z_{it} is a vector of medical resources; V_{it} is a vector of environmental conditions; and S_{it} is a vector of individual country characteristics.

Combining available comparative data, we specify a basic model:

(2a) $LE_{it} = \alpha + \beta_1 PRIV_{it} + \beta_2 GDP_{it} + \beta_3 LIB_{it} + \beta_4 DEM_{it} + \beta_5 WAR_{it} +$

$\beta_6 URBAN_{it} + \beta_7 EDUC_{it} + \beta_8 DEP_{it} + \theta\lambda_{it} + \mu_i + \eta_t + \varepsilon_{it}$

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[7] This was particularly notable for infant mortality, for which a structural break occurred in 1992/1993 when the more restrictive Soviet-era definition was substituted for the WHO definition (Shkolnikov 1997).

(2b) $\text{MPRIV}_{it} = \alpha + \gamma_1\text{ETH}_{it} + \gamma_2\text{DEBT}_{it\text{-}1} + \gamma_3\text{FSU}_{it} + \gamma_4\,X_{it} + \delta_{it}$

Here LE is male life expectancy and PRIV is one of the three privatization variables described previously. We operationalize Q in eq. 1 using five variables: the natural log of GDP per capita (GDP), which is a robust determinant of health (L. Pritchett, Summers, LH., 1996); the EBRD price liberalization index (LIB), because price setting by markets was theorized to be the main complementary policy needed for privatization to succeed (Selowsky 1997); the Freedom House democratization index (DEM), which was theorized to exert independent health benefits and facilitate transition (O. Adeyi, G. Chellaraj, E. Goldstein, et al 1997); and the occurrence of military or ethnic conflict, including civil war (WAR), which carries direct population health consequences and damages social infrastructure. *HC* is specified as the percentage of population with tertiary education which proxies for individual health knowledge and non-health public sector capacity (EDUC). *D* is specified using two variables: first, the percentage of population living in urban settings, as processes of urbanization shape individual access to healthcare, employment, and exposure to risk factors (URBAN), and second, population dependency ratios (DEP), with youth and elderly as dependents, to adjust for pressure on healthcare systems, as youth and elderly consume the greatest amount of healthcare, and population ageing, which independently affects mortality. λ is the

Inverse-Mill ratio calculated from the first-stage, μ is a vector of country-specific

dummies, and η is a vector of period dummies.[8]

In the first stage equation 2b, MPRIV is the binary variable for implementation of

mass privatization, ETH measures the size of the second largest ethnic minority as a

percentage of the population stratified into three categories, DEBT is the natural log of

total external debt, with a zero for countries and periods which features no debt, FSU is a

regional dummy for membership in the Former Soviet Union, and X indicates that the

first stage nests the second stage covariates to avoid misspecification.

Our main hypothesis is that $\beta_1 < 0$. We also hypothesize that $\beta_2 > 0$, $\beta_3 < 0$, $\beta_4 > 0$,

$\beta_5 > 0$, $\beta_6 < 0$, $\beta_7 > 0$, and $\beta_8 < 0$.

Serial Correlation, Heteroskedasticity, and Unit Roots

Testing our data for nonconstant variance with the Breusch-Pagan method

indicates the presence of heteroskedasticity. We also find evidence of first-order

autocorrelation in our panel. Augmented Dickey-Fuller tests reject the presence of unit

roots in the life expectancy data.[9] Thus we specify an AR(1) model with country-specific

serial correlation using the Prais-Winsten transformation and generalized least squares

estimation to produce asymptotically consistent parameters. Robust panel-corrected

standard errors (Beck and Katz 1995) are calculated to adjust for heteroskedasticity and

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[8] Due to the lack of available data, as robustness checks, we model N as caloric availability. We also subsequently model Z as logged per capita health expenditures. Comparative environmental panel data are unavailable (Ivaschenko, 2006).

[9] Using the following equation to test the null that $\alpha = 0$ based on the critical values in Dickey-Fuller, 1950: $\Delta LE_t = \alpha LE_{t-1} + \beta_1 \Delta LE_{t-1} + \beta_2 \Delta LE_{t-2} + \dots \varepsilon_t$

contemporaneous correlation across panels. Since the panel is unbalanced, the covariance matrix is generated using all available observations rather than only time periods without missing data (which produces slightly higher standard errors here) unless the matrix is not full rank or not positive definite.

Results

First we present our basic model of the effect of privatization on male life expectancy, followed by tests of the consequences of earlier and more extensive privatization strategies. We then undertake a series of robustness checks to account for potential endogeneity and strengthen the case for causality.

Effect of Privatization Policy on Male Life Expectancy

Table 3 shows the results of the basic equation. All three privatization measures, both with and without controls for fixed effects, cause significant male life expectancy losses. Although the coefficients vary, the net effects are similar in size, ranging from 1.28 years lost for countries which implemented mass privatization to between 0.56 and 0.98 years lost in those same countries for average increases in the EBRD privatization indicators.

To put these effects in perspective, according to our model a doubling of per capita GDP would achieve roughly a 1.60 year increase in male life expectancy. That is, growth would need to increase by nearly 80% just to offset the social harms of

privatization as measured by life expectancy losses. However, since most countries

experienced a severe depression following market liberalization (N. Campos and F.

Coricelli 2002, B. Merlevede and K. Schoors 2004, UNDP 1999), declining GDP per

capita further contributed to the Postcommunist mortality crisis.

Several of our other controls have important effects. Price liberalization is

positive and significant in the pooled OLS model, but has no effect once controls for

country- and time-specific effects are included. Democratization improves male life

expectancy, which is consistent with other empirical findings (A. Franco, A. Alvarez-

Dardet, M. Ruiz, 2004). Military conflict has a positive effect in the pooled OLS which

other studies have found in the transition context (M. Suhrcke, 2000), although this is

likely driven by underreporting of mortality (WHO, 2007). Once fixed effects are added

which control for surveillance changes, the occurrence of military conflict is estimated to

reduce male life expectancy by between -0.70 and -0.80 years. Education has no effect.

Both greater urbanization and higher dependency ratios decrease life expectancy as

predicted.

Since the two EBRD variables are highly correlated ($r = 0.85$) and don't appear to

be capturing systematically different relationships with regard to life expectancy

outcomes, we proceed using an average of the EBRD privatization indices to dilute

measurement error.

Testing Rapid versus Gradual Privatization Strategies

There are two ways that the pace of privatization has been treated in the literature: in terms of how early privatization reforms were implemented and how extensive those reforms were. While most empirical analyses consider one or the other, in Tables 4a and 4b we test both. First we interact EBRD privatization measures with the first and second half of the transition period. Each one point increase in privatization prior to 1996 decreased life expectancy by -0.54 years, whereas increases after 1996 were negative but not significant (Table 4a). These results suggest that delaying reforms to later periods shielded populations from social harms associated with privatization. Second we test the effect of more extensive privatization by breaking privatization scores into four intervals. Table 4b shows evidence that higher privatization scores, as compared with little or no privatization, became increasingly more adverse to male life expectancy, albeit at a decreasing rate. Taken together, these findings provide strong evidence that countries which adopted earlier and more extensive privatization reforms – or more "rapid" privatization programs – had greater social costs.

Effect of Privatization Reversals on Male Life Expectancy

To further show that the direction of causality runs from privatization to worse health and not the other way around, we code an indicator for whether the EBRD privatization indices decreased from the previous period (not shown). In this model, the coefficient for a privatization reversal is positive 0.26 and significant at $p<0.05$. Together

with the previous findings, this shows that greater increases in a country's privatization decrease male life expectancy and that conversely when countries reverse privatization its male life expectancy improves as a result.

Sample and Specification Robustness Checks

We next sequentially add several variables identified by the individual health production model (eq. 3) to the right-hand side in order to test the robustness of our basic findings. None of the additional controls had any significant effect (Table 5). However, in several models the coefficient of privatization was modestly attenuated or enhanced, although this could occur simply due to variations in the sample size as a result of missing data.

Endogeneous Selection Bias

Lastly, we evaluate the possibility that unobserved societal or economic conditions may account for both the adoption of mass privatization policies and the mortality crisis net of our controls. Perhaps, the countries with the worst predisposing conditions, or as some argue, most corrupt governments (B. Black, Kraakman, R., and A. Tarassova, 2000), adopt rapid privatization programs as a measure of desperation. If this were the case, it is plausible that life expectancy was going to fall in the countries which implemented mass privatization irrespective of the policy.

Table 6 shows the results of 2SLS and Heckman-type selection models.[10] The coefficient on the EBRD average privatization index is -0.42, which does not significantly differ from models without using instrumentation. However, we find evidence of endogeneity for mass privatization – even with controls for fixed effects. The estimated effect of mass privatization significantly increases to -2.24, and the selection coefficient is positive and significant at $p<0.05$. These results suggest that failing to control for unobserved differences between countries that privatized and countries that didn't privatize understates the relationship between mass privatization and mortality.

The first step model of the determinants of privatization suggests why this is the case (Appendix 1). The biggest factor in explaining intra-former Soviet Union variation in privatization is ethno-national structure, which is historically determined. Those regions that were industrialized under the Soviet Union had a large ethnic Russian population that staffed many of the specialist occupations of the new enterprises. Thus, the countries that mass privatized were also likely to be the more industrialized ones, and as a result were more protected from large-scale economic disturbances.

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[10] Our instruments satisfy required statistical properties. Greater sizes of the Russian minority, membership in the Former Soviet Union, and increased external debt are each significantly scorrelated with mass privatization. Tests for overidentification, or regressing the residuals from the second-stage model using the full set of controls on the instrument set, reject the null hypothesis that the instruments are correlated with the error term of the male life expectancy equation. This reinforces the claim that the size of the ethnic Russian population, membership in the former Soviet Union, and logged external debt levels, after adjustment for the set of controls described, affects our health measures through increasing a country's likelihood of adopting mass privatization as a property reform strategy (orthogonality condition).

Discussion

Rapid privatization, by increasing male death rates, played a critical role in the past century's worst peacetime mortality crisis. Even if successive empirical analysis proves growth benefits, it is extremely unlikely that these gains will be sufficient in magnitude and equitable in distribution to outweigh the tremendous social costs identified in our study. This line of analysis, by using health data as an indicator of economic success or failure, offers one of the first expressions of Amartya Sen's recommendations for empirical welfare evaluations of economic policies (A. Sen, 1998).

Despite our rigorous robustness checks and efforts to account for potential endogeneity, our analysis has several methodological limitations. First, there are no comparative privatization rate data available. The existing EBRD indices are subject to considerable bias, and "reflect the judgment of the EBRD's Office of the Chief Economist about country-specific progress in transition." Given that the Post-Soviet episodes of privatization have been without doubt the largest economic experiment in modern history, such limitations to evaluative infrastructure are of concern. Monitoring and evaluation of policy experiments *in milieu* should focus both on program implementation and outcomes. In many contexts, such as the Postcommunist one, the linkage between the two is not direct, and our study is as a result unable to fully differentiate between these aspects.

Second, although we control for differences in health surveillance between countries, there is potential for bias arising from time-varying surveillance changes within countries. It is, however, unlikely that the temporal variation in surveillance can

account for the relationship between privatization and health net of our control variables. Since studies have linked privatization to decreased state capacity (L. King and P. Hamm 2005), and as a result worsened health surveillance which would lead to greater underreporting, the direction of the potential bias is probably conservative.

Finally, as with all cross-country studies there is potential for ecologic fallacy. However a large body of ethnographic and micro-level research supports our hypothesis, and it is plausible that rapid privatization, by catastrophically increasing work-related stress and eroding social safety nets, fuels mortality increases (E. Brainerd, 1998). In a longer version of this article, we find that rapid privatization explains increases in alcohol-related mortality, suicides and heart-disease mortality.

Keynes, in writing about Stalinism in 1933, foreshadows the implications of Sachs-Shleifer-Fischer's "transition economics" (Yale Review):

> *"We have a fearful example in Russia today of the evils of insane and unnecessary haste. The sacrifices and losses of transition will be vastly greater if the pace is forced…"*

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Table 2. Descriptive Statistics

Summary Statistics

Variables	Mean (SD)	Number of Observations
Male Life Expectancy	66.27 (3.57)	322
EBRD Large-Scale Privatization Index	2.41 (0.98)	309
EBRD Small-Scale Privatization Index	3.11 (1.14)	309
Mass Privatization	0.33 (0.47)	340
Log GDP per Capita	7.28 (0.96)	340
EBRD Price Liberalization	3.21 (0.93)	340
Democratization	7.26 (3.48)	340
Military Conflict	0.06 (0.24)	367
Education	23.38 (12.05)	313
Urbanization	56.63 (12.46)	340
Dependency Ratio	53.41 (10.50)	340

Correlation Matrix

Male Life Expectancy	1.00										
EBRD Large-Scale Privatization Index	0.19	1.00									
EBRD Small-Scale Privatization Index	0.28	0.84	1.00								
Mass Privatization	-0.30	0.40	0.35	1.00							
Log GDP per Capita	0.22	0.39	0.39	-0.11	1.00						
EBRD Price Liberalization	0.27	0.71	0.74	0.38	0.17	1.00					
Democratization	-0.31	-0.52	-0.51	-0.13	-0.69	-0.39	1.00				
Military Conflict	0.12	-0.26	-0.14	-0.18	0.02	-0.07	0.03	1.00			
Education	0.08	0.48	0.49	0.20	0.56	0.49	-0.57	-0.04	1.00		
Urbanization	-0.13	0.22	0.13	0.20	0.62	0.14	-0.53	-0.05	0.45	1.00	
Dependency Ratio	-0.21	-0.39	-0.39	-0.18	-0.71	-0.38	0.67	-0.08	-0.58	-0.76	

Table 3. Effect of Privatization Policy on Life Expectancy in 25 Transition Countries, 1991-2002

Covariates	Pooled OLS[†]			Fixed Effects[‡]		
	(I)	(II)	(III)	(III)	(IV)	(V)
EBRD Large-Scale Privatization Index	-0.63 (0.27)*	–	–	-0.25 (0.12)*	–	–
EBRD Small-Scale Privatization Index	–	-0.38 (0.27)	–	–	-0.35 (0.14)*	–
Mass Privatization	–	–	-2.81 (0.42)***	–	–	-1.28 (0.23)***
Log GDP per Capita	1.07 (0.28)***	1.04 (0.33)**	0.12 (0.31)	1.81 (0.31)***	1.72 (0.31)***	1.46 (0.33)***
Price Liberalization	1.10 (0.29)***	1.00 (0.32)**	1.10 (0.22)***	-0.20 (0.13)	-0.19 (0.12)	-0.19 (0.14)
Democratization	0.32 (0.08)***	0.30 (0.08)***	0.32 (0.07)***	0.22 (0.07)**	0.23 (0.07)***	0.21 (0.07)***
Military Conflict	0.32 (0.68)	0.63 (0.65)	0.15 (0.52)	-0.72 (0.31)*	-0.70 (0.31)*	-0.80 (0.25)***
Education	-0.07 (0.02)***	-0.07 (0.02)***	-0.06 (0.02)***	-0.01 (0.01)	-0.01 (0.01)	-0.01 (0.01)
Urbanization	-0.19 (0.02)***	-0.19 (0.02)***	-0.15 (0.02)***	-0.22 (0.06)***	-0.23 (0.05)***	-0.19 (0.06)***
Dependency Ratio	-0.13 (0.03)***	-0.13 (0.03)***	-0.15 (0.03)***	-0.23 (0.06)***	-0.26 (0.06)***	-0.23 (0.07)***
N x T	302	302	302	302	302	302
N	25	25	25	25	25	25
R^2	0.35	0.35	0.44	0.92	0.92	0.93

Note: † - Robust standard errors in parentheses. ‡ -Prais-Winsten transformation used to accommodate AR(1) disturbance with robust panel-corrected standard errors; models also control for two-way fixed effects. Hausman-Taylor $\chi^2 = 44.23$ (p<0.01), favors fixed effects over random effects.
* - p<0.05, ** - p<0.01, *** - p<0.001

Table 4a. Effects of Early versus Late Privatization

Dependent Variable: Male Life Expectancy

Covariates	Prior to 1996	Post 1996
EBRD Average Privatization Index	-0.54 (0.21)**	-0.07 (0.46)

Note: Robust panel-corrected standard errors in parentheses. Models control for the effects of price liberalization, occurrence of military and ethnic conflict, percentage of population urban, age-dependency ratio, and percentage population with tertiary education and country- and time-dummies.

Table 4b. Effects of Extensive Privatization

Dependent Variable: Male Life Expectancy

Threshold	Average Privatization
Index >=3.5	-0.76 (0.33)*
2.5< Index <=3.5	-0.61 (0.24)*
1.5< Index <=2.5	-0.34 (0.19)
Reference <=1.5	–

Note: All effects are jointly significant at p<0.001 based on robust panel-corrected standard errors calculated using $\chi^2(3)$. Models control for the effects of price liberalization, occurrence of military and ethnic conflict, percentage of population urban, age-dependency ratio, and percentage population with tertiary education and country- and time-dummies.

Table 5. Sample and Specification Robustness Checks

Covariates	Coefficient of Control	Coefficient of Mass Privatization	Coefficient of Control	Coefficient of EBRD Avg. Privatization	N
Economic and Policy (Q)					
Foreign Direct Investment	0.02	-1.25	0.03	-0.45	302
	(0.01)	(0.23)***	(0.02)	(0.14)**	
EBRD Foreign Exchange &	0.15	-1.43	0.06	-0.47	290
Trade Liberalization	(0.11)	(0.24)***	(0.11)	(0.15)**	
Hyperinflation	-0.08	-1.29	-0.01	-0.43	302
	(0.16)	(0.23)***	(0.05)	(0.15)**	
Health System (Z)					
Log Health Spending per	-0.09	-1.19	-0.05	-0.42	258
Capita	(0.17)	(0.25)***	(0.16)	(0.17)*	
Health Spending as a	2.63	-1.23	2.58	-0.37	253
Percentage of Total	(2.05)	(0.23)***	(1.94)	(0.16)*	
Government Spending					
Number of Physicians per	0.03	-1.28	0.25	-0.42	281
1000 population	(0.21)	(0.22)***	(0.23)	(0.17)***	
Hospital Beds	-0.03	-1.57	0.00	-0.43	274
	(0.09)	(0.21)***	(0.11)	(0.20)*	
Diet and Nutrition (N)					
Protein Availability	0.08	-1.25	0.10	-0.51	297
	(0.10)	(0.23)***	(0.10)	(0.16)***	
Log Fruit and Vegetable	0.36	-1.34	0.53	-0.62	281
Availability	(0.59)	(0.23)***	(0.53)	(0.20)**	
Log Caloric Availability	0.13	-1.47	-0.37	-0.54	299
	(0.92)	(0.23)***	(0.93)	(0.17)**	

Note: Results presented from 20 separate regression models. Robust panel corrected standard errors in parentheses. Q, Z, and N correspond to the health-production function in eq. 3.

Table 6. 2SLS and Selection Models, 1991-2002

Covariates	2SLS[†]	Treatment Effects[‡]
EBRD Average Privatization Index	-0.42 (0.15)**	–
Mass Privatization	–	-2.24 (0.55)***
Selection Coefficient (λ)	–	0.73 (0.33)*

Note: Results presented from four separate regression models. † - Robust panel-corrected standard errors in parentheses. ‡ - Robust standard errors adjust for selection. Models control for the effects of price liberalization, occurrence of military and ethnic conflict, percentage of population urban, age-dependency ratio, and percentage population with tertiary education and country- and time-dummies.

* - $p<0.05$, ** - $p<0.01$, *** - $p<0.001$

Appendix 1. Descriptive Statistics and Variable Definitions

	Appendix 1. Descriptive Statistics and Variable Definitions				
Variable	Definition	Obs	Mean	Std. Dev.	Source
Log GDP per Capita	Gross Domestic Product per capita US$ 2000	340	7.28	0.96	World Bank World Development Indicators 2005 Edition
Democratization	Sum of Heritage Foundation Political Freedom and Civil Liberties Index	340	7.26	3.48	Heritage Foundation
Price Liberalization	EBRD Price Liberalization Index, scale of 1 (planned) to 4.3 (market) in increments of 0.3	340	3.21	0.93	Enterprise Bank for Reconstruction and Development Structural Change Indicators
Foreign Exchange & Trade Liberalization	EBRD Foreign Exchange & Trade Liberalization Index, scale of 1 (planned) to 4.3 (market) in increments of 0.3	321	3.12	1.24	Enterprise Bank for Reconstruction and Development Structural Change Indicators
Average Privatization	Average of EBRD Small- and Large-Scale Privatization Indices	309	2.76	1.01	Enterprise Bank for Reconstruction and Development Structural Change Indicators
Foreign Direct Investment	Log foreign direct investment as a percentage of GDP	340	0.03	0.04	World Bank World Development Indicators 2005 Edition
Physicians	Number of physicians per 1,000 population	286	3.05	0.85	World Health Organization European Health for All Database 2007
Health Spending	Public health spending as a percentage of GDP	263	3.92	1.72	World Health Organization European Health for All Database 2007
Hospital Beds	Number of hospital beds per 100,000 population	278	8.49	2.68	World Health Organization European Health for All Database 2007
Caloric Intake	Average number of calories available per person per day	311	2831.28	393.01	World Health Organization European Health for All Database 2007
Protein	Percentage of total energy available from protein	309	11.92	1.19	World Health Organization European Health for All Database 2007
Fruit and Vegetables	Availability of fruits and vegetables in 10 kilograms per person per day	293	151.66	42.88	World Health Organization European Health for All Database 2007

Appendix 2. Determinants of Privatization

Covariates	Mass Privatization Probit[†]	EBRD Average Privatization LPM
Log External Debt	0.01	0.03
	(0.01)*	(0.00)***
Titular Nationality	-0.17	-0.16
	(0.05)***	(0.06)**
Former Soviet Union	0.57	0.53
	(0.09)***	(0.11)***
Log GDP per Capita	-0.20	0.47
	(0.05)***	(0.06)***
EBRD Price Liberalization	0.17	0.58
	(0.04)***	(0.04)***
Democratization	0.04	-0.07
	(0.01)***	(0.01)***
Military Conflict	-0.15	-0.33
	(0.04)*	(0.18)
Dependency Ratio	-0.02	-0.00
	(0.01)**	(0.01)
Urbanization	0.01	-0.03
	(0.01)	(0.01)***
Education	-0.01	-0.00
	(0.00)***	(0.01)
N x T	313	313
N	25	25
Pseudo-R^2	0.52	0.77

Note: † - evaluated at marginal effects at mean values. Robust standard errors clustered by country in parentheses.

Appendix 3. Privatization Scores and Life Expectancy Losses, 1991-2002

COUNTRY	IMPLEMENTED MASS PRIVATIZATION PROGRAM	SMALL-SCALE PRIVATIZATION[†]	LARGE-SCALE PRIVATIZATION[†]	EXCESS MORTALITY (NET YEARS OF MALE LIFE EXPECTANCY LOST)
ALBANIA	No	4.0	3.0	7.28
ARMENIA	Yes	3.7	3.0	-10.04
AZERBAIJAN	No	3.3	2.0	5.33
BELARUS	No	2.0	1.0	-11.99
BULGARIA	No	3.7	3.7	-5.75
CROATIA	No	4.3	3.0	15.12
CZECH	Yes	4.3	4.0	8.61
ESTONIA	No	4.3	4.0	-9.86
GEORGIA	Yes	4.0	3.3	-11.24
HUNGARY	No	4.3	4.0	1.88
KAZAKHSTAN	Yes	4.0	3.0	-17.31
KYRGYZSTAN	Yes	4.0	3.0	-13.45
LATVIA	Yes	4.3	3.0	-12.97
LITHUANIA	Yes	4.3	3.3	-7.04
MACEDONIA	No	4.0	3.0	5.73
MOLDOVA	Yes	3.7	3.0	-6.67
POLAND	No	4.3	3.3	9.02
ROMANIA	Yes	3.7	3.3	-7.80
RUSSIA	Yes	4.0	3.3	-23.00
SLOVAKIA	No	4.3	4.0	0.89
SLOVENIA	No	4.3	3.0	5.27
TAJIKISTAN	No	3.7	2.3	-21.61
TURKMENISTAN	No	2.0	1.0	-1.67
UKRAINE	Yes	3.3	3.0	-13.21
UZBEKISTAN	No	3.0	2.7	-3.14

Note: † - denotes index value in 2002. Excess mortality is calculated as the sum of each year's life expectancy difference from 1991 to 2002: $-\sum_{1992}^{2002}(LE_{Current} - LE_{1991})$. Negative values indicate net life expectancy gains during the transition period. Mass Privatization codings are taken from the Enterprise Bank for Reconstruction and Development *Transition Report* series.

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