

Pricing

1. In order to evaluate competition in the brick industry, we need to understand how prices are set in this industry. The purpose of this appendix is to provide a technical summary of the econometric model that estimated the relation between prices and possible price determinants, based on transaction data from Baggeridge, Hanson and Ibstock for 2003 to 2006.¹
2. Specifically, our empirical analysis considers how: (a) geographic distance; (b) volume; and (c) multi-sourcing impact on ex-works prices. Using an ordinary least squares (OLS) approach, we found that there was a small negative volume effect (ie prices are slightly lower, the larger the transaction volume), negative multi-sourcing effects (ie prices are lower for customers who also purchase bricks from other manufacturers) and a negative distance effect (ie prices are lower the larger the geographic distance between brick plant and customer). However, as we found that the Wu-Hausman tests rejected the null hypothesis of exogeneity of volume, the OLS analysis might yield biased and inconsistent estimates. The method of choice was therefore two-stage least squares (2SLS), in which we used three-month dummies (March, June and September) as instrument variables² for volume. The results of this regression are shown in Table 1.

TABLE 1 2SLS estimation results for $P_{ext_ew} = f(\text{volume, dist, mult3})$ base case

Variable	Coefficient	Std error	t-Statistic	$P > t $	95% Confidence interval	
Volume	-0.047	0.016	-2.95	0.003	-0.079	-0.016
Dist	-0.197	0.043	-4.60	0.000	-0.282	-0.113
Mult3	-6.099	1.014	-6.01	0.000	-8.086	-4.111

Source: CC analysis of data provided by the four firms.

Note: The sample period is 2003 to 2006. The instrument list for the first stage regression is: Mar Jun Sept.

3. The base case is Baggeridge's ex-works prices for extruded facing bricks (P_{ext_ew}). We found that, in comparison, ex-works prices for engineering bricks are lower on average and ex-works prices for soft mud facing bricks are higher on average.
4. The results in Table 1 confirm the findings of the OLS regression. The negative distance coefficient suggests that ex-works prices are generally lower the larger the distance between a manufacturer's plant and the location of its customer, ie the higher transport costs for longer distance deliveries are partly offset by reduced ex-works prices. This confirms what the four manufacturers have told us, ie that they flex their ex-works price to compensate for higher transport costs in order to be competitive in areas further from their plants. We note that the volume effect will be underestimated because volume rebates were not included in the realized prices in the transaction database. The negative multi-sourcing coefficient suggests that ex-works prices are generally lower if customers multi-source from three manufacturers.

¹Wienerberger's transaction data did not separate transport costs from the total transaction price, which made it impossible to evaluate the effects of volume, distance and multi-sourcing on its ex-works prices. Wienerberger data have therefore been excluded from the regression analysis.

²An instrument variable is an exogenous variable that is correlated with, in this case, volume, which will therefore tell us something about the effect of volume on prices, but without biasing the regression. The three-month dummies capture (exogenous) seasonal variation in construction activity which one would expect to be correlated with volume.

5. As a sensitivity test of our findings, we also regressed *delivered* prices. The Heckman selection model was estimated for delivered prices to account for the fact that only a sub-sample of all transactions involved delivery by the manufacturers, (as opposed to collection by customers). The results of the regression of delivered prices are shown in Table 2.

TABLE 2 2SLS estimation results for $P_{ext_del} = f(\text{volume, dist, mult3})$ base case

Variable	Coefficient	Std error	z-Statistic	$P > z $	95% Confidence interval	
Volume	-0.059715	0.0001078	-55.40	0.000	-0.0061828	-0.0057602
Dist	0.0537318	0.0084687	6.34	0.000	0.0371333	0.0703302
Mult3	-5.845369	0.2036068	-28.71	0.000	-6.244431	-5.446307

Source: CC analysis of data provided by the four firms.

Note: The sample period is 2003-2006. The instrument list for the first stage regression is: Mar Jun Sept.

6. The base case is Baggeridge's delivered prices for extruded facing bricks. As above, we found that, in comparison, delivered prices for engineering bricks are lower on average and delivered prices for soft mud facing bricks are higher on average.
7. The results shown in Table 2 broadly confirm our findings above. We find similar volume and multi-sourcing effects. The distance coefficient is no longer negative, but slightly positive, indicating delivered prices vary little with distance, with prices generally being somewhat higher the larger the geographic distance between a manufacturer's plant and its customer's location. This appears to confirm that manufacturers essentially compete on the basis of delivered prices, varying their ex-works price to compensate for higher transport charges.