



## Market Competition, Industrial Policy and Corporate Risk-Taking: Evidence from Pakistani Enterprises

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### Abstract

*This study evaluates the impact of industrial policy and market competition on corporate risk-taking using data from Pakistani firms. This study reveals that industrial policy (IP), measured by IP-hat, consistently reduces corporate risk-taking across multiple model specifications. The relationship between market competition (HHI) and risk-taking shows methodological sensitivity, while Pooled OLS estimates indicate significant negative effects from both high and low competition levels, these effects become statistically insignificant in fixed effects models that control for firm-level heterogeneity. This suggests that observed competition effects may stem from time-invariant firm characteristics rather than dynamic market changes. Furthermore, we find no significant interaction between industrial policy and market competition, indicating that policy effects operate independently of market structure. These results highlight the risk-suppressing nature of IP in emerging economies and underscore the importance of methodological considerations in competition studies. The findings carry important implications for policymakers designing industrial policies that balance firm support with innovation incentives in developing markets.*

### Keywords

Industrial Policy; Corporate Risk-Taking; Market Competition; Pakistani Firms; Fixed Effects Model

### Introduction

Over the past decade, views on industrial policy have undergone a notable shift. Following the intense debates of the late 1970s and mid-1980s largely driven by the success of Japan and other East Asian economies, the discussion surrounding industrial policy gradually faded. For nearly three decades thereafter, it was largely sidelined due to ideologically driven and politically motivated neglect (Chang, 2011). This tendency can be explained by a prevailing supply-side orientation in the industrial policy literature, which has led many scholars to underestimate the role of demand management in shaping industrial policy outcomes, both at the domestic level through fiscal and monetary measures and at the international level, most notably via exchange rate policy. (Fischer (2015); Nissanke (2019); Ocampo et al. (2009); Storm (2017)). Industry policy plays a crucial role in any country economy, since 1947 industry policy passed through different phases in Pakistan from private to public owner and recently public private partnership (Imran et al. 2023). Following independence, the industrial sector was modest, comprising only 34 of the 921 inherited units, which contributed a mere 7% to the GDP and employed approximately 26,000 individuals.

Risk taking is much important for any firms to gain benefits and increase its value, but in same content taking huge risk may lead to crisis. In recent years, one of the new concerns and a developing field of study in the fields of finance and management is the connection between market competition and business risk-taking. The nature of competitive dynamics might have a very heavy

bearing on the risk appetite of a firm for that it readjusts its strategy to navigate various pressures coming from the market (Baker & Wurgler, 2013). However, due to weak institutional frameworks, concentrated ownership, and limited access to finance, many Pakistani firms exhibit cautious or conservative risk-taking behaviour (Nazir & Asad, 2023). The majority of businesses in Pakistan, an emerging nation, are family-owned. Compared to companies that are not family-owned, these companies have different policies. This is the empirical proof that in a growing economy, product market conflict reduces investment efficiency (Ali 2024). Therefore, this paper aims to empirically examine how market competition and industrial policy both individually and in combination affect corporate risk-taking among Pakistani non-financial firms. Using firm-level panel data, the study explores whether these factors drive firms toward higher risk-taking or greater risk aversion, and whether their effects are ultimately positive or negative.

### **Literature Review**

In today's competitive and dynamic economy, risk-taking strategy is important for businesses and economic growth. Investment decisions (Faccio et al., 2016), corporate policy (Ferris et al., 2017), and other strategic choices are closely linked to risk-taking strategy, which is a firm's inclination to take risks in the pursuit of profits (John et al., 2008). Risk-taking strategy is a key factor in firm performance and growth (Nakano 2012).

Numerous studies have demonstrated that the external environment that micro-enterprises confront would be significantly impacted by the implementation and modification of pertinent industrial policies (陆正飞 2013; 袁博 2017). Relevant industries will benefit from improved competitive development conditions, increased investment and financing opportunities and a reduction in the survival risks faced by businesses with the encouragement and support of industrial policies (黎文靖 2014; 赵卿 2016). Rodrik (2023) and Zhang (2024) argue that well designed industrial policies particularly those that promote technological advancement can strengthen firm's innovation capacity and in turn, enhance their willingness to take risks. However, according to 肖翰 (2018) industrial policies have a negative impact on firm by reducing product market conflict and financial flexibility. In contrast 吴倩 (2019) noted industrial regulations redirect resources toward supported firms in their development and maturity stages through secondary allocation, thereby increasing risk-taking and broadening the scope of enterprise investment.

Market competition is a key determinant of firms' risk-taking behavior, as firms adjust their strategies to survive and perform in competitive environments. Many studies suggest that intense competition pushes firms toward greater risk-taking. Under the high market competition firms apply bold strategies like higher leverage and reduced capital buffers to protect profitability and market share (Baker 2013; Louati 2015; John 2008; Laksmana 2015). 高磊 (2018) study further prove that market competition enhance risk taking and firms performance especially in private firms. Conversely, some studies support a adverse relation between HHI and risk-taking. High competition firms adopted more conservative approaches to avoid the loses, which mean less competitive market are more willing to take risk (Salhi et al., 2020; Chang et al., 2023).According to Moudud-Ul-Huq (2021) financial sector like banks also shows low completion can increase risk taking behaviour. According to 胡利琴 (2024) financial innovation mediates the link between competition and risk-taking, while 屠立鹤 (2017) highlighted that managerial incentives interact with market conditions to shape corporate risk taking behavior.

### **Data**

This study initially considered information from 650 officially registered on the Pakistan Stock Exchange (PSX). Financial firms are not included in this study because they differ from non-financial organizations in terms of risk level, financial structure, and laws. Therefore, both the static and dynamic penal estimation, the current research is restricted to non-financial enterprises. The following firms should be excluded from the sample in order to prevent sample selection bias: (1) special treatment firms (2) firms with missing data (3) firms insolvent during the period and (4) firms with less than three years of continuous data.

Finally, we looked at 202 firms between 2010 and 2021. Among many other important industries, the sample includes cement, oil, gas and auto parts & accessories. Financial data are obtained

from State Bank of Pakistan (SBP), Board of Investment Pakistan, Ministry of Industries and Production and Pakistan Stock Exchange (PSX).

This article utilizes Excel for data organization and employs R for data processing, statistical testing, and regression analysis. This article employs Winsorizing at the 1% upper and lower limits to mitigate the influence of outliers on all continuous variables.

### Variables

Corporate risk-taking is measured using the volatility of firm-specific return on assets (ROA). First, the average ROA of all firms is calculated for each year. Next, the difference between a firm's ROA and the yearly average ROA is obtained and squared to remove negative values, resulting in adjusted ROA. Finally, the square root of this value is taken to complete the calculation. This approach to measuring corporate risk-taking follows Boubakri et al. (2013) and John et al. (2008).

$$RISK_{i,t} = \sqrt{\frac{1}{N-1} \sum_{n=1}^N (Adj\_Ro a_{i,n} - \frac{1}{N} \sum_{N=1}^N Adj\_Ro a_{i,n})^2} \quad /N = 3 \quad (1)$$

RISK<sub>i, t</sub> is the volatility of ROA calculated by the rolling window of the industry mean-adjusted ROA from year t to t+2, as shown in Eq. (1).

### Explanatory Variables

The core explanatory variable in this study is HHI. In this study employ the Herfindahl-Hirschman index ("HHI"), which is used to measure the level of competition within an industry. The Herfindahl (H) index is defined as:

$$HHI = \sum_{j=1}^J S_{ij}^2$$

Where  $S_{ij}$  is the market share of firm  $j$  in industry  $i$ . A firm's market share is determined by dividing its net sales by the total industry sales in a given year. The HHI is computed as the sum of the squared market shares of businesses within an industry. The index is calculated annually for each industry and then averaged over the preceding three years to produce a more stable indicator of industry rivalry while minimizing potential data mistakes. This article uses this as a criterion for sample classification, using the median of the Herfindahl Index of sample enterprises in that year as the boundary. If a company's Herfindahl Index is greater than the median, it belongs to the low market competition group; otherwise, it belongs to the high market competition group.

Following Chen (2017) and Zhao (2020), construct a dummy variable IP to measure industrial policy. The variable is set as follows. First, identify "encouraged industries" from Pakistan's Federal Budget and Annual Plans, which guide the national economy each year. If an industry is listed as supported, promoted, or receiving incentives such as subsidies, tax breaks, or credit schemes, firms in that industry are assigned IP = 1. Otherwise, IP = 0.

### Control Variables

This study employs a number of control variables in empirical analysis to account for the potentially confounding effects of institution-specific factors on the level of risk taking.

Table 1. Control Variable

Code	Variable	Definition
SIZE	Enterprise scale	The natural logarithm of the firm's total assets.
LEV	Financial leverage	Total liabilities divided by total assets reflects a company's leverage level.
ROA	Profitability	Net profit divided by total assets (return on assets).
GROW	Growth	This year's operating income minus last year's operating income, divided by last year's operating income.
LIQ	Liquidity	The ratio of current assets to current liabilities (current ratio).
CASH	Cash flow	Measured by the ratio of operating cash flow to total assets.
AGE	Company age	The natural logarithm of the number of years since the company was listed on the Pakistan Stock Exchange (PSX).

Finally, to control for unobserved industry and year effects on corporate risk-taking, industry (IND) and year (YEAR) dummy variables are included in all regressions.

### Methodology

In this study we use panel regression model include fixed effect model and random effect model, For determination the appropriate model for research on industry policy effect on risk taking is used

hausman test. The fixed effects model examines how predictor variables affect outcomes within the same entity. The fixed-effect equation is

$$Y_{it} = \beta_1 X_{it} + \alpha_i + U_{it} \dots \dots \dots$$

The random effects model assumes that differences between entities are random and not related to the independent variables, unlike the fixed effects model (Reyna, 2007). The random effects model is

$$Y_{it} = \beta_1 X_{it} + \alpha + U_{it} + \varepsilon_{it}$$

This paper constructs the following regression model to examine whether industrial policies regulate the impact of market competition on firm risk-taking. The model introduces an interaction term between the market competition indicator and the industrial policy variable specifically in the form:

$$RISK_{i,t} = \beta_0 + \beta_1 HHI_{i,t} + \beta_2 IP_{i,t} + \beta_3 (HHI_{i,t} \cdot IP_{i,t}) + \beta_4 GROW_{i,t} + \beta_5 ROA_{i,t} + \beta_6 LEV_{i,t} + \beta_7 SIZE_{i,t} + \beta_8 LIQ_{i,t} + \beta_9 CASH_{i,t} + \beta_{10} AGE_{i,t} + \beta_{11} IND + \beta_{12} YEAR + \varepsilon_{i,t}$$

To address the endogeneity issue, the study first uses an OLS regression to generate the predicted value of industrial policy, commonly referred to as IP-hat. This predicted value isolates the part of industrial policy that is not influenced by reverse causality, industry cycles, or other omitted factors. By replacing the original IP variable with IP-hat, the analysis becomes more reliable. In the next step, corporate risk-taking is examined using this instrumented policy variable along with the relevant control variables and fixed effects.

## Result

Before the final calculation the descriptive statistics of the variables are important. It helps to check the characteristics of variables used for the examine. Table 2 shows the result of descriptive statistics about the data set which includes a total of 2424 observation. The mean value of dependent variable (Risk Taking) is 0.054. The risk taking of firms lies between 0.387 to 0.003 with the standard deviation of 0.059. The range of industry policy (IP-hat) of the firm is -0.107 to 1.438. Some firms receive limited or even adverse policy influence, while others benefit from strong industrial policy support. This variation suggests that industrial policy effects are unevenly distributed across firms, which provides meaningful dispersion for analyzing its impact on corporate risk-taking behavior. State is a dummy variable to show that the firm is state own or not. HHI the mean value and median is 0.156 and 0.136. The mean value is slightly higher than median, indicating some industries are relatively concentrated, resulting in variability in market competition across firms.

Table 2. Descriptive Statistics

	mean	sd	min	max	median	n
Risk_taking	0.0542	0.0595	0.0038	0.387	0.0344	2424
IP_hat	0.5239	0.4135	-0.107	1.4386	0.5459	2424
HHI	0.1561	0.1284	0.0334	0.4854	0.136	2424
SIZE	15.4525	1.7148	11.6571	19.651	15.3114	2424
LEV	0.6473	0.4652	0.0943	3.4981	0.582	2424
ROA	0.0911	0.1113	-0.2027	0.4421	0.0833	2424
GROW	0.1145	0.341	-0.741	1.9107	0.1033	2424
LIQ	1.5369	1.4931	0.1064	10.0416	1.1299	2424
CASH	0.0611	0.1092	-0.2178	0.4051	0.0488	2424
AGE	39.7376	18.0153	5	106	35	2424

This study in order to analysis the relationship of market competition, industry policy and risk-taking, initially sample divided based on the Herfindahl-Hirschman Index into high-HHI and low-HHI groups. First, Fixed Effects (FE) and Random Effects (RE) models were intended to be estimated for these sub-samples, with the Hausman test to choose the appropriate model, in order to assess both the direct effect of HHI and the interaction effect with industrial policy ( $HHI \times IP\text{-hat}$ ). However there is large number of coefficients and limited time periods that's why the Random effect model for sub samples could not be estimated. Therefore, the pooled OLS regression was used on these sub-sample to as an exploratory check to observe the general patterns. For the primary analysis this study still applied Fixed-effects and Random effects model on full sample. The result shows in table 2 .

Table 2 Relationship of market competition, industry policy and risk-taking

Risk taking			
Variables	Fixed Effect (FE) Full Sample (1)	OLS Regression Low Competition (2)	OLS Regression High Competition (3)

HHI	-0.047 (-0.738)	-1.038*** (-2.863)	-0.233** (-2.653)
IP_hat	-0.011** (-2.488)	0.035 (1.432)	0.0199 (1.622)
HHI*IP	0.009 (0.424)	-0.251 (-1.188)	-0.0963** (-2.325)
GROW	-0.007** (-2.278)	-0.009** (-1.975)	-0.00342 (-0.641)
ROA	0.073*** (4.397)	0.007 (0.362)	0.0948*** (5.006)
LEV	0.017*** (4.988)	0.024*** (5.071)	0.0210*** (5.691)
SIZE	-0.019*** (-5.033)	-0.003*** (-3.334)	-0.0034** (-2.699)
LIQ	0.0001 (0.154)	-0.0007 (-0.546)	-0.0002 (-0.207)
CASH	-0.018 (-1.461)	-0.051*** (-2.739)	-0.0297** (-2.206)
AGE	0.006*** ( 9.990)	-0.0001 (-1.219)	-0.00005 (-0.624)
Constant		0.240*** (5.057)	0.099*** (3.693)
YEAR	Yes	yes	yes
IND	Yes	yes	yes
N	2424	1214	1210
Adj. R-Squared	0.0743	0.108	0.337
F-statistic	21.177, p< 2.22e-16	6.572, p < 2.2e-16	18.09, p< 2.22e-16
Hausman Test	29.594, p=0.041		

The Pooled OLS regression result represent in table model (2) and (3), result shows that when sample split on the base on HHI into low and high market competition both have negatively significant impact at the level of 1% and 5% with the coefficients -1.038, -0.233 respectively. However the interaction term between HHI and industry policy high competition coefficient (-0.0963) negatively and significantly impact on risk taking at the level 5%, but low competition remain negative but insignificant. The IP-hat have not significantly impact on risk taking. Other control variables like GROW, SIZE and Cash have negatively and significantly impact on risk taking, however, ROA and LEV have positive and significant impact on risk taking, it's indicates that financially stronger or more leveraged firms are more willing to undertake risky projects to enhance returns.

In the table 2 model (1) shows the primary analysis of full sample and the result driven by the Fixed Effects (FE) model. This study firstly applied Fixed-effects and Random effects model on full sample, and then using hausman test, the p value of hausman test is 0.041 less than 5%. In this result HHI (-0.047) shows not any significant effect on risk taking, the interaction term also shows insignificant impact which suggested changes in market competition do not meaningfully strengthen or weaken the impact of industrial policy on firms' risk-taking behavior. But IP-hat coefficient (-0.011) negatively and significantly impact on risk taking. However in the pooled OLS regression with cluster-robust standard errors, the coefficient of HHI and it's interaction term is significant, this difference arises because the FE model isolates within-firm variation over time and controls for unobserved firm-specific heterogeneity. This is why the impact of industry policy on risk taking becomes significant at the level of 5%. The insignificance of HHI in the FE model suggests that changes in market concentration within individual firms over time do not have a strong effect on their risk-taking, whereas the cross-sectional differences captured by pooled OLS show a significant relationship. Other control variables maintain similar significance and direction as pooled OLS regression analysis instead of age, in full sample age highly significant and positive impact on risk taking.

In order to confirm the validity of main findings, the robustness test was applied in two alternative techniques, first change the measure of earnings volatility. First, robustness according to 刘行 (2016), the volatility of profitability was measured using the three years rolling range between the maximum and minimum ROA of enterprises during the observation period. The two-way fixed-

effects regression results indicate that The market competition remain statically insignificant but it changes sign compared to primary analysis, similarly the interaction term between HHI and IP-hat also remain insignificant. However, the coefficient of industrial policy remains negative and statistically significant at level 10% and also other control variables remain their directions and significance. These findings align with the main results, demonstrating that the negative relationship between industrial policy and corporate risk-taking but there is no relationship with market competition.

Table 3. Relationship of market competition, industry policy and risk-taking

Risk-Taking			
Variable		Co-efficient	T-Value
	HHI	0.005	0.028
IP_hat		-0.022*	-1.540
HHI*IP		0.021	0.321
GROW		-0.020*	-1.933
ROA		0.179***	3.532
LEV		0.052***	5.020
SIZE		-0.074***	-6.293
LIQ		0.0009	0.246
CASH		-0.042	-1.081
YEAR	yes		
IND	yes		
N		2424	
Adj. R-Squared		-0.049	
F-statistic		13.655, $p < 2.22e-16$	
Hausman Test		154.84, $p < 2.22e-16$	

Second robustness test, the sample was divided based on time period (2010- 2015 and 2016-2021), the random effect model result shows that 2016-2021 IP-hat negatively significant. HHI and its interaction with Industry policy remain insignificant, however control variables also remain their direction and signs which this approach enhances the robustness of our primary analysis. Result of time period 2010-2015 shows market competition positively significantly effect risk taking, similarly it interaction with IP-hat shows significant but negatively impact on risk taking, which indicates low market completion firms more willing to take risk. However, the control variables remain their direction and significance as primary result.

Table 4. Relationship of market competition, industry policy and risk-taking

Risk-Taking			
Time Period			
Variables		2010-2015	2016-2021
	HHI	0.035*	0.007
		(1.932)	(0.159)
IP_hat		0.001	-0.023*
		(0.436)	(-1.940)
HHI*IP		-0.051**	0.002
		(-2.345)	(-0.347)
GROW		-0.002	-0.0006
		(-0.730)	(0.470)
ROA		0.035**	0.063 ***
		(2.299)	(2.602)
LEV		0.031***	0.019***
		(4.992)	(5.415)
SIZE		-0.003**	-0.003*
		(-2.316)	(-1.897)
LIQ		0.002**	-0.0001
		(2.222)	(-0.080)
CASH		-0.009	-0.063**
		(-0.849)	(-3.180)
AGE		-0.0002**	0.0006***
		(-2.034)	(2.993)
Constant		0.071***	0.102***

	(3.414)	(2.920)
YEAR	yes	yes
IND	yes	yes
N	1212	1212
Adj. R-Squared	0.041	0.066
F-statistic	53.592, p= 5.7776e-08	81.9283, p=2.1005e-13

### Conclusion

This study empirically investigate the relationship between industry policy, market completion and risk taking as dependent variable (Risk-taking) and independent variable (IP-Hat), market competition (HHI) and their interaction with different firms specific control variables. The analysis is based on a sample of 202 non-financial firms from 2010 to 2021. For identify the individual impact of both market competition and industry policy on risk taking through panel regression model under both Fixed effect model and Random effect model from a static perspective.

This study finds that industrial policy, as measured by the IP-hat variable, has a clear and significant negative effect on corporate risk-taking among Pakistani firms. Firms benefited by such policies tend to take more safe strategies. The protection industry received from the government made firms more cautious, refraining from taking steps to take risks in order to stay competitive or innovative. The relationship between market competition, measured by HHI, and risk-taking is relatively more complex and depends largely on the approach towards the analysis. It suggested that both highly and low competitive markets significantly deter risk-taking behavior, as the theory of industrial organization would have predicted. However, this relation vanished in the FE model as HHI became statistically insignificant. This significant variation implies that the observed impact due to competition is not because of temporal changes within enterprises; instead, it is a cross-sectional fact based on time-invariant intrinsic features of the firms performing under various market configurations. In other words, even if the OLS model evidences that market competition affects risk-taking behavior, the FE model makes it clear that it is the preexisting nature and position of a firm in the market that drives this relationship. However, the impact of industrial policy on the reduction of corporate risk-taking has shown no consistent and significant interaction with market competition. This shows that the effect of industrial policy is basically not at all influenced by market competition. Summing up, for Pakistani firms, while industrial policy is a clear disincentive to take risks, the role of market competition is more about for which firms operate in which markets rather than about any impact of competitive changes on firm behavior.

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