

## **Did Mass Privatisation *Really* Increase Post-Communist Mortality? Web Appendix**

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In this document, we describe more fully the methods and results summarized in our letter to *The Lancet*. We begin by presenting our replication of the cross-country analysis reported in Stuckler, King, and McKee (henceforth SKM).<sup>1</sup> We then proceed to an alternative research design, where we explore the relationship between privatisation and mortality across Russian regions. Finally, we revisit the question of whether privatisation increased mortality, the only mechanism for which SKM provide evidence by which privatisation might have increased mortality.

### **Cross-Country Analysis**

As discussed in the letter, we begin by reexamining the cross-country correlation between mortality and privatisation, focusing on the 15 former republics of the former Soviet Union (FSU), as SKM find a positive relationship between privatisation and mortality only in that sample. The table in the letter presents these results.

We first perform pure replications using the SKM regression specifications. The dependent variable in SKM and our replications is the natural log of the age-standardized mortality rate for males aged 15–59. SKM use two alternative measures of privatisation in different specifications: a “mass privatisation” indicator and the “average EBRD privatisation index,” the latter the average of two widely used measures of progress in privatisation published in the annual *Transition Report* of the European Bank for Reconstruction and Development.<sup>2</sup> We discuss both measures further below. In all specifications, SKM include country fixed effects, and they control for various time-varying country characteristics: log income, price liberalization, foreign exchange/trade liberalization, democracy, war, population dependency, urbanization, and higher education.

Columns (1) and (2) of the first row of estimates in the table in the letter present these replications. The results are very similar to those published in SKM. There is a positive estimated impact of privatisation using both measures in the FSU sample. Results for the control variables are not reported in SKM, so we suppress them here as well (they are available on request).

We next use original source data to reexamine SKM’s privatisation variables. Beginning with the mass privatisation indicator, the SKM definition is “a programme that transferred the ownership of at least 25% of large state-owned enterprises to the private sector in 2 years...0 before mass privatisation, 1 thereafter,” measured as “a jump from 1 to 3 on the EBRD large-scale privatisation index” (p. 2). The coding of the SKM variable is sometimes inconsistent with this definition, however, as when the rise from 1 to 3 took more than two years but the SKM variable is coded as 1. Furthermore, the SKM description of timing is ambiguous: at what point during the period the EBRD index is changing should the indicator change from 0 to 1? The SKM variable is again inconsistent, but it seems most reasonable to code the mass privatisation indicator as 1 from the year the index reaches 3. We use a recoded indicator that incorporates these two changes; details are available in Tables A1–A3.

Results for a regression with the recoded mass-privatisation indicator are shown in column (3) of the first row of the table in the letter. (With the exception of the recoded mass-privatisation indicator, we continue to use the SKM data in this and all subsequent specifications.) The estimated effect on mortality is much smaller and only weakly significant. This result alone greatly undermines the case that enterprise privatisation raised mortality in postcommunist countries. Giving SKM the benefit of the doubt, however, one could point out that designations of “mass privatisation” are subjective, possibly differing among knowledgeable observers. SKM’s description of their indicator might be incorrect or oversimplified. In any case, the results are clearly quite sensitive to the coding of this variable.

Next, we consider issues of regression specification. Many questions could be raised about the SKM specification, but we restrict attention to two: timing and trends. First, SKM assume that the impact of privatisation on mortality is immediate, but it seems more likely that any impact would occur with a lag. Certainly this is the case if the causal mechanism is the one adduced in the article: privatised firms shed workers, who in turn become unemployed and unhealthy. Second, the SKM specification also assumes that trends in mortality are equal for all countries. As noted elsewhere, however, trends are quite different across these countries, and some of them appear to be long-term.<sup>3</sup> (An *F*-test on country-specific trends in a regression using data through 1993—the pre-privatisation years in the data— produces a statistic significant at the 0.02 level.) We therefore check the robustness of the results to lagging the privatisation and other economic variables and to inclusion of country-specific linear time trends.

The specifications in the second and third rows of the table in the letter lag the privatisation and other economic variables by one and two years, respectively. Lagging by just one year substantially attenuates the original estimates and reduces their statistical significance. Lagging by two years further reduces the estimated coefficients and in two of three cases eliminates their statistical significance entirely. (The table reports results from specifications that drop the first one and two observations for each country, respectively, when lagging by one and two years, but the estimates are very similar if we instead use original source data to back-fill variables.)

The specification in the fourth row of the table in the letter adds country-specific linear time trends. This small change substantially reduces both the magnitude and statistical significance of the estimated effect of privatisation on mortality. Combining country-specific trends with one-year lags (the fifth row of the table) eliminates any statistically significant effect of privatisation on mortality. Combining trends and two-year lags (the sixth row of the table) results in only negative coefficients, two of them statistically significant.

While the correct functional form for the privatisation-mortality relationship is unknown, these results show that small, reasonable changes in variable measurement or specification yield substantially different conclusions on the magnitude and even sign of this relationship. We conclude that the positive estimated relationship between privatisation and mortality reported in SKM is not robust.

### **Privatisation and Mortality in Russian Regions**

We next turn to an alternative research design, examining the relationship between privatisation and mortality across regions within Russia, perhaps the country with the best-known privatisation program. This within-country approach has the advantage of holding constant many features of the economic, political, and social environment that could be correlated with privatisation and mortality.<sup>4,5</sup> At the same time, we can exploit substantial variation across regions in the extent of privatisation and in changes in mortality rates during the early transition period.

The Russian State Statistics Service (Rosstat) provides regional data on mortality. Unfortunately, however, the mortality rate for working-age men (defined as deaths per 100,000 men aged 16 to 60), the focus of SKM and most work on mortality in postcommunist countries, is not available for the years 1991–1993. Given that mass privatisation in Russia was implemented between late 1992 and mid-1994, we therefore examine determinants of change in (the log of) the mortality rate for working-age men from 1990 to 1995, regressing this variable on measures of privatisation and other regional characteristics; we obtain very similar results if we use the change from 1990 to 1994.

To examine the relationship between privatisation and change in mortality, we use two measures of employment in privatised firms. The first, provided by Rosstat, is the proportion of employment in firms with mixed state-private ownership. Because the state retained a residual share in nearly every firm privatised through mass privatisation, this corresponds closely to privatised employment. (In contrast, fully private firms are in most cases *de novo* enterprises.) We use data from 1995, the first year available.

We constructed the second measure, privatised manufacturing employment, from industrial-registry data on manufacturing enterprises collected by Rosstat and used in previous work to estimate regional productivity effects of privatisation.<sup>6</sup> These data are quite comprehensive, corresponding roughly to the “old” sector of manufacturing firms (and their successors) inherited from the Soviet system. We use ownership and employment data from 1994 to calculate the proportion of manufacturing employment in firms privatised to domestic owners. Both this and the Rosstat measure exhibit substantial variation, with standard deviations of 13% and 7%, respectively, versus means of 81% and 22%.

We control for various regional characteristics that may be correlated with both changes in mortality and privatisation outcomes. In addition to regressors similar to those in SKM, proportion Muslim<sup>7</sup> is included because regions with large Muslim populations may have been less affected by changes in the price and availability of alcohol, a leading explanation for changes in mortality rates.<sup>8,9,10,11</sup> Mean January temperature is also included, as conditions may be different in inhospitable regions populated forcibly during the Stalinist era.

Table A4 reports results from OLS regressions of initial mortality and change in mortality on various regional characteristics, including our two privatisation measures. The primary finding is the uniform absence of any evidence that privatisation increased mortality for working-age men. The point estimate of the privatisation effect is in fact negative in every case, and it is statistically significant when privatisation is defined as privatised manufacturing employment. This holds regardless of whether initial mortality is included among the regressors.

### **Privatisation and Unemployment**

The analysis so far focuses on the robustness—or lack thereof—of the privatisation-mortality correlation in SKM. As an additional check on the results, we consider the question of causality: how could privatisation raise mortality? The main theory offered by SKM is that privatised firms reduce employment, with the resulting unemployment leading to worsened health and higher mortality. But is the first step in this logic valid—that is, does privatisation systematically lead to substantial job loss?

SKM provide evidence on this point from regressions of the log of the registered male unemployment level on the same set of variables used in the mortality regressions. The reported coefficients on the mass privatisation indicator and EBRD average privatisation index are positive in the FSU, but not in Central and Eastern Europe. We replicate that analysis, again checking for robustness to variable measurement and specifications that account for timing and trends.

The first two columns of the first row of Table A5 are pure replications of the SKM unemployment results, and the estimates are qualitatively similar. The third result in this row, however, shows that the estimated effect of the recoded mass privatisation indicator is negative, though statistically insignificant, casting doubt on the positive estimated relationship reported in SKM.

The second row of Table A5 lags privatisation and other economic variables by one year, which permits time for policy implementation to affect downsizing; the estimated effect of privatisation on unemployment is substantially smaller than that in the baseline specification in all three cases. Adding country-specific trends to account for differences in trend unemployment growth, the estimated coefficients are all statistically insignificant, with magnitudes generally close to zero.

Thus, evidence in support of the primary mechanism hypothesized in SKM is not robust to small changes in measurement and specification. It is also not supported by analysis of data on firms, the level where decisions about employment and privatisation take place. Unemployment may worsen health, but there is little evidence that post-communist privatisation caused unemployment to rise.<sup>12</sup> Moreover, while involuntary turnover of workers may lead to poor health outcomes, all available evidence suggests little impact of enterprise privatisation in postcommunist societies on layoffs and other types of worker turnover.<sup>13,14,15</sup>

## References

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**Table A3: EBRD Large Privatisation Index**

	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Albania	1	1	1	1	1	1	2	2.33	2.33	2.33	2.67	2.67	3	3
Armenia	1	1	1	1	1	1	2	3	3	3	3	3	3	3.33
Azerbaijan	1	1	1	1	1	1	1	1	2	2	1.67	1.67	2	2
Belarus	1	1	1	1	1.67	1.67	1.67	1	1	1	1	1	1	1
Bulgaria	1	1	1	1.67	2	2	2	2	3	3	3	3.67	3.67	3.67
Croatia	1	1	1	2	2	2	3	3	3	3	3	3	3	3
Czech Republic	1	1	1	2	3	4	4	4	4	4	4	4	4	4
Estonia	1	1	1	1	2	3	4	4	4	4	4	4	4	4
Georgia	1	1	1	1	1	1	2	3	3.33	3.33	3.33	3.33	3.33	3.33
Hungary	1	2	2	2	3	3	4	4	4	4	4	4	4	4
Kazakhstan	1	1	1	1	2	2	2	3	3	3	3	3	3	3
Kyrgyzstan	1	1	1	2	2	3	3	3	3	3	3	3	3	3
Latvia	1	1	1	2	2	2	2	3	3	3	3	3	3	3.33
Lithuania	1	1	1	2	3	3	3	3	3	3	3	3	3.33	3.67
Macedonia	1	1	1	1	2	2	2	3	3	3	3	3	3	3
Moldova	1	1	1	1	2	2	3	3	3	3	3	3	3	3
Poland	1	2	2	2	2	3	3	3	3.33	3.33	3.33	3.33	3.33	3.33
Romania	1	1	1.67	1.67	2	2	2	2.67	2.67	2.67	2.67	3	3.33	3.33
Russia	1	1	1	2	3	3	3	3	3.33	3.33	3.33	3.33	3.33	3.33
Slovakia	1	1	1	2	3	3	3	3	4	4	4	4	4	4
Tajikistan	1	1	1	1	1	1	2	2	2	2	2.33	2.33	2.33	2.33
Turkmenistan	1	1	1	1	1	1	1	1	2	1.67	1.67	1.67	1	1
Ukraine	1	1	1	1	1	1	2	2	2.33	2.33	2.33	2.67	3	3
Uzbekistan	1	1	1	1	1	2	2.67	2.67	2.67	2.67	2.67	2.67	2.67	2.67

Source: EBRD Transition Indicators (<http://www.ebrd.com/country/sector/econo/stats/tic.xls>).

**Table A4: Determinants of Mortality in Russian Regions**

	Initial mortality		Change in Mortality		
	(1)	(2)	(3)	(4)	(5)
Privatized employment		-0.130 (0.443)	-0.136 (0.423)		
Privatized manufacturing employment				-0.188 (0.061)	-0.189 (0.074)
Log initial mortality			-0.035 (0.801)		0.012 (0.933)
Log income	-0.058 (0.375)	0.004 (0.960)	0.002 (0.983)	-0.003 (0.973)	-0.002 (0.979)
Population dependency	1.821 (0.026)	-1.570 (0.047)	-1.504 (0.062)	-1.704 (0.029)	-1.726 (0.037)
Urbanization	-0.080 (0.467)	0.639 (0.000)	0.639 (0.000)	0.640 (0.000)	0.642 (0.000)
Higher education	-0.179 (0.520)	-0.859 (0.156)	-0.870 (0.162)	-1.006 (0.076)	-1.006 (0.078)
Proportion Muslim	-0.586 (0.000)	-0.100 (0.030)	-0.120 (0.162)	-0.133 (0.005)	-0.126 (0.118)
Mean January temperature	-0.002 (0.309)	-0.002 (0.244)	-0.003 (0.211)	-0.001 (0.679)	-0.001 (0.687)
Constant	5.900 (0.000)	0.822 (0.022)	1.031 (0.267)	1.041 (0.006)	0.973 (0.270)
R-squared	0.569	0.628	0.628	0.647	0.647

Notes: OLS regressions. Dependent variable is log mortality rate for working-age men, 1990 (column 1); change in log mortality rate for working-age men, 1990 to 1995 (columns 2--5). Sample is 76 regions. In parentheses, *p*-values calculated from heteroskedasticity-robust standard errors.



**Table A5: Cross-Country Unemployment Regressions on the SKM Sample of FSU Countries**

	Mass Privatisation	Average EBRD Privatisation	Recoded Mass Privatisation
	(1)	(2)	(3)
SKM specification	0.684 (0.003)	0.579 (0.000)	-0.073 (0.775)
One-year lag	0.568 (0.008)	0.272 (0.058)	-0.371 (0.115 )
One-year lag & country-specific trends	0.300 (0.161)	0.080 (0.604)	-0.340 (0.158)

Notes: Each cell of the table reports the estimated effect of privatisation on log registered male unemployment level from a separate regression. Privatisation is measured in three alternative ways: Column (1), as a dummy variable for mass privatisation coded by SKM; Column (2), as the average of the European Bank for Reconstruction and Development (EBRD) indexes for large-scale and small-scale privatisation; and Column (3), as a dummy variable for mass privatisation recoded precisely following the description in SKM (see text for details). With the exception of the privatisation measure in Column (3), data are identical to those in SKM. Specifications are identical but for the specific changes noted in the table. In parentheses, *p*-values calculated from heteroskedasticity-robust standard errors.