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REGULATION OF ENTRY AND THE DISTORTION OF INDUSTRIAL ORGANIZATION

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We study the distortions of industrial organization caused by entry regulation. We take advantage of heterogeneity across industries in their natural barriers and growth opportunities to examine whether industries are differentially affected in countries according to entry regulation. First, we consider the effect of entry regulation on the (static) industry structure. We find that regulation has a greater impact in industries with lower natural barriers to entry, both on the number of firms and on the average size of firms. We find that the effect of entry regulation on industry share is not related to differences in natural barriers. Regarding industry dynamics, we find that in countries with high entry regulation, industries respond to growth opportunities through the expansion of existing firms, while in countries with low entry regulation, growth opportunities lead to the creation of new firms; finally, the total sectoral response is invariant to the level of regulation.

JEL classification codes: O14, K20, L11, L50
Key words: regulation, regulation of entry

I. Introduction

Economists have presented two contrasting views of government regulation of economic activity. Under the Regulatory Capture view (Stigler 1971), regulation

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is acquired by industries, and is designed and operated for their benefit, through the increased market power that regulation allows. By contrast, the Public Interest perspective, as initially suggested by Pigou (1938), holds that industry will be fraught with inefficiencies stemming from market failures of all kinds, if left to its own devices. Regulation is therefore *required* to achieve socially efficient outcomes. Both perspectives suggest that entry regulation in particular will have an impact on industrial structure by directly influencing the costs of starting a new enterprise in a given industry, but differ in their views on the relative trade-off between the correction of externalities and the creation of market power. In order to appropriately assess the extent of this trade-off requires some empirical sense of the actual distortions that may be caused by regulatory burdens. Even though this paper does not deal with the actual *causes* of regulation, it sheds some light on the matter, by means of analyzing some interesting *consequences* of entry regulation.

There exists a nascent empirical literature examining the impact of entry regulation on economic outcomes. Two recent papers take contrasting approaches on this issue. Djankov et al. (2002) document significant differences across countries in the ease with which firms may open new businesses. They go on to examine a number of country-level outcomes and find that, consistent with the Public Choice view, entry regulation is associated with higher corruption and larger unofficial economies, but not higher quality of public or private goods. Bertrand and Kramarz (2002) look more closely at the effects of entry regulation on employment of the retail sector in France, taking advantage of regional and temporal variation in the stringency with which entry regulation was applied. They find that entry regulation decreases retail employment, partly due to the increase in concentration and the ensuing price upturns.

In our paper, we take an approach that empirically straddles the two papers described above. We take advantage of heterogeneity across industries in their natural barriers and growth opportunities to examine whether some industries are *differentially* affected in countries with high levels of entry regulation. This allow us to examine how entry regulation *differentially influences* industrial structure, as a function of industry characteristics, and the opportunities available to firms in that industry. This approach contrasts with Djankov et al., who examine the impact of regulation only at the country level – our approach allows for the inclusion of both country and industry fixed-effects, which mitigates some concerns of unobserved heterogeneity and reverse causality. Furthermore, Djankov et al. examine only ultimate (social) outcomes of entry regulation, rather than the direct impact upon industry structure that would be the primary consequence of regulations according to the Regulatory Capture view. Also, in contrast to Bertrand and Kramarz, by considering a range of industries and countries, we are able to study the differential impact of regulation across industries, and reflect on how it varies across a much broader range of institutional structures.

Our methodology is similar to the approach popularized by Rajan and Zingales (1998), in that we utilize U.S. data at the industry level to proxy for underlying industry characteristics that have arisen in an economy with relatively few institutional constraints. Also following the approach of Rajan and Zingales, we then examine how the relation between (underlying) industry characteristics and *actual* industry structure is affected by the extent of entry regulation. We report three primary sets of findings.

First, we consider the effect of entry regulation on the (static) structure of industry. We find that in industries with high natural barriers to entry (and hence little need for additional barriers through regulation), entry regulation has little impact on the quantity and average size of firms in an industry. By contrast, in industries with low natural entry barriers, countries with high entry regulation have few, large firms, relative to less regulated economies. Surprisingly, there is no relation between natural entry barriers and overall industry share of manufacturing, as a function of entry regulation. Second, utilizing firm-level data, we show that operating margins are relatively high in low barrier industries in high entry regulation countries (relative to high natural barrier industries). Together, these results suggest that, while entry regulation does not distort intersectoral allocation, the within-industry organization of production is affected by the regulation of entry. We then examine the impact of entry regulation on industry dynamics, by analyzing the ability of industries to take advantage of shocks to growth opportunities. These results parallel those on static industry structure: in countries with high entry regulation, industries respond to growth opportunities through the expansion of existing firms, while in countries with low entry regulation, the response is primarily through the creation of new firms. Moreover, we find that the investment response to growth opportunities is stronger in countries with low entry regulation, when we limit the sample to richer countries. Once again, we find that the total sectoral response is invariant to the level of regulation.

Overall, our results provide a consistent body of evidence suggesting that regulation distorts the (within) structure of industry, promoting industry concentration, but does not have measurable effects on intersectoral allocations. It is plausible that there may be some socially beneficial elements to the entry regulations that we examine. However, given the distortions that we uncover, combined with the absence of any measurable benefits, our results are in greater conformity with the Regulatory Capture view of regulation.

The rest of the paper will be structured as follows: In Section II, we further elaborate on our methodology. Section III describes the datasets that we have brought together for this paper. Our main results and their interpretation are presented in Section IV, and Section V contains our conclusions and discussion.

II. Methodology

A. Entry regulation and industry structure

Our first approach is based on the assumption that there exist industries that have 'naturally' high entry barriers. The underlying sources of these barriers are of secondary importance to our study, but may include a range of factors, such as capital intensiveness of production or technological complexity. For our purposes, what is necessary is that there exists some component of these barriers that is industry-specific and invariant across countries, say K_i, where i indexes industry.[1] Furthermore, we observe that models of entry with fixed costs generally predict a convex relationship between the size of fixed costs and the number of firms in an industry.[2] Thus, we may consider the total (fixed) cost of entry to be $K_i + R_c$, where R_c is the cost associated with entry regulation in country c. Since the number of firms, N_{ic} , is convex in $K_i + R_c$, $\partial^2 N_{ic} / \partial K_i \partial R_c > 0$. For constant demand, it also follows that for average firm size, $Size_{ic} = Q_{ic}/N_{ic}$, $\partial^2 (Q/N)_{ic} / \partial K_i \partial R_c < 0$, where Q_{ic} is total industry output. The intuition is straightforward: If 'natural' industry entry barriers K_i are extremely high (as in, say, petroleum refineries or tobacco), then the *marginal* impact of an increase in a (relatively small) cost of entry, R_c, will be small. However, if industry entry barriers are close to zero, the marginal impact of R_c may be quite significant.

A suitable test for this conjecture would examine the interaction between natural entry barriers and entry regulation. If the presence of natural entry barriers mitigates

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[1] Dunne and Roberts (1991) describe a set of industry characteristics that explain much of inter-industry variations in turnover rates. Furthermore, they find that the correlation between those industry characteristics and the industry turnover pattern is stable over time, which they take as an indication these correlation actually result from differences in technologies across industries. This is confirmed by the evidence presented by Cable and Schwalbach (1991) on systematic inter-industry figures.

[2] This is true, for example, of a simple Cournot model with free entry, and (fixed) linear demand.

the impact of entry regulation on industry structure, we would expect to see this effect empirically in the interaction of (natural) entry barriers and entry regulation. Our regressions will thus take the form:

$$\text{Log}(N_{ic}) = \alpha_i + \alpha_c + \beta \cdot \textit{Entry Barrier}_i \cdot \textit{Entry Regulation}_c + \varepsilon_{ic}. \quad (1)$$

$$\text{Log}(\textit{Size}_{ic}) = \alpha_i + \alpha_c + \beta \cdot \textit{Entry Barrier}_i \cdot \textit{Entry Regulation}_c + \varepsilon_{ic}. \quad (2)$$

For our main results, we will use firm turnover (defined below as entry + exit) in the United States, $\textit{Turnover}_i$, as a proxy for industry-specific entry barriers.[3] High turnover will be taken as a sign of relative ease of entry, i.e., turnover is negatively correlated with entry barriers.[4] This has been suggested by Dunne and Roberts (1991). They report high inter-industry correlations between entry and exit figures, justifying the characterization of industries with high natural entry barriers as those exhibiting relatively high entry *and* exit barriers. More specifically, they argue that industries can be characterized by turnover ratios as a function of industry-specific levels of sunk costs. An alternative measure of natural entry barriers could be given by considering just the 'entry' rate; however, this measure is more directly influenced by the life cycle of each industry. [5] Consequently, we suggest translating (1) and (2) into the following specifications that may be estimated with available data:

$$\text{Log}(N_{ic}) = \alpha_i + \alpha_c + \beta \cdot \textit{Turnover}_i \cdot \textit{Entry Regulation}_c + \varepsilon_{ic}, \quad (3)$$

$$\text{Log}(\textit{Size}_{ic}) = \alpha_i + \alpha_c + \beta \cdot \textit{Turnover}_i \cdot \textit{Entry Regulation}_c + \varepsilon_{ic}. \quad (4)$$

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[3] While US turnover is used, US observations are excluded from the regressions. As a robustness check, we also used the mean industry-level turnover from a set of seven developed countries (Belgium, Canada, Germany, U.K., Norway, Portugal and the USA). The correlation of entry and turnover across countries is higher than 90% and significant in all cases. Our results are robust to this alternative specification.

[4] One may think of three 'classes' of entry barriers: 1) regulatory 2) 'technical' exogenous (e.g., capital intensity) and 3) endogenous but consistent across countries (e.g., advertising). Anything else will be effectively in our error term. Now, our measure of turnover in the United States incorporates both 2) and 3), and we cannot differentiate between a technological need for scale, versus an industry's affinity for *creating* entry barriers through investment. Analyzing these differences would be interesting, since responses may vary according to different types of barriers; we leave this exercise, however, for future research. From our perspective, it does not matter *why* there exist barriers, simply that they exist and that some component of them is consistent across countries.

[5] We present the analysis using this alternative measure of entry barriers in the Appendix.

As suggested above, we predict a negative coefficient on the interaction term in (3) and a positive coefficient on the interaction term in (4).

There may be some concern that regulation is endogenous to industrial structure. Thus, for example, countries with high industry concentration may have high entry regulation, because these industries might lobby more successfully for entry regulation.[6] Additionally, one might expect more willingness to lobby, when natural barriers to entry are lower. Under a more benign interpretation, countries that differentially benefit from industrial concentration may *choose* high levels of regulation. To address these concerns, we will consider several variables that describe a country's legal and political structure as instruments. In particular, we will use legal origin, as popularized by La Porta et al. (1998), as well as dummies that indicate whether a country has a presidential (versus parliamentary) political system and whether a country has a majoritarian (versus proportional representation) voting structure. Persson and Tabellini (2003) and others have argued that these variables significantly impact both the size of government, as well as the extent to which governments intervene in the economy.

To be effective instruments, these variables must collectively be predictive of the extent of entry regulation, i.e., the instruments are significant in the first stage, and the instruments must only (differentially) affect our outcome variables through their impact on entry regulation. While we cannot rule out the effect of government structure on industry organization outside of regulation, this is the most natural channel through which government may influence industry structure. Now, since we are using these variables as instruments for regulation interacted with turnover, the instruments themselves will be interaction terms.

B. Entry regulation and industry margins

It is possible that any effects uncovered by regressions (3) and (4) could be the result of 'artificial' firm boundaries. Under this hypothesis, industry structure is identical across all levels of entry regulation in actual functioning, but there are different demarcations 'on paper' simply to avoid regulatory costs. To test whether there is an impact on actual industry structure, we utilize a measure of operating margins, a dependent variable that directly reflects the ability of firms to set prices above costs. We supplement (3) and (4) with a parallel set of regressions on margins, focusing once again on the interaction of 'natural' entry barriers and regulation:

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[6] We thank an anonymous referee for stressing this point.

$$Margin_{ic} = \alpha_i + \alpha_c + \beta \cdot Turnover_i \cdot Entry\ Regulation_c + \varepsilon_{ic}. \quad (5)$$

Since high entry regulation is expected to have a greater impact on market power whenever natural barriers are low (i.e., turnover is high), we expect a positive coefficient in the interaction term in equation (5).

C. Entry regulation and response to growth opportunities

We now consider the *dynamic* effects of entry regulation. If a growth opportunity arises, entry regulation may prevent potential entrants from responding to the new opportunity.[7] For incumbents, however, the opportunity presents a chance for expansion, protected from the competitive pressures that would be present in less regulated environments. That is, high entry regulation will promote the expansion of firm size in response to growth opportunities, whereas low entry regulation will promote an expansion in the number of firms where growth opportunities arise. We examine the existence of this differential response by looking at the interaction terms in the following specifications:

$$Growth(N_{ic}) = \alpha_i + \alpha_c + \beta \cdot Global\ Growth\ Opportunity_i \cdot Entry\ Regulation_c + \varepsilon_{ic}, \quad (6)$$

$$Growth(Size_{ic}) = \alpha_i + \alpha_c + \beta \cdot Global\ Growth\ Opportunity_i \cdot Entry\ Regulation_c + \varepsilon_{ic}. \quad (7)$$

Similar to the previous sections, if entry regulation distorts responses to growth opportunities, we predict $\beta < 0$ in (6) and $\beta > 0$ in (7). Estimating (6) and (7) requires a measure of global shocks to growth opportunities. Following Fisman and Love (2003a), we use actual growth in the United States as a proxy. The rationale is very similar to that described above: assuming that U.S. firms are in an institutional environment that allows them to optimally respond to growth opportunities, we may write:

$$USGrowth_i = Global\ Growth\ Opportunity_i + \varepsilon_{iUS}. \quad (8)$$

[7] If there is an optimal firm size, from a technological perspective, *all* adjustment to demand shocks should take place through changes in the number of firms. The possibility of supply shocks that affect optimal firm structure precludes any general statement on this point.

That is, actual growth in the United States is a measure of global shocks to opportunities, plus some U.S.-specific shock ε_{iUS}. We may then simply rewrite (6) and (7) as:

$$Growth(N_{ic}) = \alpha_i + \alpha_c + \beta \cdot USGrowth_i \cdot Entry\ Regulation_c + \varepsilon_{ic}, \quad (9)$$

$$Growth(Size_{ic}) = \alpha_i + \alpha_c + \beta \cdot USGrowth_i \cdot Entry\ Regulation_c + \varepsilon_{ic}. \quad (10)$$

Given the concern about regulation being endogenous, we will also test the previous models using the instrumental variables defined in Section II.A. In this case, the instrument will be the interaction between these variables and the *USGrowth* term.

III. Data

The data on regulation of entry of start-up firms are from Djankov et al. (2002), which contains information on the regulations of 77 countries in 1999. Our choice for the measure of entry regulation includes the entire cost incurred by a prospective firm in order to obtain legal status to operate, as a fraction of per capita GDP. As described by Djankov et al. (2002), it includes all identifiable official expenses, together with the monetary value of the entrepreneur's time.[8] We acknowledge that, although we limit ourselves to manufacturing industries, there is still very likely within-industry variation in regulation. Unfortunately, we have not been able to obtain reliable information at the industry level; hence, we use the country-level measure of entry regulation described above, keeping this caveat in mind.

As our measure of natural entry barriers, we use firm turnover, as explained in the previous section. Following the intuition of Rajan and Zingales (1998) of interpreting US data as 'industry representative' of an optimal economy, we use US turnover data as our proxy for natural barriers of entry.[9] We obtain these data from Dunne et al. (1988), which contains firm-level entry and exit data based on U.S. census data; we define turnover as the simple sum of entry and exit, deflated by the number of firms in the industry.[10]

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[8] This variable is identified as Cost + time in Djankov et al. (2002),

[9] Alternatively, we used average turnover ratios from a subset of 7 countries: Belgium, Canada, Germany, Norway, Portugal, UK and USA (as reported by Roberts, 1996). Our results are robust to this specification.

[10] Dunne and Roberts (1986) provides a full description on the data construction.

High-income countries may be expected to have technological characteristics that are more similar to those of U.S. firms. Hence, U.S. turnover may be a better proxy for technological barriers to entry primarily for richer countries, and as a result, we may wish to restrict our analyses to wealthier countries in what follows. We construct an auxiliary dummy variable called *Rich* which takes on a value of 1 if the country has per capita income greater than the median of our sample and zero otherwise. Throughout, we will present results for both our full sample of countries, as well as the limited sample of countries with *Rich* = 1. The reasons for this are twofold: first, our U.S.-based proxies for growth opportunities and natural barriers are more applicable to more advanced economies. Also, since the United Nations' UNIDO data are based on national industrial censuses, data from countries with *Rich* = 1 are of higher quality than that of the less developed countries in the broader sample.[11]

Our outcome variables are derived from the United Nations' UNIDO database, which provides data on production, value-added, number of employees, number of establishments and total wages bill, by industry, for a sample of 57 countries. We use two country-industry specific outcome variables in our main regressions: average firm size, defined as the (log of the) ratio of industry value added to industry total number of establishments; and the (log of the) number of establishments in each industry.[12] The use of logs allows for a relatively straightforward interpretation of coefficients as elasticities, and also attenuates the effect of any outliers. Following Rajan and Zingales (1998), we also include an industry's share of total manufacturing production as a control, defined as industry value added generated to total manufacture value added.[13] Also to be consistent with earlier work, we use the industry composition utilized by Rajan and Zingales (1998), which is a combination of 3- and 4-digit ISIC industries. All of the variables described in this paragraph are constructed using data from 1990.

The UNIDO data do not contain information on industry margins; to fill this gap, we utilize the World Scope Database (WSD), which provides firm-level data on public companies worldwide, representing over 96% of the world's market value.

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[11] We also computed results using only OECD countries, which generated results very similar to those with *Rich* =1. When the sample is limited to OECD firms with *Rich* =1, the results are even stronger than those reported in the text.

[12] These data are available for 52 out of the 57 countries. When merging this data with the regulation data from 77 countries, only 36 countries survive.

[13] This variable varies with industry and country, and is therefore not absorbed by the inclusion of country and industry dummies.

We define margins as the ratio of operating income to total sales, and generate a measure of margins at the firm level by taking averages over all available years during 1991-97. This is further collapsed to industry-country medians for some of the analyses that follow.

Finally, for our analyses on industry-level responses to growth opportunities as a function of entry regulation, we require a measure of industry-specific growth opportunities. Once again, we follow the intuition of Rajan and Zingales (1998), using industry-level US sales growth as a measure of growth opportunities worldwide. As with turnover, we may be concerned that industry-specific shocks to growth opportunities will be more similar in countries at similar levels of economic development (see Fisman and Love, 2003b, for a discussion); hence, we will once again consider our results for both, the entire sample, as well as the sub sample of countries with *Rich* = 1. The dependent variables in this section are also similar to those used by Rajan and Zingales (1998), and are simply the compounded industry-level growth rates of average firm size and number of firms, as well as growth in value added, as defined above, during 1981-90.[14]

There may be some concerns that regulation is endogenous to industrial structure (entry regulation being a result of high industry concentration). We address these concerns by undertaking an instrumental variables approach. In particular, we use legal origin, from La Porta et al. (1998); as well, we utilize dummy variables reflecting majoritarian (versus proportional) and presidential (versus parliamentary) political systems.[15]

Finally, we consider the effect of other regulation on industry structure. According to the Regulatory Capture view of government intervention, any regulation may indeed serve as an entry barrier, and may therefore potentially have a distortionary effect on industry structure. We use an index of labor regulation as our primary alternative measure of regulation, derived from Botero et al. (2003), which measures the level of protection of labor and employment laws, taking into account availability of alternative employment contracts, conditions of employments and job security. As a coarser, alternative summary measure of regulation, we use an index derived from Holmes et al. (1997).

Table 1 provides details on the construction and source for each of our variables. We do not include descriptive statistics for space reasons.

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[14] The reason for dropping the year 1980 is the amount of missing observation in some of our key variables.

[15] We thank Torsten Persson for providing us with these data.

Table 1. Variables' description and data sources

Abbreviation	Description and Sources
Dependent variables	
Log(*Size*)	Log of the ratio of industry value added to industry total number of establishments in each industry for year 1990. The industry composition is a combination of 3- and 4-digit ISIC industries. From United Nations' UNIDO database.
Log(*N*)	Log of the number of establishments in each industry for year 1990. Source: UNIDO.
Sector Share	By country measure of industry's share of total value added in manufacturing sector in 1990. Source: UNIDO.
Margin	Firms' average ratio of operating income to total assets during the period 1991-1997. Source: World Scope Database.
Growth_VA	Compounded industry-level growth rate of value added, during 1981-1990. Source: UNIDO.
Growth_N	Compounded industry-level growth rate of number of establishments, during 1981-1990. Source: UNIDO.
Growth_Size	Compounded industry-level growth rate of firms' average size (as defined in the first line). Period 1981-1990. From: UNIDO.
Alternative dependent variables	
Log(*Avemp*)	Log of the ratio of industry number of employees to industry number of establishments, year 1990. Source: UNIDO.
Gwth_Avemp	Compounded industry-level growth rate of the ratio defined above, during 1981-1990. Source: UNIDO.
Independent variables and controls	
Entry_Reg	Total costs incurred by a prospective firm in order to obtain status to operate, as a fraction of per capita GDP. It includes identifiable official expenses, as well as monetary value of the entrepreneur's time. Source: Djankov et al. (2002).
Turnover	Sum of the average entry and exit rates for the US manufacturing sector over the period 1963-82. From Dunne et al. (1988).
USGrowth	Growth in real sales, industry-level median of firm average growth rates over the period 1981-1990 for each ISIC industry in the US. Source: Compustat.
Log*(GDPPC)*	Log of GDP per capita, dollars in 1980.
Rich	Dummy variable which equals 1 if the country has per capita income greater than the median in the sample and zero otherwise.
Log Assets	Log value of firms' total assets.
Labor_Reg	Measures the level of protection provided by labor and employment laws. It takes into account availability of alternative employment contracts, conditions of employments and job security. From Botero et al. (2003).

IV. Results

Before proceeding to regressions, we present some basic cross-tabulations to illustrate the patterns in the raw data. In these cross-tabs, we limit observations to countries with *Rich* = 1, to control in a limited way for income effects. Table 2 shows our data classified in high versus low turnover industries (where, as stated above, turnover is a proxy for natural entry barriers), and high versus low entry regulation countries. A much larger number of firms are in high turnover industries. Consistent with our conjecture on the impact of entry regulation, the *differential* between high and low turnover firms is much smaller for countries with high entry regulation. Table 2 shows a similar set of results for average firm size, where we find that the gap between the size of firms in low versus high turnover industries is narrower for countries with high entry regulation. Surprisingly, average firm size is larger overall in low entry regulation countries; in our regressions, however, all country-specific factors will be absorbed by fixed-effects, which will allow for a cleaner comparison on the differential effects of entry regulation by industry. Additionally, Table 2 shows that margins are indeed higher in low turnover industries, and that the gap is narrower in high regulation countries. This simple cross-tabulation shows that

Table 2. Comparison for low and high entry regulation countries and firms' characteristics

Firms' characteristics	Low entry regulation	High entry regulation
Average number of establishments		
Low turnover	0.2052	0.2952
High turnover	0.7066	0.6151
Firm average size (industry value added/industry number of establishments)		
Low turnover	17.9409	13.6990
High turnover	2.1633	2.2822
Average margin		
Low turnover	0.0839	0.0587
High turnover	0.0755	0.0570
Growth rate of the average number of establishments		
Low growth opportunity	0.0037	0.0004
High growth opportunity	0.0255	0.0035
Growth rate of the firm average size		
Low growth opportunity	0.0526	0.0509
High growth opportunity	0.0517	0.0504

Note: cross-tabulations for countires with *Rich* = 1.

average margins are lower in high regulation countries, but this will once again be absorbed by country-level fixed effects.

Table 2 also shows cross tabulations that illustrate the effects of entry regulation on firms' responses to growth opportunities, by splitting the sample into high and low growth opportunity industries (as measured by actual growth in the United States). When looking at growth in the number of establishments; we observe that in general, the number of establishments grows more within industries with relatively higher growth opportunities. However, this differential is much greater in countries where entry regulation is low. Finally, for the growth rate in average establishment size, we observe that industries located in countries with high entry regulation exhibit relatively higher growth rates in average establishment size in industries with higher growth opportunities.

A. Entry regulation and industry structure: regression results

Our estimations of equations (3) and (4) are listed in Tables 3 and 4. We show our baseline results for the full sample and without any additional controls in columns [1] and [2] of Table 3. The coefficients of interest are of the predicted signs, and are significant at least at the 5 percent level. Furthermore, the magnitudes are large, and may be illustrated with the following thought experiment: In moving from Singapore, the country at the 25th percentile of the distribution of entry barriers, to Peru, the country at the 75th percentile, the difference between the number of firms in Paper and Allied Products (25th percentile of *Turnover*) and the number of firms in Industrial Machinery and Equipment (75th percentile of *Turnover*) narrows by 11.03 percent ((0.81 – 0.61)*(-0.28 + 0.68))*(-1.379). Similarly, the difference in average firm size narrows by 4.76 percent ((0.82 – 0.61)*(- 0.28 + 0.68))*(0.595).[16]

We add *Turnover**log(*GDPPC*) as a control in columns [3] and [4] , and find that the size of our coefficients are reduced (in absolute values) but their significance increases to the 1% level. In columns [5] through [8], we restrict the sample to countries with *Rich* = 1, and find that for this subsample the coefficients show a stronger and more significant effect on average firm size.[17]

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[16] I.e., the slope relating number of firms to *Turnover* is *less* positive in Peru than in Singapore, and the slope relating average firm size to *Turnover* is *less* negative in Peru than in Singapore.

[17] In order to address a potential concern on the endogeneity of our control variable 'sector share', we also estimate these regressions without including such controls. The coefficients of interest remain significant at conventional levels in models [2] through [8].

Table 3. Regression results relationship between entry regulation and industry structure: within-industry effect

Model	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]
Method	OLS	OLS	OLS	OLS	OLS	OLS	OLS	OLS	IV	IV
Sample	All countries				Rich countries					
Dep. variable	Log(*Size*)	Log(*N*)	Log(*Size*)	Log(*N*)	Log(*Size*)	Log(*N*)	Log(*Size*)	Log(*N*)	Log(*Size*)	Log(*N*)
Turnover *	0.595**	-1.379***	0.555***	-1.000***	0.626***	-1.087***	0.631***	-0.902***	0.573***	-0.923***
Entry_Reg	[0.237]	[0.251]	[0.177]	[0.180]	[0.204]	[0.215]	[0.179]	[0.233]	[0.188]	[0.232]
Turnover *			-0.057	0.535			0.027	0.945	-0.067	0.910
Log(*GDPPC*)			[0.319]	[0.398]			[0.570]	[0.744]	[0.578]	[0.645]
Sector Share	8.719***	8.733***	8.763***	8.318***	9.356***	6.488***	9.351***	6.310***	9.354***	6.311***
	[1.491]	[1.860]	[1.485]	[1.745]	[1.502]	[1.975]	[1.521]	[1.930]	[0.985]	[1.986]
Constant	18.248***	-2.218***	17.108***	-1.956	13.026***	5.668***	13.903**	-4.816	15.500	-7.129
	[0.699]	[0.738]	[1.247]	[1.518]	[0.136]	[0.171]	[5.151]	[6.672]	[5.254]	[5.880]
Observations	860	860	860	860	419	419	419	419	419	419
R-squared	0.86	0.89	0.86	0.89	0.89	0.92	0.89	0.93	0.88	0.93

Note: *Size* represents the firm average size measured as the ratio of industry value added to industry number of establishments and *N* measures the industry number of establishments. Model IV presents instrumental variable results. The set of instruments includes a dummy for presidential political systems, a dummy for majoritarian voting structures, and dummies for legal origin, all interacted with *Turnover*. All regressions include country and industry dummies. ***, ** and * represent coefficients significant at the 1%, 5%, and 10% levels respectively. Standard errors in brackets.

Finally, in Columns [9] and [10] we report the IV regressions. In the first stage, our collection of instruments is significant at the 1 percent level (based on an F-test).[18] In the second stage, we find that the magnitudes of the coefficients generated by the instrumental variables approach are very similar to those in our OLS regressions. Furthermore, all coefficients remain significant at conventional levels.

In Table 4, we repeat the same set of regressions, but with $Sector\ Share_{ic}$ as the outcome variable. Interestingly, this does not generate *any* significant coefficients once we control for the interaction of turnover with the GDP per capita. Our standard errors in these regressions are not increased, relative to the preceding set of regressions, suggesting that the effect of regulation does not distort total intersectoral allocations. Rather, the regulations affect industry structure through within-industry distortions.

Table 4. Regression results relationship between entry regulation and industry structure: inter-industry effect

Model	[1]	[2]	[3]	[4]	[5]
Method	OLS	OLS	OLS	OLS	IV
Sample	All countries			Rich countries	
Dep. variable	*Sector Share*	*Sector Share*	*Sector Share*	*Sector Share*	*Sector Share*
Turnover *	-0.027***	0.001	-0.008	0.000	-0.004
Entry_Reg	[0.008]	[0.011]	[0.009]	[0.009]	[0.006]
Turnover *		0.037**		0.043**	0.038
Log(*GDPPC*)		[0.015]		[0.018]	[0.018]
Constant	-0.069**	-0.323***	-0.014	-0.149**	-0.364**
	[0.025]	[0.110]	[0.029]	[0.069]	[0.165]
Observations	958	958	478	478	478
R-squared	0.48	0.50	0.53	0.54	0.53

Note: ***, ** and * represent coefficients significant at the 1%, 5%, and 10% levels respectively. Standard errors in brackets.

B. Entry regulation and operating margins: regression results

We present our estimation of equation (5) in Table 5. The coefficient on the interaction term is positive, suggesting that entry regulation disproportionately generates market power for firms in high-turnover industries. It is highly significant in all regressions once we either control for the interaction of GDP per capita and turnover or when

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[18] 1st stage tables are available upon request. In the first stage, the presidential dummy interaction is not significant, but all others are individually significant.

the sample is limited to the subset of "rich" countries. A similar thought experiment to that described above suggests that in moving from Singapore to Peru, the gap in margins between 'high' and 'low' regulation industries increases by approximately 0.4 percentage points.

Table 5. Regression results relationship between entry regulation and industry margin

Model	[1]	[2]	[3]	[4]	[5]
Method	OLS	OLS	OLS	OLS	IV
Sample	All countries			Rich countries	
Dep. variable	*Margin*	*Margin*	*Margin*	*Margin*	*Margin*
Turnover *	0.012	0.032**	0.038**	0.039***	0.019***
Entry_Reg	[0.014]	[0.012]	[0.013]	[0.013]	[0.006]
Turnover *		0.028*		0.007	0.051
Log(*GDPPC*)		[0.015]		[0.026]	[0.033]
Log Assets	0.007**	0.007**	0.011***	0.011***	0.004***
	[0.003]	[0.003]	[0.002]	[0.002]	[0.001]
Constant	-0.046	-0.059	0.107*	0.083	-0.413
	[0.073]	[0.072]	[0.053]	[0.110]	[0.301]
Observations	1054	1054	585	585	1898
R-squared	0.75	0.75	0.61	0.61	0.17

Notes: *Margin* is defined as the ratio of operating income over sales. Model IV presents instrumental variable results. The set of instruments includes a dummy for presidential political systems, a dummy for majoritarian voting structures, and dummies for legal origin, all interacted with *Turnover*. All regressions include country and industry dummies. ***, ** and * represent coefficients significant at the 1%, 5%, and 10% levels respectively. Standard errors in brackets.

C. Entry regulation and responses to growth opportunities: regression results

To analyze the dynamic effects of entry regulation, we turn to the empirical tests described in (9) and (10), and reported in Table 6. The full-sample regressions yield significant coefficients in the regressions examining growth in the number of establishments: there is a smaller response to growth opportunities in those countries with higher barriers to entry. However, when we limit the sample to countries with *Rich* = 1, both sets of coefficients are significant and of the predicted sign (see columns [5] and [6]). Columns [7] - [9] present analogous results, corresponding to the IV specification. The coefficients in the regressions examining average establishment size are of the predicted sign, but not significant at conventional levels.

D. Other forms of regulation

In this paper, we have focused on the specific *type* of regulation that we expect to most directly impact industry structure, due to the effect on the fixed cost of entry,

Table 6. Regression results relationship between entry regulation and response to growth opportunities

Model	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]
Method	OLS	OLS	OLS	OLS	OLS	OLS	IV	IV	IV
Sample		All countries				Rich countries			
Dep. variable	*Growth_VA*	*Growth_N*	*Growth_Size*	*Growth_VA*	*Growth_N*	*Growth_Size*	*Growth_VA*	*Growth_N*	*Growth_Size*
USGrowth *	-0.014	-0.143**	0.122	0.022	-0.195***	0.221**	0.029	-0.204***	0.233**
Entry_Reg	[0.073]	[0.068]	[0.089]	[0.072]	[0.071]	[0.101]	[0.075]	[0.075]	[0.100]
USGrowth *	0.018	0.041	-0.031	-0.013	-0.127	0.124	-0.002	-0.144	0.144
Log(*GDPPC*)	[0.085]	[0.085]	[0.099]	[0.207]	[0.202]	[0.289]	[0.205]	[0.209]	[0.286]
Sector Share	0.458***	0.291**	0.182	0.362***	0.027	0.326***	0.363***	0.026	0.326***
	[0.069]	[0.113]	[0.120]	[0.081]	[0.063]	[0.060]	[0.081]	[0.062]	[0.060]
Constant	0.080	0.013	0.031	0.122	0.134	-0.015	0.050	-0.036	0.087
	[0.101]	[0.026]	[0.097]	[0.223]	[0.217]	[0.304]	[0.067]	[0.062]	[0.087]
Observations	1012	906	870	543	477	477	543	477	477
R-squared	0.50	0.50	0.56	0.60	0.54	0.63	0.60	0.54	0.63

Notes: Growth measures are taken for the period 1981 to 1990. *Growth_VA*, *Growth_N* and *Growth_Size* represent industry growth rates of value added, number of establishments and average size. Model IV presents instrumental variable results. The set of instruments includes a dummy for presidential political systems, a dummy for majoritarian voting structures, and dummies for legal origin, all interacted with *USGrowth*. All regressions include country and industry dummies. ***, ** and * represent coefficients significant at the 1%, 5%, and 10% levels respectively. Standard errors in brackets.

relative to production (fixed or marginal) costs. However, our explanation could *potentially* apply to other types of indirect regulatory barriers to entry, which are correlated with entry regulation. We therefore wish to get a sense of whether regulation *generally* is distorting industrial structure by acting as a barrier to entry, or whether there is something special about regulation of entry. We therefore provide an alternative set of results that examine the impact of labor regulations, based on the data collected by Botero et al. (2003).

In the interests of space, we do not show those regressions. Given the entry regulation results, however, it is remarkable that none of the interaction terms involving labor regulation are significant. We have also repeated these regressions using the overall measure of government intervention of Holmes et al. (1997), and find that almost all coefficients are insignificant at the 10 percent level.

E. Additional robustness checks

As Djankov et al. (2003) have noted, regulation is correlated with various other country-level characteristics. While the most obvious control, *log*(*GDPPC*), is included in all reported specifications, there may be concerns of other omitted variables. We therefore repeated our full set of regressions including interactions involving a number of additional covariates that might be expected to impact industry structure. First, we consider interactions with a measure of financial market development, taken from Rajan and Zingales, defined as the ratio of private domestic credit and stock market capitalization to GDP. As well, we consider the effect of including interactive controls utilizing the country-level measure of corruption developed by Kaufmann, Kraay, and Zoido-Lobatón (2003). Finally, we try to control for overall bureaucratic quality using a measure from Political Risk Services (1997). In no case were any of the coefficients systematically significant. Furthermore, the coefficients on the interaction terms reported above were uniformly unaffected by the inclusion of these additional interaction terms.[19]

A second concern that affects the “average size” specification is that our measure of firm size is based on value added, which incorporates both prices and quantities produced. To ensure that these results are not driven purely by price effects, but signify ‘real’ distortions, we repeat these specifications using employment-based measures of firm size, also derived from the UNIDO data. These results parallel the firm size results based on firm value-added.

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[19] These results can be obtained from the authors.

V. Conclusions

In this paper, we study the distortions to the organization of industry caused by entry regulation, taking advantage of heterogeneity across industries in their natural barriers and growth opportunities to examine whether some industries are *differentially* affected in countries with high levels of entry regulation.

First, we consider the effect of entry regulation on the (static) structure of industry. We find that in industries with high 'natural' barriers to entry, as proxied by firm turnover in the U.S., entry regulation has little impact on the quantity and average size of firms in an industry. By contrast, in industries with low 'natural' entry barriers, countries with high entry regulation have few, large firms, relative to less regulated economies. We find no relation between 'natural' entry barriers and overall industry share of manufacturing, as a function of entry regulation.

Second, utilizing firm-level data, we show that operating margins are relatively high in low barrier industries in high entry regulation countries (relative to high 'natural' barrier industries).

Finally, we examine the impact of entry regulation on industry dynamics, by analyzing the ability of industries to take advantage of shocks to growth opportunities, and find that in countries with high entry regulation, industries respond to growth opportunities through the expansion of existing firms, while in countries with low entry regulation, the response is primarily through the creation of new firms; the total sectoral response is invariant to the level of regulation.

Overall, our results provide a consistent body of evidence suggesting that regulation distorts the (within) structure of industry, promoting industry concentration, but does not have measurable effects on intersectoral allocations.

The Public Interest view does allow for the possibility that industrial organization may be distorted through the creation of regulatory entry barriers. However, the particular form of regulations that we examine here, in contrast to the regulation of labor, environmental contaminants, or product safety, do not provide obvious social returns. Therefore, if we assume that having a lower number of firms (and consequently higher margins) as we report decreases social welfare, our results would suggest regulation of entry to have a negative impact that may not be offset by social gains.[20] We leave further analysis on the overall welfare implications of regulation as an area for further research.

[20] Even though this is a reasonable assumption, an alternative view is also possible. Kamenica (2008), for example, suggests that having more firms (and hence more products) could make uninformed consumers worse off. We thank an anonymous referee for making this point.

Appendix

Table A1. Regression results relationship between entry regulation and industry structure, Entry instead of Turnover as a proxy (inverse) of natural entry barriers

Model	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]
Dep. Variable	Log(*Size*)	Log(*N*)	Log(*Size*)	Log(*N*)	*Sector Share*	*Sector Share*	*Margin*	*Margin*
Entry *	1.096***	-1.912***	1.074***	-1.414***	-0.009	0.005	0.0184**	0.0213**
Entry_Reg	[0.263]	[0.286]	[0.218]	[0.298]	[0.014]	[0.014]	[0.008]	[0.008]
Entry *			-0.111	2.529**			0.079***	0.0780*
Log(*GDPPC*)			[0.783]	[1.096]			[0.027]	[0.041]
Observations	404	404	404	404	460	460	2058	2058
R-squared	0.89	0.93	0.89	0.93	0.53	0.54	0.18	0.18

Notes: *Size* represents the firm average size measured as the ratio of industry value added to industry number of establishments and *N* measures the Industry number of establishments. The sample is limited to countries with *Rich* =1. The same sets of controls are included as in the preceding regressions. All regressions include country and industry dummies. ***, ** and * represent coefficients significant at the 1%, 5%, and 10% levels respectively. Standard errors in brackets.

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