This paper develops a new method to estimate production functions, taking advantage of firm-product-level quantity and price information and arguably exogenous variation in factor prices. We use data on prices and quantities of both inputs and outputs in the Colombian manufacturing census combined with Colombian customs data. We aggregate inputs and outputs to the firm-year level, using an assumption of constant elasticities of substitution between inputs and between outputs within firms. In addition to using lagged levels as instruments for changes in a standard panel-data framework, we use exchange rates and the minimum wage in Colombia as sources of variation in factor prices to instrument materials and labor quantity choices.