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Markups, Entry Regulation, and Trade

Does Country Size Matter?

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Country size matters in determining the effectiveness of domestic and foreign competition on pricing behavior in manufacturing. Removing barriers to the entry of new firms reduces markups more in large countries, while removing barriers to imports reduces markups more in small countries.

Summary findings

Actual and potential competition is a powerful source of discipline on the pricing behavior of firms with market power. Hoekman, Kee, and Olarreaga develop a simple model that shows that the effects of new entry and import competition on industry price-cost markups depend on country size.

The authors predicted that barriers to domestic entry would have a stronger anti-competitive effect in large countries, while barriers to foreign entry (imports) would have a stronger effect in small countries. After estimating markups for manufacturing sectors in 41 industrial and developing countries, they test these hypotheses and find that the hypotheses cannot be rejected by the data. For example, although Indonesia and Italy impose the same number of regulations on the entry of new firms, the effect of the regulations on manufacturing markups is 20 percent greater in Italy because of its larger size. Similarly, while Chile and Zimbabwe have the same import penetration ratio, the market discipline effect of imports is 13 percent greater in Zimbabwe because of its smaller size.

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Markups, Entry Regulation and Trade: Does Country Size Matter?*

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Non Technical Summary

It is often argued that an open trade regime is a powerful instrument to discipline the behavior of firms which have market power. The empirical literature investigating the impact of import competition on the pricing behavior of domestic firms has concluded that trade liberalization forces firms to set prices closer to marginal costs. That is, there is a negative relationship between price-cost margins (markups) and the openness of the economy. Indeed, Levinsohn (1993), Harrison (1994), and Grether (1996) find some support for the hypothesis that imports are a source of market discipline in studies of domestic firms behavior in Turkey, the Ivory Coast, and Mexico, respectively.

Some may go further and argue that an open trade regime can be a perfect substitute for an active competition policy in small economies (e.g., Blackhurst, 1991). Hong Kong and Singapore have been used to illustrate this view as both are very small and open economies with no competition policy authority (WTO, 1997). Another example of this view is the suggestion by a member of Canada's Bureau of Competition Policy, that NAFTA reduced the Bureau's concern with potentially harmful conduct (see quote in Cadot, Grether, and de Melo, 2000).

In a simple model of symmetric Cournot equilibrium with a fixed cost of entry that could be due to government entry regulation, it is shown that import penetration has a negative impact on domestic markup while entry regulations have a positive effect on markups. It is also shown that an increase in market size dampens the former effect while it reinforces the latter.

These hypotheses are tested in a sample of 41 developed and developing countries for which data was available. We first estimate the industry markups of the countries using a structural regression approach developed by Hall (1988) with a random coefficient technique. The technique allows the markups to vary across industries within each country while at the same time estimating the *average* industry markup of the countries. We then regress the estimated average industry markup on measures of entry regulation, import penetration and their interactions with country size, controlling for the level of financial development, the strength of the institutional environment protecting property rights and overall level of economic development.

We find that both entry regulation and import penetration are statistically significant sources of market discipline. Countries that have lower entry costs or higher import penetration ratios tend to have lower average industry markups. Moreover, the effects of both entry regulation and import penetration on markups depend on the size of the country: the effect of entry regulation is larger in large countries while the effect of import penetration is larger in small countries. Thus, even though Italy and Indonesia impose the same number of entry regulations to the establishment of new firms, the marginal effect of entry regulation on the average industry markup is 20 percent higher in Italy due to its larger size. Similarly, even though Chile and Zimbabwe have the same import penetration ratio, the market discipline effect of imports, due to a marginal increase in import penetration on markups, is 13 percent higher in Zimbabwe.

We conclude that complex entry regulations are more likely to harm competition in large countries, whereas barriers to imports will be more damaging in small economies.

1 Introduction

It is often argued that an open trade regime is a powerful instrument to discipline the behavior of firms which have market power. The empirical literature investigating the impact of import competition on the pricing behavior of domestic firms has concluded that trade liberalization forces firms to set prices closer to marginal costs. That is, there is a negative relationship between price-cost margins (markups) and the openness of the economy. Indeed, Levinsohn (1993), Harrison (1994), and Grether (1996) find some support for the hypothesis that imports are a source of market discipline in studies of domestic firms behavior in Turkey, the Ivory Coast, and Mexico, respectively.

Some may go further and argue that an open trade regime can be a perfect substitute for an active competition policy in small economies (e.g., Blackhurst, 1991).[1] Hong Kong and Singapore have been used to illustrate this view as both are very small and open economies with no competition policy authority (WTO, 1997). Another example of this view is the suggestion by a member of Canada's Bureau of Competition Policy, that NAFTA reduced the Bureau's concern with potentially harmful conduct (see quote in Cadot, Grether, and de Melo, 2000).[2]

On the other hand, in large economies, trade may play less of a role as a market disciplining device, as internal competition among a large number of firms could be sufficient to drive markups down. Internal competition will be determined in large part by the prevailing regulatory regime, including the ease of entry and exit, the efficiency of the financial sector (access to, and cost of, credit), the tightness of budget constraints (existence of subsidies, prevalence of state-owned enterprises that are supported through the government budget), and the efficacy and efficiency of institutions to enforce contracts and protect property rights

[1]For reviews of the literature, see Levinsohn (1996), Roberts and Tybout (1996) and Evenett, Lehmann, and Steil (2000).

[2]Recent evidence by Konings, Van Cayseele and Warzynski (2001) challenges this view by comparing markups across two small open economies: Belgium and the Netherlands. They show that firm markups are higher in the Netherlands, where there was no strict competition policy until recently.

(see Djankov and Hoekman, 2000).

This paper expands on the existing empirical literature on trade openness and markups by introducing the role of domestic barriers to entry (and the prevailing domestic regulatory regime) into the analysis. We focus on studying the relative importance of domestic versus foreign entry as pro-competitive devices. We ask whether barriers to domestic entry are more likely to lead to an anti-competitive domestic market than barriers impeding foreign entry (i.e., imports), and, if so, if the size of the domestic economy matters. The presumption is that both are major aspects of national competition policy regimes. We also search for evidence that in large countries barriers to domestic entry may have larger anti-competitive effects, while in small countries barriers to foreign entry are more relevant.[3]

In a simple model of symmetric Cournot equilibrium with a fixed cost of entry that could be due to government entry regulation, it is shown that import penetration has a negative impact on domestic markup while entry regulations have a positive effect on markups. It is also shown that an increase in market size dampens the former effect while it reinforces the latter.[4]

These hypotheses are tested in a sample of 41 developed and developing countries for which data was available. We first estimate the industry markups of the countries using a structural regression approach developed by Hall (1988) with a random coefficient technique. The technique allows the markups to vary across industries within each country while at the same time estimating the *average* industry markup of the countries. We then regress the

[3]We put the emphasis on entry regulation rather than on the whole competition policy package for two reasons. First, entry regulation has often been described as one of the most important components of national competition policy (see Rodriguez, A. E. and Malcolm Coate, 1997). Second, a recent study by Djankov *et al* (2000) has made available a data set containing detailed information on entry regulation for a large number of countries. As highlighted in Levinsohn (1996), Hoekman and Holmes (1999) and Maskus and Lahouel (2000), competition policy refers to the multi-faceted national laws, rules and regulations that affect the market structure and the conduct of firms in the domestic economy. This is therefore a much broader concept than competition law or antitrust. In many of the countries in our sample there is no effective competition policy or law.

[4]We abstract from the relevance of the existence of more or less competitive international markets. For a discussion of this and the interaction of trade and compeption (merger) policy, see Francois and Horn (2000) or Horn and Levinsohn (2001).

estimated average industry markup on measures of entry regulation, import penetration and their interactions with country size, controlling for the level of financial development, the strength of the institutional environment protecting property rights and overall level of economic development.

We find that both entry regulation and import penetration are statistically significant sources of market discipline. Countries that have lower entry costs or higher import penetration ratios tend to have lower average industry markups. Moreover, the effects of both entry regulation and import penetration on markups depend on the size of the country: the effect of entry regulation is larger in large countries while the effect of import penetration is larger in small countries. Thus, even though Italy and Indonesia impose the same number of entry regulations to the establishment of new firms, the marginal effect of entry regulation on the average industry markup is 20 percent higher in Italy due to its larger size. Similarly, even though Chile and Zimbabwe have the same import penetration ratio, the market discipline effect of imports, due to a marginal increase in import penetration on markups, is 13 percent higher in Zimbabwe.

We proceed as follows. Section 2 presents the theoretical model and section 3 discusses the empirical strategy. Section 4 contains the main empirical results and quantifies the effects of barriers to domestic and foreign entry on markups. Section 5 discusses a series of robustness checks. Section 6 concludes. Data sources can be found in the Appendix.

2 A Simple Model

To illustrate the effect of entry regulation and import penetration on domestic markups, let us assume that domestic and foreign firms are Cournot players in the domestic market of a homogenous good. There are N identical domestic firms and one importing foreign firm. The marginal cost of production for the domestic and foreign firms are c and d, respectively. Domestic firms face a positive fixed cost of entry, E, associated with government imposed entry regulation. Taking the quantity produced by other firms, q_{-n}, as given, each domestic firm n chooses its output by maximizing its profits:

$$\max_{q_n} \quad \pi_n (q_n, q_{-n}) = p(Q)\, q_n - c q_n - E, \ \forall n = 1, ..., N,$$

where $p(Q)$ is the inverse demand function, $Q = q_D + q_M = \sum_{i=1}^{N} q_i + q_M$, q_D is the total domestic production, and q_M is the import quantity. The first order condition for profit maximization implies:

$$p(Q) \left[1 - \frac{1}{\varepsilon}\frac{q_n}{Q}\right] = c,$$

where $\varepsilon \equiv -(\partial Q/\partial p)(p/Q)$ is the price elasticity of demand.

In a symmetric Cournot equilibrium, given identical domestic firms, total domestic production is given by $q_D^* = N\ q_n^*$. Let $m^* = q_M^*/q_D^*$ be the import penetration ratio. Substituting the equilibrium condition and m^* into each firm's first order condition, we obtain:

$$\mu^* = \frac{1}{1 - \frac{1}{\varepsilon}\frac{1}{N}\left(\frac{1}{1+m^*}\right)}. \tag{1}$$

Thus, the markup in the domestic industry is inversely related to the equilibrium import penetration ratio, m^* and the number of firms.[5]

To see how the fixed cost of entry, E affects the equilibrium markup, we need to solve for the equilibrium number of domestic firms. For simplicity, let us assume a unitary constant demand elasticity function:

$$p(Q) = \frac{a}{Q} = a\left[\sum_{i=1}^{N} q_i + q_M\right]^{-1}, \tag{2}$$

[5]See Jacquemin (1982) for a similar derivation.

where a captures the size of the market (i.e., in equilibrium $a = p^*Q^*$). The Cournot equilibrium is described by:

$$q_n^* = \frac{aNd}{(d+cN)^2},\ q_M^* = \frac{aN(cN-dN+d)}{(d+cN)^2},\ p^* = \frac{d+cN}{N},\ \pi_n^* = \frac{ad^2}{(d+cN)^2} - E. \quad (3)$$

Domestic firms will enter the market as long as $\pi_n^* \geq 0$. Thus, solving $\pi_n^* = 0$ for the optimal number of firms yields:

$$N^* = \frac{d}{c}\left(\sqrt{\frac{a}{E}} - 1\right) \quad (4)$$

Combining Equations (1) and (4) leads to Proposition 1.

Proposition 1 *In a symmetric Cournot equilibrium with some fixed number of domestic firms and one foreign firm facing a unitary constant demand elasticity in the domestic market:*

1. *the higher the equilibrium import penetration ratio the lower the markup;*
2. *the higher the cost of entry, the higher the markup;*
3. *an increase in the equilibrium import penetration ratio has a weaker effect on markup in large countries;*
4. *an increase in the cost of entry has a stronger effect on markup in large countries;*

Proof. From equations (1) and (4):

1. $\frac{\partial \mu^*}{\partial m^*} = -\frac{N^*}{(N^*(1+m^*)-1)^2} < 0$ given N^*.
2. $\frac{\partial \mu^*}{\partial E} = \frac{\partial \mu}{\partial N^*}\frac{\partial N^*}{\partial E} = \left(-\frac{1+m^*}{(N^*(1+m^*)-1)^2}\right)\left(-\frac{1}{2}\frac{d}{c}\sqrt{\frac{a}{E^3}}\right) > 0$ given m^*.
3. $\frac{\partial^2 \mu^*}{\partial m^* \partial a} = \frac{\partial^2 \mu}{\partial m^* \partial N^*}\frac{\partial N^*}{\partial a} = \left(\frac{N^*(1+m^*)+1}{(N^*(1+m^*)-1)^3}\right)\left(\frac{1}{2}\frac{d}{c}\sqrt{\frac{1}{aE}}\right) > 0.$

4. $\frac{\partial^2\mu^*}{\partial E\partial a} = \left(-\frac{1+m^*}{(N^*(1+m^*)-1)^2}\right)\left(-\frac{1}{4}\frac{d}{c}\sqrt{\frac{1}{aE^3}}\right) > 0$ given m^*.

■

Thus, we expect import penetration to have a negative effect on markup, while entry regulation should have a positive impact on markups. In addition, we expect the former effect to be stronger in small countries, whereas the latter should be stronger in large countries. The intuition behind the existence of higher markups in countries with high entry cost or low import penetration ratios is straightforward. To see why these effects are respectively amplified and reduced in large countries note that for a given fixed cost of entry, a larger market size allows more domestic firms in the market, which drives down the markup due to increased competition among domestic firms. In such a situation, the (negative) effect of import penetration on markup will be smaller given that the initial markup is low. Taking this to its limit, one would not expect any impact of an increase in import penetration on domestic markups if the market is already perfectly competitive. On the other hand, for a given level of import penetration, countries with high entry costs will have fewer domestic firms in equilibrium. In a large market, this implies high markups.

3 Empirical Strategy

To test the four hypotheses in Proposition 1 we use data on the number of entry procedures required to establish a new firm and import penetration for the manufacturing sector in different countries.[6] This will allow us to test whether countries with more restrictive barriers to domestic and foreign entry have less competitive domestic markets (as measured by the

[6]The data on the number of entry procedures is available in Djankov *et al.* (2000). As a proxy for the cost of entry regulation they also estimate the number of weeks that it takes to register a firm and the dollar cost as a share of GDP per capita. Results reported in the next sections are robust to the use of these different proxies, but we believe that the number of entry procedures is probably the most exogenous of all these proxies.

average industry markups). More specifically, we run the following cross-country regression:

$$\mu_c = \beta_0 + \beta_e E_c + \beta_m m_c + \beta_{es} E_c * size_c + \beta_{ms} m_c * size_c + \sum_v \beta_v C_{vc} + \zeta_c, \qquad (5)$$

where industry markups are regressed on entry regulation, E, import penetration m and their interaction with country size, $size$.[7]

We use three additional control variables, C_v, to capture the overall business climate in each country. First, we control for the level of financial development as proxied by the ratio of market capitalization to GDP.[8] The idea is that the wider and deeper the financial sector, the lower the cost of capital is likely to be (all other things constant), thus increasing the overall "profitability" of the economy. Financial deepening will be associated with credit that is tailored to better reflect underlying risks, financial products will be tailored to the needs of borrowers, transactions costs will be reduced, etc. All other things equal, this is likely to raise industry markups. Without controlling for overall "profitability" of a country, the market discipline effect of imports on domestic industry may be underestimated. The second control variable is an intellectual property protection law index developed by Ginarte and Park (1995). This scores the institutional environment prevailing in countries according to (1) the coverage of legislation protecting intellectual property, (2) membership in relevant international agreements, (3) provisions for loss of protection, (4) enforcement mechanisms and (5) duration of protection. The index ranges from 0 to 5; the higher the index, the stronger the intellectual property regime. Even though the share of manufacturing that is affected by intellectual property laws that grant temporary monopoly power may be quite small, the strength of such legal regimes is a good proxy for the effectiveness of a whole range of institutions that determine the strength of property rights and affect the investment

[7]The variable $size$ is proxied by GDP, but results reported in the next sections are robust to the use of population as an alternative.

[8]Market capitalization over GDP plays a role that is similar to the capital output ratio in industry-level price-cost margin regressions. See Roberts and Tybout (1996).

climate. The stronger the legal and institutional regime, the lower uncertainty and associated transaction costs, and (all other things equal), the higher should be the profitability of domestic firms. Finally, as an additional control for overall economic and institutional development we introduce GDP per capita.[9]

The first step before estimating the markup equation is to obtain a good measure of industry price over marginal cost markups across countries. As such data are not readily available, they either need to be constructed using the ratio of total sales over total costs of the industries (as in Roberts and Tybout 1996), or estimated from a well-defined structural regression *a la* Hall (1988), Levinsohn (1992) and Harrison (1993). The advantage of the latter approach is that it has a sound theoretical basis;[10] the drawback is that it comes with estimation error. It also increases the level of aggregation at which markups are measured as degrees of freedom requirements associated with the estimation imply that some of the time or cross-industry dimension in the data would have to be sacrificed.

To determine whether this is a significant problem, two accounting margins for 28 industries in 74 countries over 18 years (1980-1997) were constructed using UNIDO data.[11]

$$M_1 = \frac{\text{Total Sales}}{\text{Costs of Labor, Capital and Materials}},$$
$$M_2 = \frac{\text{Total Value Added}}{\text{Costs of Labor and Capital}}.$$

Tables 1 and 2 present the results of a multiple factors analysis of variance (ANOVA) for both accounting margins, M_1 and M_2. The high F-statistics suggest that there are significant differences in these margins across countries and industries. On the other hand,

[9]Djankov *et al.* (2000) find that the negative relation between markups and entry regulation vanishes once they control for GDP per capita.

[10]It can be shown that the constructed markups are equal to the estimated markups only in the presence of constant returns to scale. See Basu and Fernald (1995).

[11]See the appendix for details on the construction of capital cost. As suggested above M_2 is closer to the industry markup, μ, as presented in Equation (11), and they will be identical in the case of a constant returns to scale production technology: $\mu_i = S_i * M_{2i}\ \forall i$. For a proof, see Kee (2000). A major drawback of these margins is that there are sensitive to the different accounting practice in different countries.

the hypothesis that there is no difference in the margins across years, after controlling for country and industry variations, cannot be rejected. Moreover, if only country, industry and year dummies are used to capture the variation of the two accounting margins, nearly 60 percent of the explanatory power of the model can be attributed to country variations. Industry variations account for less than 40 percent, while year dummies contribute less than 5 percent.[12]

Thus, the data suggest that after controlling for industry differences, there are significant differences in margins across countries. This supports the use of a cross country analysis to study the effects of import competition and entry regulations on average industry markups. On the other hand, high within-country differences in industry markups call for a random coefficient estimation that explicitly takes into account industry variation while estimating the average industry markup of each country.

Given the theoretical merits of estimating the markups and the fact that most of the variance in accounting margins is explained by country variation, we choose to estimate the average industry markups. The constructed accounting margins are used as robustness checks in the empirical sections below.

As mentioned earlier, the use of the estimated markup as a dependent variable brings some econometric complications. Since the precision with which the markups have been estimated varies across countries, the error term in Equation (5) is heteroscedastic. In principle one could use Feasible GLS (FGLS) to correct for this. However, given that the properties of FGLS are not clear in small samples (see Amemiya, 1978, 1985), we first use non-parametric heteroscedasticity correction and then present parametric corrections as robustness checks.[13]

Finally, we provide a series of specification tests. These include the Ramsey omitted vari-

[12]The explanatory power of variable X is inferred by taking the ratio of the partial sum of squares of X to the model sum of squares.

[13]For a discussion of the advantage of parametric correction in the presence of estimated dependent variables in small and large samples, see Kee and Olarreaga (2001).

able test, the goodness-of-link-test, two outlier sensitivity analyses and instrument variable regression for the potential endogeneity of the import penetration variable.

3.1 Estimating Markups

In order to estimate manufacturing markups, for each country, let the output of industry i in period t be characterized by a production function of labor input, L_{it}, and capital input, K_{it},

$$q_{it} = A_{it} F_i \left(L_{it}, K_{it} \right). \tag{6}$$

Differentiating Equation (6) with respect to time and dividing both sides by q_{it} yields the growth rate version of Equation (6):[14]

$$\hat{q}_{it} = \hat{A}_{it} + \alpha_{iL} \hat{L}_{it} + \alpha_{iK} \hat{K}_{it}, \text{ where} \tag{7}$$

$$\alpha_{iL} = \frac{L_{it}}{F_{it}} \frac{\partial F_i}{\partial L_{it}}, \text{ and } \alpha_{iK} = \frac{K_{it}}{F_{it}} \frac{\partial F_i}{\partial K_{it}} \tag{8}$$

are the elasticity of output with respect to labor and capital inputs, respectively.[15]

For each industry i, assume that the production function F_i is homogeneous of degree S_i. F_i shows increasing, constant, or decreasing returns to scale with respect to all inputs when S_i is greater than, equal to, or less than unity. Subtracting the growth rate of the

[14]Here we adopt the convention to denote the growth rate of a variable with ^:

$$\hat{X}_t \equiv \frac{\partial \ln X_t}{\partial t} = \frac{1}{X_t} \frac{\partial X_t}{\partial t}$$

[15]As suggested by Basu and Fernald (1995), one may be concerned that the growth rate of real value added is used here instead of the growth rate of real output, given that due to the construction of value-added statistics, the growth rate of real value added will not be independent of the growth rate of intermediate inputs if the market is not perfectly competitive (even when production functions are weakly separable). However, Kee (2000) suggests that empirically this may not be such a serious problem. Moroever, UNIDO's industry level data set only provides real output measurement for a few countries. The empirical results remain qualitatively similar when output of industry is used rather than value added.

capital input from both side of Equation (7) and applying Euler's theorem for homogeneous functions, we can re-express Equation (7) as:[16]

$$\hat{q}_{it} = \hat{A}_{it} + \alpha_{iL}\hat{l}_{it} + (S_i - 1)\,\hat{K}_{it}, \tag{10}$$

with the convention that $x = \frac{X}{K}$, (i.e., small caps express variables in terms of per unit of capital).

Let

$$\mu_i = \frac{p_{it}}{c_{it}}, \tag{11}$$

be the price over marginal cost markup of industry i, and let θ_{iL} be the share of labor in total revenue.[17] Given that $\alpha_{iL} = \mu_i\theta_{iL}$, Equation (10) becomes

$$\hat{q}_{it} = \hat{A}_{it} + \mu_i\left(\theta_{iL}\hat{l}_{it}\right) + (S_i - 1)\,\hat{K}_{it}. \tag{12}$$

Equation (12) can be used to estimate markups. Note that it is crucial to control for the growth rate of technological progress, $\hat{A}_{it}$, as it enters the firm's first-order conditions for profit maximization, which in turn determine both input demand and output. Without controlling for $\hat{A}_{it}$, the least squares estimates for the coefficients of the growth rate of labor per unit of capital and the growth rate of capital will be biased. As the growth of technological progress in each industry is difficult to measure, we assume the Hicks neutral

[16]According to Euler's theorem, if a production $F_i(L_{it}, K_{it})$ is homogeneous of degree S_i with respect to its inputs, then

$$\alpha_{iL} + \alpha_{iK} = S_i \tag{9}$$

[17]Note that in order to be able to econometrically identify μ_i, it is assumed that μ_i is constant through time. This can be defended given the results of the ANOVA tables discussed above.

technological progress parameter is a random variable of the following form:

$$A_{it} = A_{i0}e^{\phi_{it}t}$$
$$\hat{A}_{it} = \phi_{it} = \hat{A}_i + u_{it}, \tag{13}$$

where A_{i0} is the technological level of industry i in period 0, and ϕ_{it} is the growth rate of technological progress. This implies that the growth rate of technological progress in industry i in period t consists of an industry-specific growth rate, $\hat{A}_i$, and a white noise, u_{it}, which is a classical random error term with zero mean and σ^2 variance.

Substituting Equation (13) into Equation (12) we obtain

$$\hat{q}_{it} = \hat{A}_i + \mu_i \left(\theta_{iL}\hat{l}_{it}\right) + (S_i - 1)\hat{K}_{it} + u_{it}. \tag{14}$$

To estimate Equation (14), we use a stationary random coefficient model. The industry specific productivity growth rate, markup and scale coefficients are assumed to be random variables with some probability distribution around the industry averages:

$$\begin{aligned} \hat{A}_i &= \hat{A} + \varepsilon_{1i} \\ \mu_i &= \mu + \varepsilon_{2i} \\ S_i &= S + \varepsilon_{3i}, \\ E(\varepsilon_k) &= 0, \ \forall k = 1,2,3 \\ E\left(\varepsilon_k \varepsilon_l'\right) &= \begin{cases} \sigma_k^2, \ \forall k = l \\ 0, \ \forall k \neq l \end{cases} . \end{aligned} \tag{15}$$

This significantly reduces the number of parameters to be estimated, while allowing the coefficients to differ across industries. Equation (14) can be therefore be simplified to become a fixed coefficient regression with a heteroscedastic error term, ω_{it} :

$$\begin{aligned} \hat{q}_{it} &= \hat{A} + \mu\left(\theta_{iL}\hat{l}_{it}\right) + (S-1)\hat{K}_{it} + \omega_{it} \\ \omega_{it} &= \varepsilon_{1i} + \varepsilon_{2i}\left(\theta_{iL}\hat{l}_{it}\right) + \varepsilon_{3i}\hat{K}_{it} + u_{it.} \end{aligned} \tag{16}$$

In other words, instead of assuming that all industries have the same markup, productivity growth and scale coefficient and estimating Equation (14) using ordinary least squares, we estimate the (weighted) average industry markup, productivity growth and scale coefficient in each country using a random coefficient panel regression. The random coefficient regression significantly cuts down on the data requirements, as it permits using the time series cross-industry panel data set of each country to estimate the country-specific average industry markup, while taking into account that there is within country variation across industries.

The main problem associated with estimating such a random coefficient model is that the error term ω_{it} is heteroscedastic. Most of the solutions that have been proposed in the literature for such a problem revolve around some type of Aitken estimates. This involves FGLS as the covariance matrix of ω_{it} needs to be estimated.[18] Here we follow the approach suggested by Swamy (1970) and use the least squares residuals to obtain unbiased estimators of the covariance matrix of ω_{it}. Zeller (1969) shows that as long as the industry-specific coefficients are not correlated with the explanatory variables, which is the assumption made in Swamy (1970), the model will not posses an aggregation bias. This implies that Swamy's estimation of average industry markup can be interpreted as an aggregate markup of each country's manufacturing sector. A test of common coefficients is rejected for the vast majority of the countries in our sample, supporting the random coefficient model. The appendix discusses the data and the construction of the variables used in the first and second stages of the estimation (in particular capital stocks at the industry level).

[18]See Hildreth and Houck (1968), Swamy (1970, 1971, 1974), Amemiya (1978) and Hsiao (1975, 1986) and Greene (2000) provide a textbook treatment.

4 Empirical Results

Table 3 presents our cross country data set, together with the estimated average industry markup and its standard error. Fifteen of the forty one countries in the sample have an estimated markup that is greater than one and statistically significant (denoted by a '$\star$').[19] Countries with the highest estimated markups in the sample are Mexico, Peru and Colombia. All three have a very low ratio of imports to value added in manufacturing. In the case of Peru, the ratio is 75 percent below the sample mean, whereas Mexico and Colombia are 50 percent below the mean. On the other hand, the total number of entry procedures necessary to establish a new firm in any of these countries is on the high side. With 17 required entry procedures, Colombia is the most restrictive country in the sample. Mexico and Peru with 15 and 14 entry procedures, respectively, are 50 percent above the sample mean.

Among the more developed countries, Japan, the United States and the United Kingdom have the highest industry markups. Even though in terms of entry regulations, both the US and UK are less restrictive, the imports to value added ratio of all these countries is below average. Indeed, with an import to value added ratio of 0.11, Japanese industries face the least import competition among all the countries in the sample. On the other hand, Hong Kong and Singapore are by far the most open economies in the sample and have estimated average industry markups below the sample mean. These observations suggest that both limited import competition and restrictive entry regulation are determinants of industry markup across countries.

This is confirmed by the results of the second stage cross-country regression reported in Table 4. The first column provides the OLS regression results with no heteroscedasticity correction. Both entry regulation and import penetration have the expected signs. The

[19]The only country that has an estimated markup that is significantly less than one is Denmark, which could be due to data problems. Estimation results are robust to the exclusion of Denmark from the regressions. The hypothesis of constant returns to scale is rejected in only seven countries: Denmark, Finland, Malaysia, Pakistan, Singapore and the United Kingdom. In all other countries we found evidence of constant returns to scale, which is consistent with previous findings in the literature at this level of aggregation.

coefficient of entry regulation is positive and significant, while the coefficient on import penetration is negative, but is only significant at a 90 percent confidence level.

Column (2) presents the first non-parametric heteroscedasticity correction, where the finite sample White standard errors are reported in parentheses.[20] Both entry regulation and import penetration are now highly significant. *Ceteris paribus*, higher industry markups are associated with higher fixed cost of entry and lower import penetration. Both the market capitalization ratio and intellectual property protection index have a positive effect on industry markups while GDP per capita is negatively related to markups. However, given that institutional development and economic development are highly correlated, it is not surprising that only the coefficient of market capitalization ratio is significant, the coefficients on intellectual property protection index and GDP per capita are not precisely estimated.

To avoid multicollinearity, we introduce the two interacting terms between market size with entry cost and market size with import penetration separately in columns (3) and (4). The coefficients of the two interacting terms are highly significant and have the right signs, suggesting that country size does matter. As predicted in Proposition 1, country size reinforces the effect of entry regulation on markups, while dampening the effect of import penetration on markups.[21]

4.1 How Large Are These Effects?

The econometric results suggest that trade openness and regulation of entry are important determinants of industry markups across countries and that economic size dampens

[20]The large sample White standard error correction uses the observed squared residual u_j^2 as an estimate of σ_j^2, the variance of the regression error of the jth observation. The finite sample White standard error (HC1) multiply u_j^2 by $n/(n-k)$ to adjust for degrees of freedom of the regression. In the next subsection we provide similar results using alternative heteroscedasticity corrections.

[21]Note that when these are entered together, all coefficients keep the right sign, but the two interacting terms become significant only at the 10 and 15 percent level due to multicollinearity. On the other hand, we also explore the possibility that countries have different responds to import and domestic competition due to the different level of development. We interact the two variables with GDP per capita of the countries. The estimated coefficients are however not significant.

(strengthens) the impact of the former (latter). But how large are these effects?

Using the estimates reported in the second column of Table 4 and the sample median provided in Table 3, the estimated elasticity of markup with respect to entry regulation and import penetration, evaluated at the sample median, are 0.58 and -0.14 respectively.[22] This implies that a 10 percent increase in entry regulations leads to an increase of 5.8 percent in the markup (or 11 percentage points from the median). Similarly, a 10 percent reduction in import penetration, which at the median is equivalent to a fall from 86 percent to 77 percent in the ratio of imports to value-added in manufacturing, leads to an increase of 1.4 percent in the markup (or 3 percentage points from the median).

One can further illustrate the magnitude of these impacts with some thought experiments. Let us consider moving from the most to the least restrictive scenario in our sample. As mentioned before, with the number of entry procedures at 17, Colombia has the most restrictive entry regulation in our sample. The estimated markup of Colombia is 3.94, a level that is way above the sample mean and median. If the Colombian's government decreases the number of entry procedures to the sample minimum of 2 procedures in Canada, its industry markup would drop by 43 percent to 2.24, a level close to that of Indonesia.

On the other hand, with the import penetration ratio of 0.11, Japan is the least open countries in our sample. Its estimated markup is 3.2, which is a level that is above both mean and median of our sample. If the Japanese' import penetration ratio increase to the sample maximum of 7.39 as in Hong Kong,[23] the Japanese' industry markup would drop by

[22]The estimated elasticity of variable Y with respect to variable X, evaluated at the sample median, is calculated as

$$\frac{\partial Y}{\partial X}\frac{\bar{X}}{\bar{Y}},$$

where $\frac{\partial X}{\partial Y}$ is the estimated coefficient when Y is regressed on X (among other variables), and $\bar{X}$ and $\bar{Y}$ are the median values of X and Y in the sample. We choose to evaluate the elasticity around the median rather the the mean values is due to the extreme value consideration. Given that our sample consists of a wide range of developed and developing countries, the mean value of some variables, e.g. GDP, is easily influenced by the most developed countries.

[23]This is clearly a thought experiment way beyond any possible policy change by the Japanese government.

nearly 70 percent to almost 1, a level close to that of the Netherlands.

Country size matters for the relative importance of these elasticities, as the interacting terms in the two last columns of Table 4 are statistically significant. Using the estimated coefficient of the interacting term reported in the third column of Table 4, one can calculate the impact that entry regulation has in small and large countries. For concreteness, we can once again do some thought experiments. While both Italy and Indonesia require 11 different procedures to set up a new firm, Italy is nearly 7 times larger than Indonesia in terms of GDP. Straightforward calculations show that a marginal increase in entry regulation will have a nearly 20 percent larger effect in Italy due to its larger size.

Similarly, we can compare the market discipline impact of imports in Chile and Zimbabwe. While both countries have the same import penetration ratio in manufacturing of 90 percent, Chilean's GDP is nearly 7 times larger. The estimates of the fourth column in Table 4 suggest that a marginal increase in import penetration in Zimbabwe has a nearly 13 percent larger effect on markups due to its smaller size.

In summary, the above thought experiments illustrate that complex entry regulations are more likely to harm competition in large countries, whereas barriers to imports will be more damaging in small economies.

5 Robustness Checks

In this section we provide three different robustness checks to the results reported above. First, we provide results using alternative non-parametric and parametric heteroscedasticity corrections. Second, we provide a series of specification tests and control for the potential endogeneity of the import penetration ratio. Finally, we provide alternative results using the constructed markups (rather than the estimated ones) at the industry level as a dependent variable.

5.1 Heteroscedasticity

Could the results reported in Table 4 be driven by heteroscedasticity correction that is employed? Table 5 presents three other kinds of heteroscedasticity correction. In the first column, the Davidson-Mackinnon (1993) version of jackknife standard error is reported for our base-line OLS regression.[24] Bias-corrected bootstrap standard errors are shown in the second column.[25] Given that jackknife standard errors (HC3) are more conservative than the finite sample White standard errors (HC1), it is not surprising to find that the significance levels of the OLS estimated coefficients are reduced in column (1) of Table 5. Nevertheless, the coefficients of interest are still significant at the 90 percent confidence level.[26] On the other hand, the bias-corrected confidence intervals using the bootstrap standard errors presented in column (2) once again show the estimated coefficients of the variables of interest are significant at the 95 percent level. Thus, all the non-parametric corrections of heteroscedasticity produce comparable results: both entry regulation and import penetration are important in affecting domestic competition.

Column (3) of Table 5 applies a parametric correction using feasible GLS. Given that the variance of the error term in Equation (5) has a country specific component associated with the standard error of the estimated markup, we first regress the error term of Equation (5) on a constant and the variance of the estimated markup.[27] We then use the inverse of the fitted value of the error term as weights on the second stage estimation of Equation (5). All the estimated coefficients are not significantly different from the OLS estimates, and the FGLS standard errors are of comparable magnitudes, generating both quantitatively and

[24] Letting h_{jj} be the diagonal element of the projection (hat) matrix, Davidson and MacKinnon (1993) show that $u_j^2/(1-h_{jj})^2$ approximates the jackknife standard error, which has been shown in MacKinnon and White (1985), to out-perform HC1 in their Monte Carlo finite sample experiments.

[25] Efron (1977) shows that bootstrap is a more general method that has a linear approximation as jackknife.

[26] In fact, it is comforting to know that with the most conservative standard errors, the p-values of the estimated coefficients of entry regulation, import penetration and market capitalization are 0.051, 0.067 and 0.06 respectively, which are relatively low.

[27] This is to capture both the homoscedastic and heteroscedastic parts of the regression errors. For a detailed exposition of the procedure, please refer to Kee and Olarreaga (2001).

qualitatively similar results to our base-line regression in Table 4. A Hausman test cannot reject the hypothesis that FGLS is efficient.[28]

In sum, the results of both parametric and non-parametric heteroscedasticity corrections suggest that the results regarding the importance of entry regulation and import competition on industry markups are robust. Controlling for economic and institutional development, countries that have fewer entry regulations or greater import penetration tend to have a lower average industry markup.

5.2 Specification Tests

Could the results of Table 4 be driven by some relevant variables that are omitted in the regression that are related to the regressors? Two types of general specification test are performed to the base-line regression in Table 4. The first is the Ramsey (1969) RESET test on omitted variables, and the second is the goodness-of-link test proposed by Tukey (1949) and Pregibon (1980) on model specification.

Under the null hypothesis that there is no relevant omitted variable in the regression, Ramsey (1969) shows that the error terms of the regression should be independent on a polynomial of the predicted dependent variable. Row (1) of Table 6 shows the result of the RESET test. With a low F-statistic, the null hypothesis that there is no omitted variable in the base-line regression is not rejected in for any conventional confidence level.

Row (2) of Table 6 presents the result of the link test. Under the null hypothesis that there is no mis-specification, Pregibon (1980) shows that the dependent variable is independent on the square of the predicted dependent variable. The low F-statistics again suggest that the null hypothesis cannot be rejected. Thus, we conclude that the data do not reveal evidence of mis-specification of our base-line regression.

[28]Under the null hypothesis that FGLS is not systematically different from OLS with White standard errors, the $\chi^2_{(5)}$ is 0.95 and the null hypothesis is not rejected at the 99 percent confidence level.

Could the results be driven by some outlier observations? Given the small number of observations in the second stage, we perform the following outlier analysis. We exclude one observation at a time and re-run the regression using the rest of the 40 countries. Results of these 41 additional regressions show that the coefficient of entry regulation varies from 0.09 to 0.13. Similarly, the coefficient of import penetration varies between -0.27 and -0.39. Given that these coefficients do not change sign and they are not significantly different from the base-line estimates, we conclude that results in Table 4 are not driven by any particular observation.

In addition, we also perform an "influential observation" test suggested by Bollen and Jackman (1990), which simply identifies any observation that shifts the estimates by at least one standard error. None of the observations in our sample are influential for the estimated coefficients on entry regulation and import penetration reported in Table 4.

Finally, import penetration may be endogenous to markups, as sectors with higher markups may attract foreign exporters. To control for this we instrument the import penetration ratio using the trade shares constructed by Frankel and Romer (1999) using the geography determinants of a gravity type model, total population and the surface are of the countries (column (4) of Table 5).[29] Not only is the estimated coefficient on import penetration significantly different from zero, the magnitude of the coefficient is larger than the OLS estimate. With a $\chi^2_{(5)}$ of 0.95, the Hausman test does not reject the null hypothesis that our OLS estimates are consistent and efficient. This suggests that OLS does not over-estimate the effect of import penetration on average industry markup. Countries that are exposed to larger import penetration tend to have lower industry markups. This result echoes the finding in Frankel and Romer (1999), where OLS is shown to under-estimate the effect of trade openness to economic growth.

Summing up, a series of specification tests do not reveal specification problems in the

[29] Under the assumption of balance trade, import share is half of the constructed trade share.

data that lead to estimation bias in our base-line regression.

5.3 The Accounting Margins

Our last robustness check is on the validity of the estimated average industry markups. We first check for the correlation between estimated and constructed markups (M_2) controlling for country, industry and time effects. Second, we provide results of the estimation of Equation (5), using the constructed rather than the estimated markup as the dependent variable.

The first column of Table 7 presents the results of the correlation between M_2 and the estimated average industry markup. The estimated industry markup is positively correlated with the accounting margin M_2. Note that theoretically they would be equal if both were provided at the same level of aggregation and in the presence of constant returns to scale. The second column of Table 7, provides the results of the estimation of Equation (5) using the constructed markup. All the coefficients have the right sign and are highly significant. Similar results are obtained when using M_1 as the constructed markup.

Thus, even though the accounting margins are not good measurements of price-cost markups of industries, the above exercises suggest that the estimated industry markups and the regression results are robust.

6 Concluding Remarks

It is sometimes suggested that small open economies have little need for domestic competition policy to restrain anti-competitive behavior by domestic firms in small open economies. The idea is that an open trade regime may be a sufficiently powerful instrument to discipline firm behavior. We explored this idea in a simple Cournot model, where domestic firms face foreign competition and confront a fixed cost of entry or establishment (proxied by the number of entry procedures necessary to the register a new firm). The model suggests that the impact on domestic markups of entry regulation increases with country size, and that an increase in trade openness, as measured by the import penetration ratio, will have a larger impact on domestic markups in small economies. The intuition is that large economies support a larger number of domestic firms, making domestic entry regulation (or competition policy) more relevant for the determination of domestic markups, as most of the competition in the domestic market comes from domestic firms.

Using a sample of 41 developing and developed countries, we find evidence that both domestic entry regulation and international trade openness are important determinants of the degree of competition in domestic markets, as measured by average industry markups. A 10 percent increase in the number of procedures necessary to set up a new firm from the sample median would lead to an increase of 5.8 percent from the median markup. A 10 percent decrease in trade openness from the sample median of 90 percent would increase markups by 1.4 percent.

Country size matters for the impact of both entry regulation and import penetration on markups. Economic size strengthens the impact on markups of entry regulation and dampens the impact of import penetration. For example, even though Italy and Indonesia impose the same number of entry regulations to the establishment of new firms, their impact on average industry markup is 20 percent higher in Italy due to its larger size. Similarly, Chile and Zimbabwe have the same import penetration ratio, but the market discipline effect of imports on markups is 13 percent higher in Zimbabwe due to its smaller size. We conclude that complex entry regulations are more likely to harm competition in large countries, whereas barriers to imports will be more damaging in small economies.

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A Data

Data used in the first stage regression consist of twenty eight industries (ISIC 3 digit) in forty one countries for the period of 1981 to 1997 (annual). Country coverage can be found in Table 3. UNIDO (1999) provides industry level data on value added, number of workers, capital expenditure for the countries. GDP deflators on the value added of manufacturing sector and domestic capital formation are used as prices for industry value added and investment, which are found in the World Development Indicators (2000). In the second stage, we use the total number of legal procedures necessary to register a new firm to proxy for the fixed cost of entry, as provided in Djankov *et al.* (2000). Import penetration is measured as the ratio of import to total industry value added. It is constructed using data from the World Development Indicators (2000). Among our control variables we use the patent protection index from Ginarte and Park (1995), a market capitalization measure available in the World Development Indicators (2000). The sample coverage was mainly constrained by the lack of industry level data in the UNIDO database and the associated matching coverage of the regulation of entry data set in Djankov *et al.* (2000).

Building Capital Stocks

Data on industry level capital stocks used in the first stage of the estimation procedure were constructed using the perpetual inventory method:

$$K_{it} = K_{it-1}(1-\delta) + I_{it},$$

where I_{it} is the real investment of industry i in period t, and δ is the rate of depreciation of capital stock, which is assumed to be 10 percent. For each industry in each country, the value of real investment is generated by deflating capital expenditure of each industry by the GDP deflator of gross domestic capital formation of the country. In order to minimize the impact of under-estimation of the initial capital stock on the growth of capital input, we use the earliest available data on capital expenditure in UNIDO as the base year capital stock.[30] For the period 1990-1995, the cross-country unweighted average annual growth rate of capital stock ranged from a 3 percent in the leather product industry to a 12 percent in the petroleum industry and glass products industry. On the other hand, the cross-industry unweighted average annual growth rate of capital stock ranged from more than a 20 percent increase in Thailand, Indonesia, and Malaysia, to more than a 2 percent decrease in Egypt and Norway.

[30] For some countries, we move as far back as 1963 to construct capital input series, which is the first year of the UNIDO data set. Interpolation is performed for some investment series that have missing values.

Table 1: Analysis of Variance: M_1

Source	Partial Sum of Squares	Degree of Freedom	Sum of Squares	F-Statistics	Prob > F
Model	1050.57	117	8.98	10.11	0.00
Country	626.69	73	8.58	9.67	0.00
Industry	400.64	27	14.84	16.71	0.00
Year	17.34	17	1.02	1.15	0.30
Residual	14872.13	16744	0.89		
Total	15922.70	16861	0.94		

Table 2: Analysis of Variance: M_2

Source	Partial Sum of Squares	Degree of Freedom	Sum of Squares	F-Statistics	Prob > F
Model	32485.45	117	277.65	3.82	0.00
Country	18531.66	73	253.86	3.49	0.00
Industry	12108.51	27	448.46	6.17	0.00
Year	1599.30	17	94.08	1.29	0.18
Residual	1233470.73	16968	72.69		
Total	1265956.18	17085	74.10		

Table 3: Main Data

Country Code	Country Name	Estimated Industry Markup	Standard Error of Markup	Ratio of Imports to Value Added in Manufacturing Sector[3]	Total Number of Procedures[1]	Ratio of Total Market Capitalization to GDP (%)[3]	Intellectual Protection Index[2]	GDP per Capital (thousand of 1995 US$)[3]	GDP (trillion of 1995 US$)[3]	Frankel & Romer Trade Share[4]	Surface Area (million sq. km)[3]	Total Population (million)[3]
AUS	Australia	1.84	0.82	0.76	3	89.84	3.86	18.34	0.312	0.02	7.74	16.85
AUT	Austria	1.30	0.23	1.01	12	13.1	4.24	26.36	0.206	0.18	0.08	7.78
BGR	Bulgaria	2.38	3.78	1.35	11	2.9	2.57	1.53	0.013	0.16	0.11	8.68
CAN	Canada	2.46*	0.33	0.99	2	67.78	3.24	18.54	0.513	0.02	9.97	27.56
CHL	Chile	2.99*	0.8	0.93	12	81.03	2.74	3.22	0.043	0.04	0.76	13.03
COL	Colombia	3.94*	1.2	0.6	17	11.52	3.24	2.1	0.074	0.04	1.14	34.78
DNK	Denmark	0.30	0.28	0.94	5	38.12	3.71	31.29	0.162	0.15	0.04	5.17
ECU	Ecuador	2.12*	0.55	0.76	12	8.61	2.71	1.51	0.015	0.06	0.28	10.16
EGY	Egypt	1.17	0.42	0.81	15	14.3	1.99	0.95	0.050	0.06	1	51.76
FIN	Finland	1.26	0.61	0.63	4	59.17	4.19	23.84	0.119	0.11	0.34	4.99
GRC	Greece	1.77	0.5	1.09	13	31.76	2.32	10.62	0.108	0.14	0.13	10.15
HKG	Hong Kong	1.50*	0.19	7.39	6	212.56	2.57	17.98	0.106	0.18	0	5.78
HUN	Hungary	1.36	0.42	1.13	10	13.54	3.75	4.58	0.048	0.13	0.09	10.41
IND	India	1.85	0.46	0.24	10	25.5	1.17	0.33	0.281	0.02	3.29	840.54
IDN	Indonesia	2.23	2.7	0.68	11	18.88	2.27	0.78	0.142	0.02	1.9	177.06
ITA	Italy	1.19	0.34	0.46	11	23.98	4.19	17.3	0.985	0.07	0.3	56.88
JPN	Japan	3.20*	0.73	0.11	11	87.54	3.94	36.34	4.473	0.03	0.38	122.68
JOR	Jordan	2.47*	0.49	2.48	13	66.74	1.33	1.62	0.005	0.34	0.09	3.33
KOR	Korea, Rep.	2.60*	0.45	0.6	11	40.62	3.94	7.77	0.338	0.07	0.1	42.63
MYS	Malaysia	2.03*	0.43	1.92	6	181.16	2.84	3.29	0.061	0.08	0.33	17.98
MEX	Mexico	5.05	3.16	0.67	15	28.15	2.52	3.27	0.270	0.02	1.96	82.51
NLD	Netherlands	0.99	1	1.57	8	86.98	4.24	23.56	0.353	0.18	0.04	14.94
NZL	New Zealand	0.54	0.94	0.86	3	61.71	3.86	15.47	0.053	0.04	0.27	3.44
NGA	Nigeria	1.52	1.12	2.93	7	6.77	3.05	0.25	0.024	0.04	0.92	95.95
NOR	Norway	1.83	0.86	1.5	6	28.44	3.91	29.64	0.126	0.12	0.32	4.25
PAK	Pakistan	0.90	2	0.62	8	13.94	1.99	0.43	0.048	0.04	0.8	107.41
PAN	Panama	2.92*	0.75	1.95	7	17.93	3.53	2.87	0.007	0.12	0.08	2.38
PER	Peru	5.01*	1.1	0.36	14	13.96	2.37	2.47	0.053	0.04	1.29	21.32
PHL	Philippines	2.43	1.28	0.72	15	50.04	2.66	1.07	0.066	0.04	0.3	61.89
POL	Poland	1.09	4.25	1.02	10	6.29	3.23	3.05	0.115	0.07	0.32	37.71
SEN	Senegal	0.41	0.67	1.23	11	0	2.57	0.56	0.004	0.1	0.2	7.28
SGP	Singapore	1.94*	0.26	4.15	10	145.39	3.91	20.64	0.058	0.24	0	2.71
ESP	Spain	1.14	0.31	0.51	11	38.69	4.04	12.85	0.498	0.06	0.51	38.7
LKA	Sri Lanka	3.22*	0.39	1.45	8	14.8	3.12	0.6	0.010	0.07	0.07	16.88
TUN	Tunisia	0.57	0.51	1.75	13	10.86	1.9	1.88	0.015	0.12	0.16	8.02
TUR	Turkey	2.71	1.13	0.56	11	17.65	1.79	2.53	0.141	0.06	0.77	54.91
GBR	United Kingdom	3.05	1.19	0.69	7	127.17	3.57	17.24	0.994	0.07	0.24	57.57
USA	United States	3.13*	0.94	0.35	4	99.28	4.86	25.03	6.273	0.01	9.36	249.16
URY	Uruguay	2.57	0.81	0.48	9	1.17	2.26	5.16	0.016	0.09	0.18	3.1
VEN	Venezuela	2.71*	0.85	0.72	15	10.68	2.75	3.54	0.068	0.04	0.91	19.29
ZWE	Zimbabwe	1.53	0.44	0.87	6	23.55	2.9	0.67	0.006	0.06	0.39	9.53
	Median	**1.94**	**0.73**	**0.86**	**10.00**	**25.50**	**3.05**	**3.29**	**0.07**	**0.07**	**0.32**	**16.88**
	Mean	**2.08**	**0.97**	**1.22**	**9.59**	**46.15**	**3.07**	**9.78**	**0.421**	**0.09**	**1.15**	**57.74**

Note: * denotes the estimated coeffient is significantly greater than one at a 95% confidence level.

[1] Djankov *et al.* (2000).

[2] Ginarte and Park (1995).

[3] Average value for the period 1980 to 1999, WDI (2000).

[4] Assuming balanced trade, imports share is half of the constructed trade share of Frankel and Romer (1999), Table A1.

Table 4: Dependent Variable: Estimated Average Industry Markups

Independent Variables	OLS (1)	OLS (HC1) (2)	OLS (HC1) (3)	OLS (HC1) (4)
Number of Entry Procedures	0.113**	0.113**	0.092	0.116**
(Entry Regulation)	(0.052)	(0.053)	(0.055)	(0.052)
Imports to Value Added in Manufacturing	-0.307*	-0.307**	-0.219*	-0.275**
(Import Penetration)	(0.165)	(0.117)	(0.124)	(0.107)
Market Capitalization	0.010**	0.010***	0.008**	0.008**
(Financial Development)	(0.005)	(0.004)	(0.004)	(0.004)
Intellectual Property Protection Index	0.107	0.107	0.112	0.032
(Institutional Development)	(0.276)	(0.236)	(0.229)	(0.242)
GDP per Capita	-0.024	-0.024	-0.038*	-0.028
(Economic Development)	(0.024)	(0.021)	(0.022)	(0.023)
Number of Entry Procedures * GDP			0.033**	
			(0.014)	
Imports Share * GDP				0.729***
				(0.215)
Constant	0.809	0.809	1.007	0.967
	(1.059)	(0.857)	(0.890)	(0.857)
R-squared	0.23	0.23	0.27	0.27
# Observations	41	41	41	41

Note: HC1 uses the Hinkley-White heteroscedasticity-consistent covariance matrix for finite sample.
*, **, *** indicate significance at 90%, 95% and 99% confidence levels respectively.

Table 5: Dependent Variable: Estimated Average Industry Markups

Independent Variables	OLS (HC3) (1)	OLS (Bootstrap) (2)	FGLS (3)	IV (HC1) (4)
Number of Entry Procedures	0.113*	0.113**	0.103**	0.108*
(Entry Regulation)	(0.056)	(0.054)	(0.051)	(0.054)
Imports to Value Added in Manufacturing	-0.307*	-0.307**	-0.298*	-0.672***
(Import Penetration)	(0.154)	(0.181)	(0.160)	(0.242)
Market Capitalization	0.010*	0.010**	0.010**	0.016**
(Financial Development)	(0.005)	(0.005)	(0.005)	(0.006)
Intellectual Property Protection Index	0.107	0.107	0.116	0.023
(Institutional Development)	(0.254)	(0.249)	(0.268)	(0.277)
GDP per Capita	-0.024	-0.024	-0.025	-0.029
(Economic Development)	(0.025)	(0.023)	(0.023)	(0.024)
Constant	0.809	0.809	0.884	1.333
	(0.918)	(0.893)	(1.033)	(0.961)
R-squared	0.23	0.23	0.22	0.13
# Observations	41	41	41	41

Note: HC3 uses the Davidson-Mackinnon covariance matrix, which is an approximation to the jackknife estimator.
HC1 uses the Hinkley-White heteroscedasticity-consistent covariance matrix for finite sample.
Confidence intervals in the bootstrap estimation are bias-corrected.
In the IV regression, imports share is instrumented by Frankel-Romer trade share, surface area and population.
*, **, *** indicate significance at 90%, 95% and 99% confidence levels respectively.

Table 6: Specification Tests

		F-Statistics	d.f.	p-value
(1)	H_0 : no omitted variables	2.08	3, 32	0.1223
(2)	H_0 : no model mis-specification	1.88	1, 38	0.1788

Table 7: Dependent Variable: M_2

Independent Variables	OLS (1)	OLS (2)
Estimated Markup	0.149***	
	(0.025)	
Number of Entry Procedures		0.049***
		(0.008)
Imports to Value Added in Manufacturing		-0.069***
(Trade openness)		(0.017)
Market Capitalization		0.003***
(Financial Development)		(0.000)
Intellectual Property Protection Index		0.125***
(Institutional Development)		(0.021)
GDP per Capita		-0.004***
(Economic Development)		(0.001)
Country Dummies	YES	YES
Industry Dummies	YES	YES
Year Dummies	YES	YES
Constant	1.061	1.700***
	(1.185)	(0.323)
R-squared	0.02	0.10
# Observations	14646	12385

Note: Country cluster adjusted White standard errors are in parentheses.
*, **, *** indicate significance at 90%, 95% and 99% confidence levels respectively.

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