5

Empirical Analyses

5.1 Analysis Procedure

The following chapters present the empirical studies on ownership and performance. The analyzed equations system is aligned with the model of hypothesized effects.[1] To first analyze the relation of each ownership measure and performance separately, the model is decomposed in the three equations systems A, B and C as demonstrated in Figure 5.1. The first of the three models elaborates on ownership concentration; the second model focusses on insider ownership and the third on institutional ownership.

Each model contains the relation of performance to one of the ownership forms and thus includes two equations; one covering the effects of the ownership aspect on performance and a second with performance determining ownership:

$$\left|\begin{array}{rl} Perf = O & + \text{control variables} \\ O = Perf & + \text{control variables} \end{array}\right|$$

In the next step all three ownership dimensions and performance are combined to one four-equations system:

$$\left|\begin{array}{rl} Perf = & +OC + IO + MO + \text{control variables} \\ OC = Perf & + \text{control variables} \\ IO = Perf & + \text{control variables} \\ MO = Perf + OC + IO & + \text{control variables} \end{array}\right|$$

All four model sections are similarly structured. To avoid a bias due to the misspecification as reciprocal system the Durbin-Wu-Hausman and the Wu-Hausman tests are applied to prove endogeneity. The null hypothesis of those tests states that an OLS estimator of the same equation would yield consistent estimates; i.e., any endogeneity among the regressors would not have deleterious effects on OLS estimates. A rejection of the null indicates that endogenous

[1] For an overview over the model see Figure 3.5, p. 68.

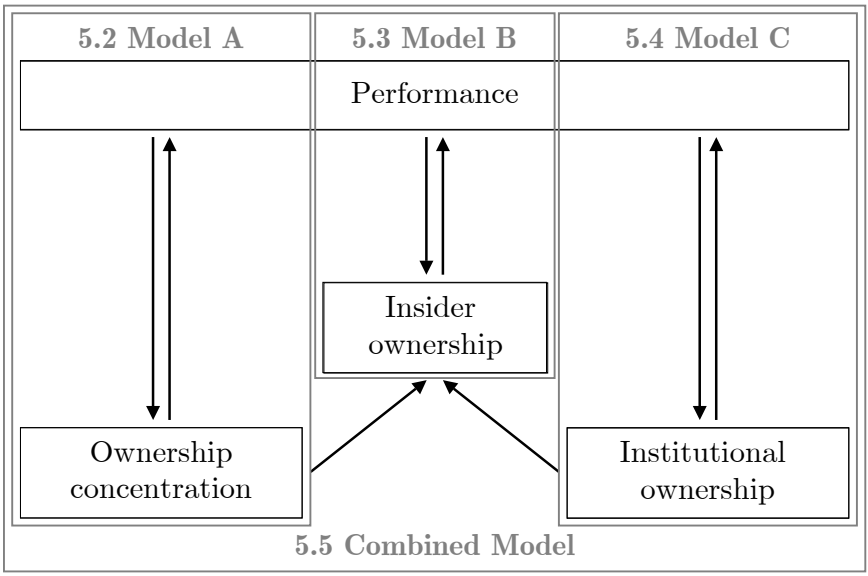

Fig. 5.1: Analyzed simultaneous equations models

regressors' effects on the estimates are meaningful and simultaneous equation techniques are required.

The two tests differ in the underlying distribution. The Durbin-Wu-Hausman test was first proposed by Durbin [1954] and by Wu [1973] and Hausman [1978]. Under the null, it is distributed χ^2 with m degrees of freedom, where m is the number of regressors specified as endogenous in the original regression. The Wu-Hausman test is often just termed Hausman test, but was first suggested by Wu [1973]. They showed that the test could be calculated straightforwardly through the use of auxiliary regressions. In contrast to the Durbin-Wu-Hausman test, the test statistic is distributed F(m, N-k) under the null, where m is the number of regressors specified as endogenous in the original regression.[2]

After simultaneity is proven and the application of simultaneous equation methods justified, the relation shape is tested as further model specification. The forms of potential relations are compared by the model fit. The evaluation is based on the commonly used root mean square error of approximation (RMSEA). It is based on the population discrepancy and calculated as follows:

[2] For a more detailed elaboration on both tests see Davidson/MacKinnon [1993, Chapter 7.9, pp. 237-240] and Nakamura/Nakamura [1981]. Generally both methods test the OLS assumption of a zero correlation between explanatory variables and error terms.