

### **Appendix C: Control Factors**

This appendix describes the remaining control factors. These control factors relate to the costs of compliance and non-compliance. The first set relates to non-compliance costs. In particular, we incorporate additional regulatory factors as control factors (Helland, 1998a; Earnhart, 2004a,b; Nadeau, 1997). First, we include two regressors that separately measure annual budgetary resources expended by state and local agencies (by state) and EPA regional offices (by region). Each budgetary measure is adjusted by the number of manufacturing facilities in each state and region, respectively, for the relevant year. Second, we include facility-specific NPDES permit conditions as regressors, which capture certain dimensions of regulatory stringency: (1) the permitted effluent limit (in pounds/day); (2) the limit type [initial or interim versus final]; and (3) an indicator for any modification(s) to the NPDES permit after issuance. We also include a set of individual calendar year indicators. In addition to regulatory pressure, we allow ownership structure to control for variation in investor pressure, by contrasting publicly held structures from all other ownership structures.

The second set of control factors relate to the costs of compliance, i.e., costs of abatement. Specifically, we include facility and firm characteristics as control factors (Earnhart, 2004a; Bandyopadhyay and Horowitz, 2006; Gray and Shadbegian, 2005). We include flow design capacity, which represents one dimension of facility size,<sup>1</sup> and the ratio of actual wastewater flow to flow design capacity, which may proxy for treatment capacity utilization. We also include the volatility of wastewater discharges, as measured by the standard deviation of the discharge ratio over a current calendar year.<sup>2</sup> We use firm ownership structure to control for variation in abatement costs, as well as variation in investor pressure.<sup>3</sup>

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<sup>1</sup> Since the EPA does not systematically provide data on flow design capacity, this study uses a proxy: the average flow of wastewater (millions of gallons per day) over the preceding 12-month period.

<sup>2</sup> Since the standard deviation, by construction, captures deviations from a mean, this regressor is not correlated with the dependent variable level (i.e., current discharge ratio).

<sup>3</sup> Flow design capacity and ownership structure vary over time for individual facilities during the sample period.