

A Study of the Chinese Toy Market: Does an Oligopsony Structure Force Manufacturers to Cut Costs?

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Abstract

The growing incidence of product safety complaints pertaining to imported goods from China has been one of the most widely covered phenomena in 2007. China's reputation as the factory of the world suffered immensely, a result of product recalls ranging from poisoned dog food to children's toys saturated with lead. The Chinese government, as a result, attempted to repair their image as a producer of safe exports. These efforts culminated in the nationwide crackdown on the production of substandard goods and the arrest of 774 people on October 29, 2007 [1]. Pressures in the United States did not cease, however, with influential politicians, including 2008 presidential hopeful Barack Obama, continuing to call for a ban on all Chinese-made toys [2].¹ Are increased regulation and protectionist measures necessary to maximize social welfare? We seek to study possible reasons for these seemingly sudden safety deficiencies, and hope to ascertain an optimal remedy. This study examines whether market power held by importing firms forces their respective Chinese contracting firms to undertake cost-cutting measures, whether such a market structure exists in the Chinese toy market, and a brief overview of possible economic justifications for Chinese firms to use hazardous materials in their production process in order to cut costs.

¹It is not our intention to single out Senator Obama; his specific mention reflects the breadth and importance the "China issue" has become in the United States, as opposed to a personal commentary.

1 Introduction

China's reputation as an exporter of safe products has been rendered nonexistent amid a sea of product recalls and intense media scrutiny. In 2007 the U.S. Consumer Product Safety Commission's China Program Plan stated that "on average about two-thirds of all U.S. product recalls are of imported products, and the large majority of those products are manufactured in China," while the European Union, similarly, reported approximately 48 percent of its dangerous product recalls in 2007 to be Chinese [3]. 57 percent of American consumers, furthermore, stated themselves "not too confident" or "not at all confident" in the safety of products made in China when polled [3]. The damage to China's reputation is therefore well documented. Close analysis of the impetus behind China's apparent incapability to produce safe goods, however, has not been quite as robust. It is our hypothesis that market power held by firms that import Chinese-made toys forces their respective contracting Chinese firms to cut costs. These cost-cutting measures may entail negative externalities that are thrust upon an unknowing consumer, such as the use of hazardous materials epitomized by the infamous lead paint of the Mattel recalls.

In Section 2 we illustrate background information about the structure of the Chinese toy market, the pressures Chinese firms are under to cut costs, and how hazardous materials such as lead paint are appealing to firms in such a situation. Section 3 describes the consequences of the monopsony market structure and why this leads Chinese firms to cut costs. Section 4 describes the economic theory that forms the basis of our econometric study as to whether it is possible importing firms in the U.S. hold market power in the Chinese toy market. Section 5 illustrates the results of the empirical analysis. Section 6 briefly reviews some possible economic justifications for Chinese firms to use hazardous materials in their production process in order to cut costs. Section 7 shows the framework for determining a theoretical socially optimal quantity of toys, possible remedies for the market failure, and concludes.

2 Background

2.1 Outsourcing Structure

Throughout the last decade China has slowly evolved into the factory of the world, as many large corporations outsource their production in an effort to cut costs through the cheaper capital and labor alternatives that China provides. Mattel for example, closed its last U.S. factory in 2002, and now produces approximately 65 percent of its products in China, or as a Mattel executive carefully rephrased it, "more than a third of Mattel toys are made outside of China" [4].

The outsourcing model that importing firms use, however, provides little transparency and engenders the information asymmetry that allows Chinese firms to use hazardous materials such as lead paint in their production process. Sometimes Chinese firms are chosen for their ability to "cope with capricious and corrupt local officials," as opposed to their efficiency [5]. Many American firms, furthermore, have long-term relationships with certain Chinese contractors, sometimes spanning decades, that result in lax inspection by the importing firms [4]. The suppliers in the Mattel recalls, Lee Der Industrial and The Early Light Industrial Company, for example, had worked with Mattel for 15 and 20 years respectively [4]. Such relationships lull U.S. firms into a false sense of security and moral hazard where they stop taking necessary precautions to ensure compliance, such as surprise inspections of contracted Chinese firms, believing China to be a stable and safe environment for production. As Mr. Stoelting of RC2 toys admitted, "We took some things for granted" [6].

While this should not be construed as an indictment of all Chinese producing firms, the sheer volume and intense competitive nature of exporting markets in China ensures that certain firms will cut costs however they can if it is possible. This is a result of the lax enforcement of regulations in China, as well as a number of firms competing for precious contracts from U.S. firms. Mattel has over 1,000 licensees who can produce goods based on its brands [7]. These same licensees operate about 3,000 factories in China [7]. Some estimates go as high as to place the total number of toy factories in China, many of them small operations, at 10,000 [7].

Many Chinese firms contracted by U.S. firms, furthermore, also continue to subcontract their production to other Chinese firms, who then continue to subcontract their production to even more Chinese firms. These

secondary and tertiary subcontracted firms are often faceless and unknown to the importing U.S. firms. Such a process makes it difficult for importing U.S. firms to properly monitor the goods they are purchasing even if they were willing to put forward the effort to do so. Some of Mattel's most trusted vendors, as was demonstrated in its toy recalls, have subcontracted to cheaper paint suppliers outside the company's approved list [4]. Even though Mattel had vetted the contractors involved in its toy recalls, the process of further subcontracting meant that "a number of companies whose factories Mattel had never visited may have had a hand in making the toys that were shipped around the world" [4]. Even if large companies are informed and compliant of safety regulations, their respective subcontractors may not be. It is this flaw that has caused Mattel to start enforcing a rule that "subcontractors cannot hire two and three layers of suppliers below them" [4].

The market structure in China is also heavily weighted in favor of importing U.S. firms, a result of the intensely competitive marketplace. K.K. Choy of Wealthwise Industrial Ltd., a large Mattel contractor, illustrates the market power Mattel holds, as Mattel is capable of giving "Wealthwise a steady diet of work producing all manner of Elmo, Dora and other toys, ...[but] also remains careful to channel some business to smaller firms to keep them in the game" [6]. Such behavior, where U.S. companies are able to purposefully preserve the kind of competition that drives down prices, theoretically should not exist in a perfectly competitive market. Foreign firms are also known to exploit the Chinese exporting market's chronic overcapacity by "shopping door-to-door for vendors who will do whatever it takes to win business" [6]. It is this sort of market structure that would cause firms to seek to cut costs. As Mattel's executive vice president of worldwide operations Thomas Debrowski conceded, "Youve seen labor prices more than double, raw material prices double or triple, and I think that theres a lot of pressure on guys that are working at the margin to try to save money" [4]. Many Chinese business executives complain of the pressures Western companies place on suppliers to lower costs, which, coupled with poor regulation, often encourages desperate or greedy firms to cut costs however they can [7]. As Mr. Gu, a factory owner in the Shenzhen province, asserts of the infamous price slasher Wal-mart: "Do you want to kill yourself? Then do business with Wal-Mart" [6].

2.2 Use of Hazardous Inputs

Does the market structure in China cause Chinese firms to cut costs, and would using hazardous materials such as lead paint assist them in that endeavor? We will define a *hazardous input* as an input used by a Chinese firm in its production process that is hazardous to the consumers of its product. An example would be lead paint.

Rising costs in China have been well documented. Whereas for the past decade China enjoyed unparalleled minimums in labor and capital costs, the advent of other Asian nations imitating the China outsourcing strategy has provided competition. Domestic conditions, moreover, have contributed to China's weakening worldwide competitiveness, a result of more expensive land and labor, China's willingness to allow the value of the yuan float, as well as a stagnant domestic market [8]. The manager of a plastic bag factory in the province of Dongguan, for example, cited a 30 percent rise in wages over the past three years, while inputs such as ABS plastic, a basic raw material in model cars, has more than doubled, while nickel, the key ingredient in batteries, has increased from around 16,000 U.S. dollars a ton to almost 47,000 dollars a ton [6]. These rising prices are also a result of China's exponential economic growth over the past decade, as more and more manufacturers enter the market.

Use of hazardous inputs such as lead paint can help Chinese firms cut their costs. A sales manager at Big Tree Toys, a company in the Shantou province, admitted that "leaded paint was about 30 percent cheaper than paint without lead," while other estimates even put the price of paint with higher levels of lead at a third of the cost of paint with low levels [7]. Lead paint is bright, durable, flexible, fast-drying, anti-corrosive, and cheap [9]. Lead chromates can enhance a yellow or orange hue, paint manufacturers add lead to make paint stick better instead of flaking off, and lead paint even resists mildew [9]. China also produces enormous quantities of lead paint, since coloring agents like lead chromate are cheaper than organic pigments, which means the price of lead paint in China is generally far lower than paint with low levels of lead [9]. As the Environmental Protection Agency in the United States warns, however, lead paint is also known to cause behavioral problems and learning disabilities in children, and in worst cases, seizures and death [10].

Enforcement of safety regulations is generally not as strict in China relative to the United States. One observer compared the situation to the

Soviet Union during the cold war, which had "very high standards on the books, but never enforced them" [7]. A study of the lead content of paint used in production by Chinese firms found that in some 26 percent of the cases the paint did not meet either American or Chinese standards [7]. As a Mr. Tao of the Chenghai Guangxin Plastic Toys Factory in the Shantou Province confided, "Factories can pick whatever paint they want...there are simply too many small obscure factories to patrol...no one really enforces [safety regulations]" [7]. Given the extreme pressures of doing business with U.S. firms, lax enforcement standards in China, as well as the numerous and wonderful attributes of lead paint², it is of great curiosity why the product recalls of 2007 have not been a more common occurrence.

3 Monopsony Consequences

In this section we review the economic theory that supplies the stimulus for our assertion that an oligopsony market forces toy-producing firms in China to cut costs.

3.1 The Monopsony Market Structure

An *oligopsony* market is a market consisting of a small number of firms that can purchase from many sellers. We are curious as to whether this definition applies to the Chinese toy market. A *monopsony* market is a market consisting of a single buyer that can purchase from many sellers. As a means of simplifying our analysis of the Chinese toy market, we will use this monopsony construct as the crux for our economic theory. A quick recap of the monopsony market structure: let us assume that the toy market in the U.S. is perfectly competitive, and therefore our monopsony firm takes the market price as given. Let us also assume that this firm's production function for the quantities of this output depends on a specialized input, the market for which we believe the firm holds market power in, as well as a vector of other non-specialized inputs, or $f(x_t, \vec{x})$.

Let us now look at Figure A (page 7). The indices given are the price of toys imported from China, w_t , and the quantity of toys imported from China, q_t , on the y and x axes respectively. Our monopsony firm's total

²The author is in no way condoning the ingestion, use, or abuse of lead paint.

revenue is the price it receives in its perfectly competitive output market, multiplied by the firm's total output, or $p \cdot f(x_t, \vec{x})$. The additional revenue that this firm receives when it employs an additional unit of its specialized input, in our case the toys it imports from China as a result of outsourcing, is therefore $p \cdot \frac{\delta f(x_t, \vec{x})}{\delta x_t}$, or the marginal revenue product of toy imports, MRP_t . This is the change in quantity produced by the monopsony firm over the change in toy imports supplied ceteris paribus, multiplied by the price, which is what we obtain if we take the partial derivative of the firm's total revenue with respect to the quantity of toy imports. This can also be seen as the demand for toys.

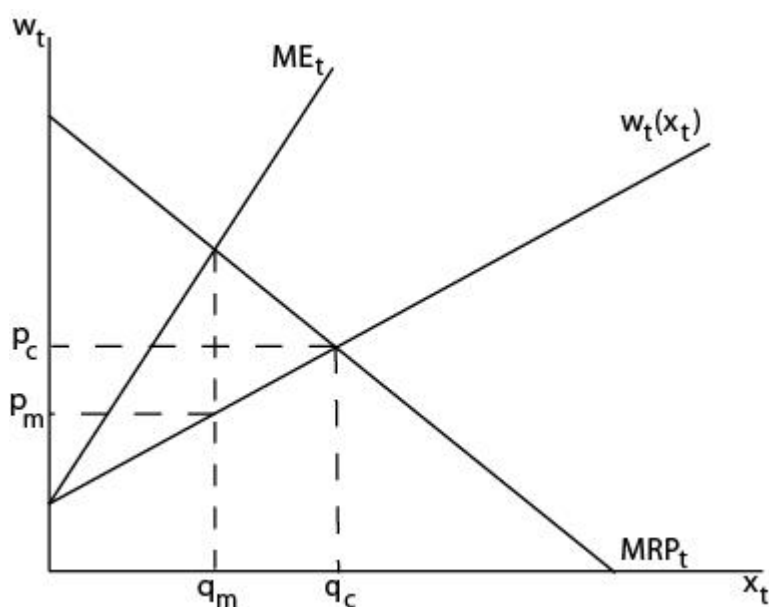


Figure A: Profit Maximization by a Monopsonist

Assuming our firm holds market power in the specialized input market, the supply of toys is described by the upward sloping toy supply curve $w_t(x_t)$. This curve tells us the price that is necessary to induce a given quantity of the specialized input to be offered in the market, and is the marginal cost of toys to a typical Chinese firm. The implication of an upward sloping supply curve is also that the monopsony firm must pay a higher price when it wants to purchase more specialized inputs.

A firm's total costs are therefore the price of the specialized input multiplied by the quantity bought of the input, plus a price vector of all non-

specialized inputs multiplied by a quantity vector of all other non-specialized inputs. This can also be written as

$$TC = w_t x_t + \vec{w} \vec{x}. \quad (1)$$

The marginal expenditure on toys ME_t equals the marginal cost of toys to the monopsony firm, which is the change in the monopsony firm's total cost over the change in toy imports supplied *ceteris paribus*. This is equal to the price paid for the specialized input, plus the change in the price of the specialized input over the change in the quantity of the input supplied multiplied by the quantity of the input supplied. The marginal expenditure on toy imports can therefore be thought of as the partial derivative of the monopsony firm's total cost function (1) with respect to the quantity of toys imported.

$$\begin{aligned} \frac{\delta TC}{\delta x_t} &= \frac{w_t \delta x_t + x_t \delta w_t}{\delta x_t} \\ &= w_t + \frac{x_t \delta w_t}{\delta x_t}. \end{aligned} \quad (2)$$

We also see in Figure A (page 7) that whereas in a competitive market the supply equals the demand and a total of q_c toys is produced at a price p_c , in a monopsony environment the monopsony firm will purchase toys at p_m and q_m . It is important to note that although the monopsony firm now consumes q_m quantity of toys, it pays a price p_m as dictated by the supply of toys $w_t(x_t)$, not the marginal expenditure on toys. The monopsony price and quantity are given when marginal revenue product equals marginal expenditures, which is the profit-maximizing condition we obtain if we take our profit equation and find the partial derivative with respect to the quantity of toys imported. Our profit-maximizing equation is obtained by subtracting total costs from total revenue and setting it equal to zero.

$$\Pi = p \cdot f(x_t, \vec{x}) - w_t x_t - \vec{w} \vec{x} = 0 \quad (3)$$

Taking partial derivatives with respect to the quantity vector of non-specialized inputs and the quantity of toys allows us to obtain our first order conditions of

$$p \cdot \frac{\delta f(\dots)}{\delta \vec{x}} = \vec{w} \quad (4)$$

and

$$\begin{aligned} p \cdot \frac{\delta f(\dots)}{\delta x_t} &= \frac{w_t \delta x_t + x_t \delta w_t}{\delta x_t} \\ &= w_t + \frac{x_t \delta w_t}{\delta x_t} \end{aligned} \tag{5}$$

respectively. We obtain a perfectly competitive result for non-specialized inputs, as we assume the firm is a price taker in other markets, and therefore inputs are employed until the value of the marginal product of the input equals the market price. For our specialized input, however, we see that inputs are employed until the value of the marginal product of the input equals the marginal expenditure of the input, or $MRP_t = ME_t$. The profit-maximizing condition for a monopsonist in the toy market can therefore also be thought of as the partial derivative of the monopsony firm's profit function with respect to the quantity of toys imported.

3.2 Cutting Costs

We theorize that the recent rash of unsafe products is a result of the pressures on Chinese firms to cut costs. Such pressures are due to the market power large U.S. firms hold in the Chinese toy market, creating an intensely competitive atmosphere for Chinese firms. If the Chinese toy market is indeed an oligopsony market, U.S. firms may be able to dictate the prices they pay for toys to some extent. A visual inspection of Figure B (page 10) shows that input-producing toy firms must cut costs in a monopsony environment.

On the left side we have the monopsony model we are familiar with. On the right side, however, we see the cost curves for a typical Chinese firm, and its indices remain the price and quantity of toys. In a competitive market it produces a quantity of q_1 at a price of p_c , where $q_1 \cdot n = q_c \cdot n$ being the number of total firms in the Chinese toy market. Given the decrease in price as per a monopsony market structure, Chinese toy-producing firms must lower their short run average total costs if they are to produce at the monopsony price and quantity p_m and q_2 respectively. The question that remains is therefore whether this necessity to cut costs translates into the use of hazardous inputs in the Chinese firm's production process, such as the use of lead paint. Standard microeconomic theory would postulate that a given Chinese firm would decrease its plant size and change its

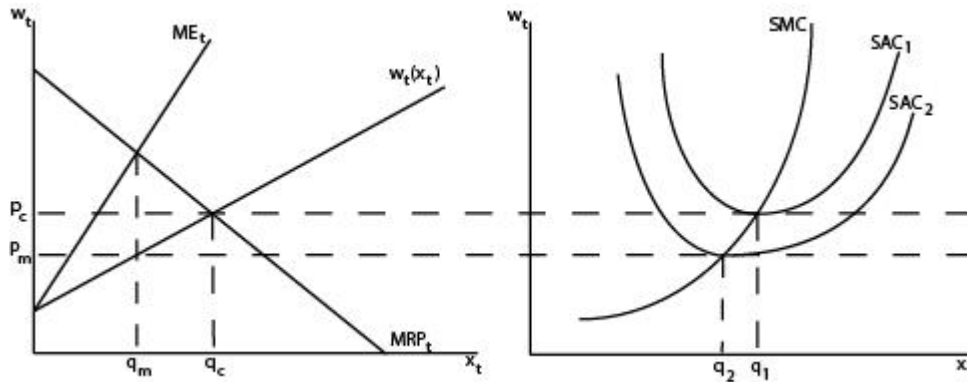


Figure B: Cutting Costs

proportion of inputs accordingly. We will review possible justifications for using hazardous inputs in section 6.

4 Empirical Theory

In this section we delineate the empirical theory that forms the basis of our econometric analysis as to whether it is possible that importing firms hold market power in the Chinese toy market.

4.1 Literature Review

The basis of our econometric study is the profit-maximizing condition for a monopsonist. There have been numerous studies that empirically test for monopsony/monopoly or oligopsony/oligopoly power. Most are based on a technique developed by Appelbaum (1982) which tested for monopoly power assuming fixed proportions technology [11]. Most empirical studies also pertain to agricultural industries. Azzam and Pagoulatos (1990), as well as Muth and Wohlgenant (1999), all tested for oligopsony power in the beef packing industry [12] [13]. Quagraine, Unterschultz, Veeman, and Jeffrey (2003) test market power in the Canadian cattle and hogs market, while Crespi, Gao, and Peterson (2005) test for oligopsony behavior in the rice milling industry [14] [15]. Finally, both Murray (1995) and Bergman (1995) measure oligopsony behavior in the U.S. and Swedish pulp and paper industry, respectively [16] [17]. The common denomina-

tor in all these studies is the use of the basic monopsony model to build an econometric modeling technique.

4.2 Inverse Elasticity Pricing Rule

We recall that the profit-maximizing condition for a monopsonist is obtained by setting the profit equation for our monopsony firm to zero, as seen in equation (3), and that this gives us the first order conditions shown in equations (4) and (5) respectively. Doing this provides two benefits. First, we have now obtained a general form of the first order condition that allows for imperfect competition,

$$w_t + \theta x_t \frac{w_t}{\delta x_t} = p \cdot \frac{f(\dots)}{\delta x_t}, \quad (6)$$

as seen in Muth [13], where θ is a parameter that indexes the degree of market power. If the market is perfectly competitive, θ equals zero, and the first order condition reduces to equation (4). If the market is monopsonistic, then θ equals one, and the marginal expenditure of toy imports equals the marginal revenue product of toy imports.

By rearranging the first order condition for our specialized input, furthermore, we can obtain

$$\begin{aligned} p \cdot \frac{\delta f(\dots)}{\delta x_t} &= w_t \left(1 + \frac{\delta w_t}{\delta x_t} \left(\frac{x_t}{w_t} \right) \right) \\ &= w_t \left(1 + \frac{1}{E} \right), \end{aligned} \quad (7)$$

as seen in Murray [16], where E equals $\frac{\delta x_t}{\delta w_t} \left(\frac{w_t}{x_t} \right)$. This is the percentage change in the quantity of the specialized input supplied per a percent change in the price of the specialized input, which is to say E equals the price elasticity of our specialized input supply, or imported toy supply. Manipulating the equation further will give us

$$\frac{MRP_t - w_t}{w_t} = \frac{1}{\epsilon_{x_t, w_t}}. \quad (8)$$

This is what Besanko and Braeutigam term the inverse elasticity pricing rule [18]. This will form the basis of our econometric study, as this condition tells us that the percentage deviation between the marginal revenue

product of toy imports and the price of toy imports is equal to the inverse of the elasticity of the imported toy supply. While in a perfectly competitive market each firm takes the price of inputs as given, thus maximizing their profits by choosing a quantity of the input that equates the price of the input to the marginal revenue product of that input, in our monopsony market a firm will pay a price less than the marginal revenue product.

4.3 Further Literature Review

All the studies previously mentioned follow the economic process in 4.2 to some degree, with a few caveats concerning notation and terminology. Due to differing data limitations, however, each study approaches the specification of their econometric model somewhat differently. Bergman attempts to estimate the supply elasticity simultaneously with the rest of his model as opposed to comparing his results with prior information on the supply and demand elasticities of the pulp and paper industry [17]. Azzam and Pagoulatos use a production-function approach which "allows all inputs to be used in variable proportions and allows the derivation of market specific conjectural elasticities" [12]. Quagraine, Unterschultz, Veeman, and Jeffrey assume a translog profit function and apply Hotelling's lemma to obtain supply equations [14]. Murray estimates a variable profit function system in order to infer a factor's value of marginal product through its shadow price [16]. Crespi, Gao, and Peterson assume Hicks-neutral production in order to avoid "specifying explicit functional forms for the input supply equations" and conserve degrees of freedom [15]. Finally, Muth and Wohlgenant use an application of the envelope theorem to derive a perceived demand function and an input supply equation in a model that only requires two structural equations [13]. We hope to emulate portions of this last model.

4.4 Deriving the Regression

Let us return to our profit-maximizing equation (3). We can rewrite our equation, apply the envelope theorem similar to Muth and Wohlgenant, such that the optimal quantities of non-specialized inputs are conditional on the level of our specialized input, the imports of toys [13]. Assuming that there are only two non-specialized inputs, labor and capital, we

rewrite our profit-maximizing equation (3) as

$$\Pi = p \cdot f(x_t, x_L^*, x_K^*) - w_t x_t - w_L x_L^* - w_K x_K^*, \quad (9)$$

such that labor and capital are optimal quantities conditional on the level of our specialized input. This is to say that labor and capital are a function of the quantity of our specialized input, the price of labor, the price of capital, and the price of our monopsony firm's output, or $x_L(x_t, w_L, w_K, p)$ and $x_K(x_t, w_L, w_K, p)$ respectively. If we now take the partial of our profit-maximizing equation (9) with respect to the quantity of our specialized input, applying the chain rule, we obtain

$$\begin{aligned} \frac{\delta \Pi}{\delta x_t} &= p \frac{\delta f(x_t, x_L^*, x_K^*)}{\delta x_t} + p \frac{\delta f(\dots)}{\delta x_L^*} \frac{\delta x_L^*}{\delta x_t} + p \frac{\delta f(\dots)}{\delta x_K^*} \frac{\delta x_K^*}{\delta x_t} \\ &\quad - x_t \frac{\delta w_t}{\delta x_t} - w_t - w_L \frac{\delta x_L^*}{\delta x_t} - w_K \frac{\delta x_K^*}{\delta x_t} = 0, \end{aligned} \quad (10)$$

which also equals

$$\begin{aligned} w_t + x_t \frac{\delta w_t}{\delta x_t} &= p \frac{\delta f(x_t, x_L^*, x_K^*)}{\delta x_t} + \left(p \frac{\delta f(\dots)}{\delta x_L^*} - w_L \right) \frac{\delta x_L^*}{\delta x_t} \\ &\quad + \left(p \frac{\delta f(\dots)}{\delta x_K^*} \right) \frac{\delta x_K^*}{\delta x_t}. \end{aligned} \quad (11)$$

Let us now assume that our monopsony firm does not hold market power in its non-specialized input markets, and that labor and capital are function of the quantity of our specialized input, the price of labor, the price of capital, and the price of our monopsony firm's output, or $x_L(x_t, w_L, w_K, p)$ and $x_K(x_t, w_L, w_K, p)$ respectively. We can therefore reduce equation (11) to

$$w_t = -x_t \frac{\delta w_t}{\delta x_t} + p \frac{\delta f(x_t, x_L(x_t, w_L, w_K, p), x_K(x_t, w_L, w_K, p))}{\delta x_t}. \quad (12)$$

The envelope theorem allows us to differentiate our profit function with respect to the quantity of our specialized input holding our non-specialized inputs at their optimally efficient levels, given that the monopsony firm is a price taker in those non-specialized input markets. Since the optimal quantities of labor and capital do not depend on our specialized input,

the last two terms drop out, leaving us with equation (12). Then following Muth [13] we are able to identify the degree of market power with a reduced-form value marginal product specification, which allows us to insert a linear reduced-form value marginal product to obtain

$$w_t = -x_t \frac{\delta w_t}{\delta x_t} + \beta_1 x_t + \beta_2 x_L + \beta_3 x_K + \beta_4 p. \quad (13)$$

5 Empirical Analysis

In the following section we review our econometric process and the findings that we obtained.

5.1 Preparation

The specific firm we study is Mattel, due to its prominent role in the events that transpired. From Mattel’s quarterly SEC filings we obtain labor expenditures, classified as the aggregate of advertising, promotion, selling, and administrative expenses; capital expenditures, classified as quarterly purchases of property, plant and equipment; Mattel’s quarterly expenditures on inputs to manufacture its toys; and Mattel’s inventory stock at the beginning of each quarter. From the Bureau of Labor statistics we obtain a BEA end use import price index, harmonized price index, harmonized system import price indices with and without tariffs, as well as the producer price index for domestic toy prices.

Since the theoretical relationship between some of our variables might have a constant elasticity, but not a constant slope, we will use a semi-log model. A one unit increase in the BEA, harmonized with tariffs, harmonized without tariffs, or producer price indices, is equal to a one percent increase in prices, leading us not to transform those indices with the natural logarithm. After transforming the rest, our equation looks like

$$\begin{aligned} BEAindex = c + \beta_1 \log(revenues) + \beta_2 \log(labor) \\ + \beta_3 \log(capital) + \beta_4 (producerpriceindex), \end{aligned} \quad (14)$$

where the producer price index is used as a proxy variable for domestic toy prices, the price Mattel receives for its output, $\log(revenues)$ is used as

a proxy variable for the supply of imported toys, and the BEA index is used as the proxy variable for the price of imported toys from China. We also take the natural logarithm of labor and capital. We postulate that the output of our specialized input is endogenously determined and therefore correlated with the residuals. We therefore use a two stage least squares model with the harmonized system import index with and without tariffs, domestic toy prices, the natural logarithm of Mattel inventories at the beginning of each quarter, the natural logarithm of Mattel's expenditures on inputs to manufacture toys, the natural logarithm of capital, the natural logarithm of labor and the natural logarithm of a trend variable as our instrument list. This way we might eliminate possible simultaneity. The supply of our specialized input is dependent upon domestic toy prices, Mattel's existing inventories, and the inputs Mattel uses to manufacture toys, as well as capital, labor, and the prices of imported toys. We need such a model since more than one dependent variable, specifically the price and quantity of imported toys, is being determined at the same time. If we do not use more than one equation our ordinary least squares estimates will be biased. Since quarterly data is skewed toward the holiday season, where Mattel's expenditures and revenues are both consistently higher, we also weigh our regression over $\log(revenues)$ in an attempt to minimize heteroskedasticity.

5.2 Results

All our econometric analysis used the statistical program EViews. Our original results are given in the appendix as Table I. We conclude that $\log(revenues)$, $\log(capital)$, and $domtoyprices$ are all statistically significant at a 5 percent significance level, which is consistent with our critical t-value for a one-sided 5 percent level of significance, 1.708, as well as the p-values in our original results. $\log(labor)$, however, is not statistically significant, requiring at least a 12.76 percent significance level. Testing our f-statistic also confirms that at a 5 percent significance level at least one of our slope coefficients is statistically different from zero, given a critical value of 2.76.

Testing for multicollinearity by examining the correlation coefficients, given in Table II, shows that $\log(capital)$ and $\log(labor)$ might be a source of multicollinearity. In an attempt to remedy the problem, we regress $\log(labor)$ on all the remaining independent variables, seen in Table III,

as well as regressing $\log(\text{capital})$ on all the remaining independent variables, seen in Table IV. Measuring the variance inflation factor confirms that $\log(\text{labor})$ is a possible source of multicollinearity given its variance inflation factor of 5.88, greater than the benchmark of 4, while $\log(\text{capital})$ only has a variance inflation factor of 2.85. Since eliminating $\log(\text{labor})$ renders our model statistically useless, however, we will avoid multicollinearity paranoia and retain $\log(\text{labor})$ in our econometric model for the time being.

A test of the Durbin-Watson statistic is inconclusive, although just barely. Our Durbin-Watson statistic of 1.28 lies between our critical values of 1.14 and 1.74, and a visual inspection of the residuals given in Table V shows the same. Autocorrelation, therefore, possibly exists in our model, although the possibility does not seem overwhelmingly threatening.

We also test for heteroskedasticity using a White test, seen in Table VI. We find that heteroskedasticity is present since our observed r-squared is less than our critical chi-squared of 23.68. We therefore apply White's method in an attempt to obtain more accurate standard errors, and thus t-values.

This allows us to attain our final model, whose results are given in Table VII. We now see that $\log(\text{labor})$ is statistically significant at a 10 percent significance level, reflected in its t-statistic. We also construct confidence intervals for each slope coefficient, as seen in Figure C (page 16). Possible

$$\begin{aligned} -12.63 < \beta_1 < -2.41 \\ 0.878 < \beta_2 < 3.36 \\ 0.2236 < \beta_3 < 11.49 \\ -0.144 < \beta_4 < -0.079 \end{aligned}$$

Figure C: Slope Coefficients

problems with autocorrelation and multicollinearity within our model is most likely a result of the proxy variables that we chose due to lack of available data. The BEA price index, specifically, measures the price of all toy imports into the U.S., and not just China. Our r-squared of 0.76 tells us that although a good majority is explained by our existing independent variables, we are probably still missing some explanatory variables in our model.

The coefficient we are interested in is that of $\log(\text{revenues})$. This should tell us that for every percent increase in revenues, there is a 7.53 percent decrease in our BEA import price index, which should resemble a 7.53 percent decrease in prices. If we look back at equation (8), this is identical to the inverse of our elasticity of toy imports supply. We therefore conclude that Mattel holds some form of market power in its specialized input, toy imports, since there is a 7.53 percent deviation between the marginal revenue product of toy imports and the price of toy imports.

6 Implications

Even if importing firms hold some form of market power in the Chinese toy market, does this necessarily force their respective contracting Chinese firms to use hazardous inputs such as lead paint? In this section we scratch the surface of some possible economic justifications as examples for future study.

6.1 Survival

It is our theory that although they may find the risks associated with using hazardous materials too great in a competitive environment, some firms may find such risks worth taking if they are faced with the decision of survival, when the price p_m of toys is below the minimum level of average variable cost, assuming all fixed costs are sunk. The intense competitive nature of the Chinese toy market forces firms to cut costs. This scenario is illustrated in Figure D (page 18).³ We see that at the given monopsony price of p_m the typical Chinese firm takes a loss in the short run equal to the shaded area, which can also be expressed as $\int_0^{q_m} (SAC_1(q_2) - SMC(q_2)) dx_t$.

The firm will continue to operate with a negative economic profit in the short run since it can still offset some of its loss when the firm's total revenue still exceeds its total variable cost. The firm will therefore not shut down until the monopsony price is lower than its shutdown price of p_s . If the firm believes this monopsony price will persist, however, it cannot stay in the market indefinitely, and will most likely reduce its plant size or

³The author expresses great appreciation to Henry Pan for his assistance with the graphical portion of this depiction.

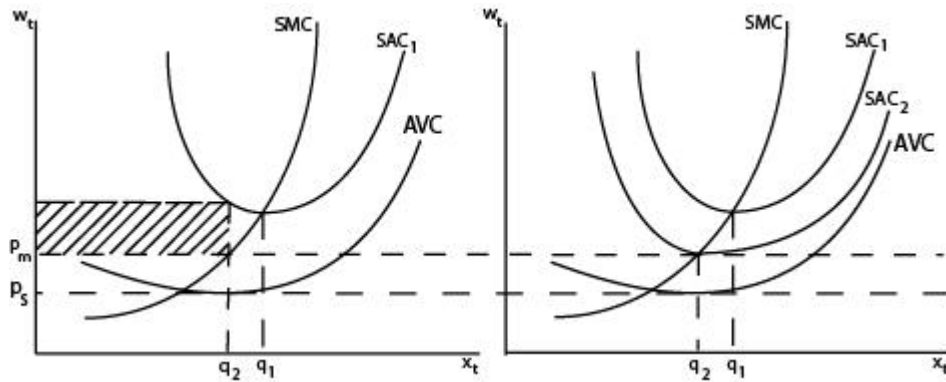


Figure D: Survival

possibly exit the market entirely. If possible, the firm would ideally like to lower its costs to SAC_2 such that it no longer operates at a loss.

6.2 Long Run Analysis

Let us recall that the profit-maximizing condition for a monopsonist dictates a monopsony price that would force a typical individual Chinese firm to lower its short run average total cost curve, as shown in Figure B. Let us also recall that a typical Chinese firm's shutdown price is defined by its average variable cost curve, as shown in Figure D (page 18). If the firm believes that a monopsony price lower than the shutdown price will persist, it will most likely reduce its plant size or possibly exit the market entirely. Figure E (page 19) illustrates a typical Chinese firm's long run average cost curve and long run marginal cost curve, where the long run average cost curve is the lower envelope of the short run average cost curves [18]. Firms may adjust their plant sizes and can even leave the industry altogether, which is also to say that a long run perfectly competitive equilibrium does not currently exist. Given a monopsony price p_m , furthermore, the firm must eventually leave the market since the price p_m is below the minimum of the long run average cost curve. With a long run marginal and average cost curve depicted in Figure E, the firm would earn negative profit regardless of any adjustments to the proportions of inputs it employs. If the firm is able to lower its long run marginal and average cost curves as in Figure F (page 20), however, then it will be able to shift its short run average cost curve to an equilibrium such that it is able to stay

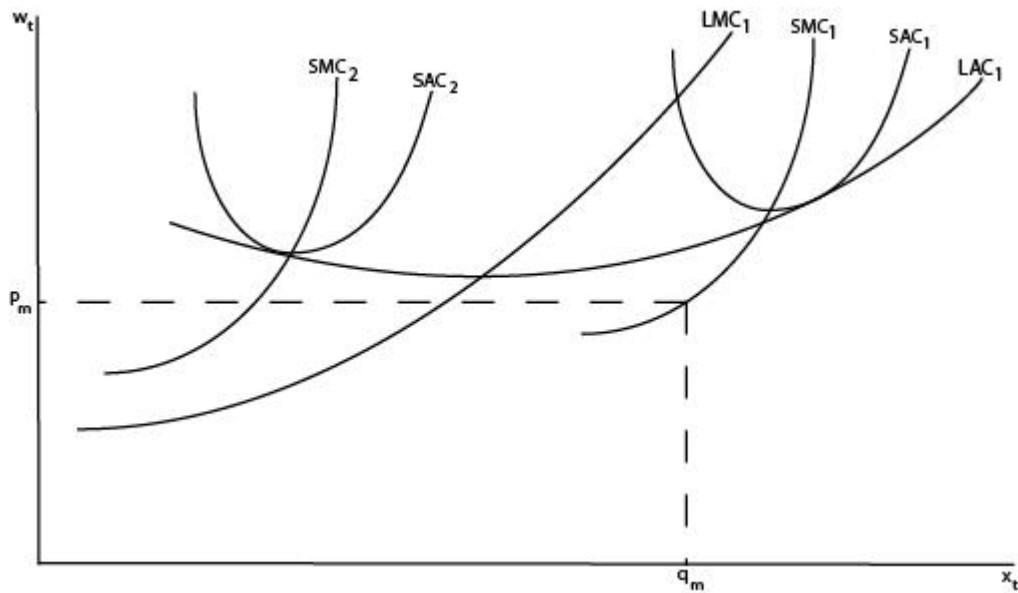


Figure E: Long Run Shutdown

in the industry, where the minimum of its average cost curve is equal to the given monopsony price.

It is important to note that the shift in these cost curves is consistent not with a change in the proportion of inputs as we would expect in the short run, but rather illustrates that the Chinese firm has managed to reduce its long run costs, possibly through technological advancement, or as we hypothesize, through the use of hazardous inputs.

6.3 Over-production Externality

We also note that the long run marginal cost curves given in Figures E and F represent the long run supply curves of the Chinese toy market, starting from the intersect of the long run marginal cost and long run average cost curves. If we analyze the shift of these supply curves we can observe the negative externality associated with over-production in Figure G (page 20).

Since the Chinese firm does not need to internalize the negative effects of using hazardous materials in its toys, its private marginal cost is equal to the shifted long run marginal cost curve, while the firm should have

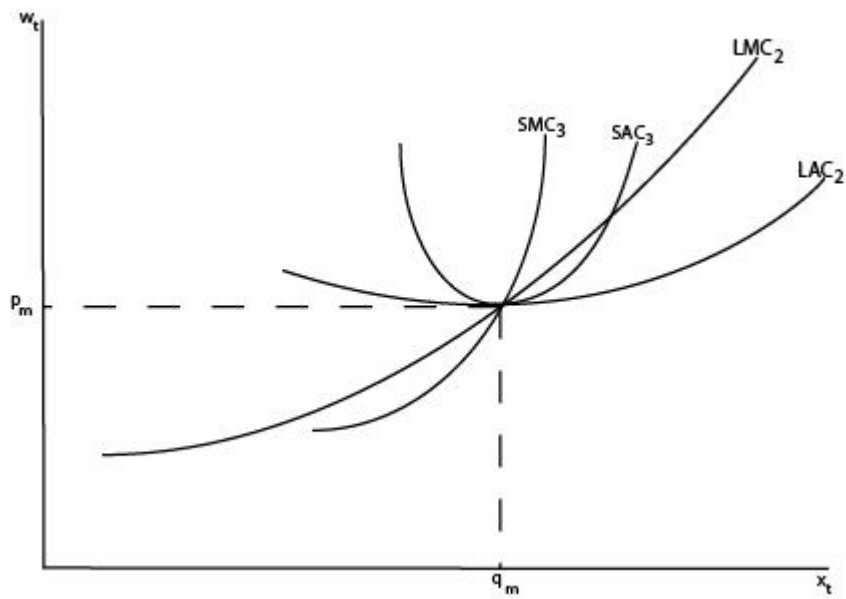


Figure F: Long Run Shift

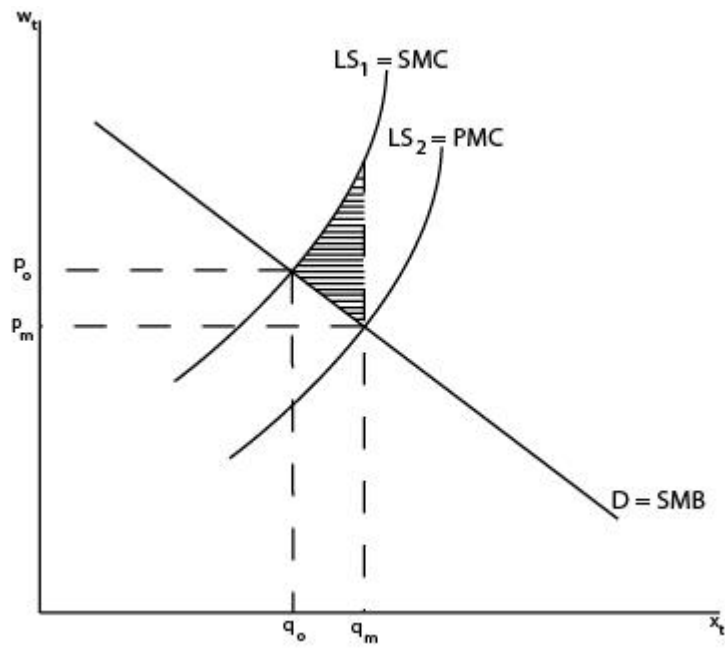


Figure G: Over-production Externality

exited the market and the long run supply curve should be LS_1 , which is equal to the social marginal cost. The social welfare loss is described as $\int_{q_0}^{q_m} (LS_1 - D) dx_t$.

6.4 Information Asymmetry

The other facet to the market failure in the toy industry pertains to asymmetric information, which causes a greater-than-optimal demand from consumers. If an importing firm such as Mattel was aware that toys it bought from Chinese firms might have product safety deficiencies, then it might presumably demand less since the marginal benefit it would receive from the toys would be less due to damages to its reputation when Mattel's consumers buy toys that are hazardous to their health. This argument holds true for the ordinary consumer as well. Figure H (page 21)

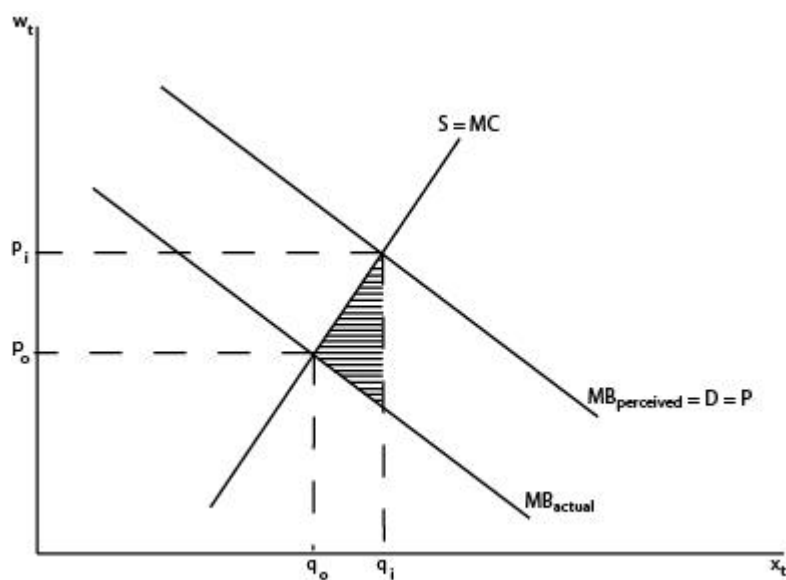


Figure H: Information Asymmetry

illustrates the fact that if consumers cannot accurately ascertain the actual marginal benefit of imported toys, they will demand a quantity of q_i at a price of p_i instead of the socially optimal quantity and price of q_o and p_o respectively. The deadweight loss due to this market failure can be characterized as $\int_{q_0}^{q_i} (MC - MC_{actual}) dx_t$. It is also this information asymmetry

that would allow Chinese firms to cut costs by using hazardous inputs, as if consumers had perfect information, they would demand a smaller quantity of toys and the equilibrium quantity of toys produced would also be smaller.

6.5 Game Theoretics

Would a Chinese firm be more inclined to risk using hazardous inputs in a monopsony environment as opposed to a perfectly competitive market? In an intensely competitive market such as China, competitive pressures alone may drive firms to "cheat" and use hazardous inputs. We examine a simplistic exercise with two firms.

In Figure J (page 22) we illustrate the decisions facing two firms regarding their expected costs in a perfectly competitive market. We delineate p the probability a firm believes it will be caught using hazardous inputs, and therefore $(1-p)$ is the probability the firm will escape detection. For simplicity's sake we assume the probability is the same for both firms. S is given as a given firm's sunk costs, also assumed to be the same for simplicity. In a perfectly competitive environment the use of hazardous inputs by one firm increases competitive pressures on other firms, and serves to push the equilibrium price down. We will ignore the prospect of economic rent.

	Firm 2 Uses Hazardous Inputs	Firm 2 Does Not Use Hazardous Inputs
Firm 1 Uses Hazardous Inputs	$(-S)p, (-S)p$	$(-S)p, p(S) - S$
Firm 1 Does Not Use Hazardous Inputs	$p(S) - S, (-S)p$	$\Rightarrow 0, 0 \Leftarrow$

Figure J: Competitive Decisions

Therefore if both firms use hazardous inputs the expected costs to either firm can be described as $EC = (-S)p + (0)(1 - p) = (-S)p$, or the probability that they are discovered, multiplied by their sunk costs, which they would forfeit from losing their contract or being shut down, plus the probability that they will escape detection, multiplied by their expected economic profit, which is zero. Their expected economic profit is zero since the pressures in a competitive market pushes the equilibrium price

lower and other firms are faced with the decision of matching these decreases or leaving the market. This is also to say the use of hazardous inputs by the firms increases competitive pressures and helps lower the equilibrium price.

If firm one uses hazardous inputs and firm two does not, then the expected cost of firm one remains the same. They would forfeit their sunk costs if discovered, and make zero economic profit if they evade detection. The expected costs of firm two, however, will depend on the probability that firm one is discovered, and can be described as $EC = (0)p + (-S)(1 - p) = p(S) - S$. If firm one is discovered firm two will not face increased competitive pressure and continue to produce and make an economic profit of zero. If firm two is not discovered, firm one will be driven from the market since they cannot keep pace with increased competitive pressure and lower equilibrium price. The reverse holds true if firm two uses hazardous inputs and firm one does not. If neither firm uses hazardous inputs then they both expect to make an economic profit of zero since neither will face increased competitive pressures or risks of using hazardous inputs.

Let us look at firm one (Figure J, page 22). If firm two uses hazardous inputs, firm one will face expected costs of either $(-S)p$ or $(S)p - S$. We recall that for simplicity we assume the probability of detection facing either firm is the same, and is p . Firm one's expected costs therefore depend on the probability of detection; for any value of p over 0.5 firm one should not use hazardous inputs, for any value of p over 0.5 firm one should use hazardous inputs, and if p equals 0.5 firm one is indifferent. The same holds true if we look at the situation from the perspective of firm two. If firm two does not use hazardous inputs, then firm two will also never use hazardous inputs because the best outcome for firm two if it does use hazardous inputs can only be zero, if the probability of detection is zero.

What is of importance is that the best outcome for either firm regardless is zero. If both firms use hazardous inputs and there is no probability of detection they will make zero economic profit. If firm one uses hazardous inputs and firm two does not, and the use of hazardous inputs will always be detected, firm one will take a loss of $-S$ and firm two will make zero economic profit. If the use of hazardous inputs is never detected, firm one will make zero economic profit and firm two will take a loss of $-S$. A *dominant strategy* is a strategy that is better regardless of the other player's decision. The dominant strategy for both firms in a perfectly competitive

market is therefore to never use hazardous inputs, and is delineated by arrows in Figure J (page 22).

	Firm 2 Uses Hazardous Inputs	Firm 2 Does Not Use Hazardous Inputs
Firm 1 Uses Hazardous Inputs	$\Rightarrow (-S)p, (-S)p \Leftarrow$	$(-S)p, -S$
Firm 1 Does Not Use Hazardous Inputs	$-S, (-S)p$	$-S, -S$

Figure K: Monopsony Decisions

Figure K (page 24) shows a similar situation but in a monopsony environment. The difference here is that if firm one uses hazardous inputs and firm two does not, then firm two has an expected cost of $EC = p(-S) + (1 - p)(-S) = p(-S) - S + p(S) = -S$. This is because regardless of whether or not firm one is discovered, firm two will always be driven out of the market if it does not use hazardous inputs since the monopsony market structure dictates a lower price. The dominant strategy for either firm in a monopsony market, therefore, is to always use hazardous inputs since even if a firm faces a probability equal to one, where they are always caught, this is still only equal to the costs they face regardless if they do not use hazardous inputs, or $-S$. This is shown in Figure K (page 24) with arrows.

7 Conclusion

We hope to illustrate some possible remedies for the oligopsony market failure and summarize our findings.

7.1 Optimal Market Outcome

Figure L (page 25) illustrates an optimal outcome taking into account the costs of prevention. The indices are given as the price of prevention w_p and the quantity of prevention x_p , on the y and x axes respectively. The total cost of accidents due to unsafe toys is TC_a , or $p(x)(A)$, where $p(x)$ is the probability of incurring an accident as a function of the quantity of prevention, x , multiplied by the cost of the accident, A . The total cost of prevention is given as TC_p , or $w_p(x)$, where w_p is the price of prevention as

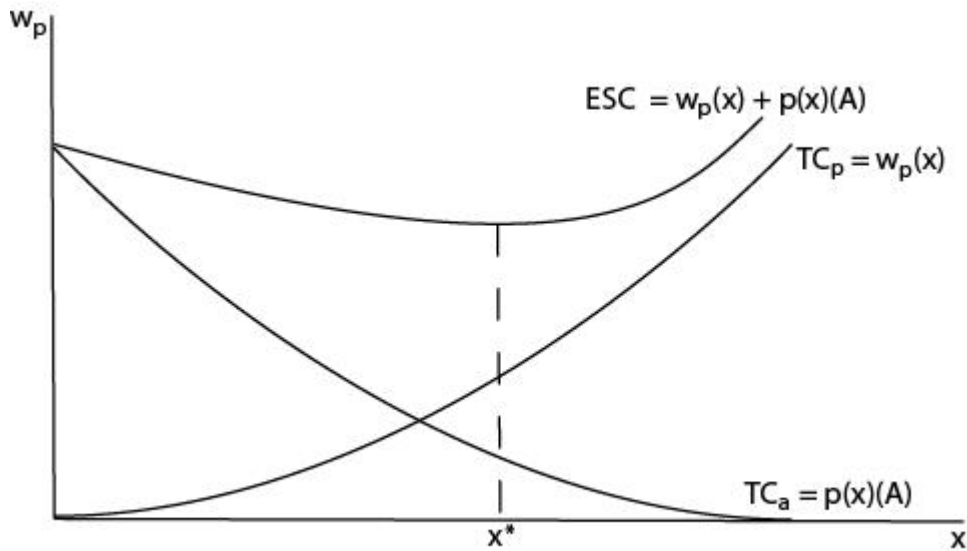


Figure L: Optimal Market Outcome

a function of the quantity of prevention x . This prevention might take the form of mandatory safety inspections implemented by the government, an importing firm's own efforts in paying closer attention to its contracting firms, or a Chinese firm's use of non-hazardous materials. We will address the question of which party might be able to offer prevention at the lowest cost in the following section. For now, we seek to find the optimal quantity of prevention, which we derive from our expected social cost function

$$ESC = p(x)(A) + w_p(x). \quad (15)$$

Our cost-minimizing condition is where the slope of our expected cost function equals zero, which can also be expressed as

$$\begin{aligned} \frac{dESC}{dx} &= \frac{dp(x)}{dx}(A) + \frac{dw_p}{dx} = 0 \\ \Rightarrow \frac{dp(x)}{dx}(A) &= \frac{-dw_p}{dx}. \end{aligned} \quad (16)$$

This quantity is given to us in Figure L (page 25) as x^* .

7.2 Possible Remedies

The market failure in the Chinese toy market stems from the structure of the market that gives importing firms such as Mattel power to dictate prices to its contracting Chinese firms. Given China's evolving economic liberalization, however, market constraints may not be the best course of action. There are no simple ways of reducing the market power importing U.S. firms have, and imposing price floors would hinder China's transition to a free market economy. Nor would market constraints in China necessarily internalize the issue of unsafe toys; there are many countries willing to cut costs and become the next "China." A better strategy would be to address the allegations that increased regulation or protectionist measures are necessary. Let us therefore discuss second-best alternatives.

Let us assume Mattel is held strictly liable for any and all damages. Given this standard, Mattel will choose the socially optimal quantity of prevention x^* as given in Figure L (page 25). This is because the expected social costs of unsafe toys now equal Mattel's expected private costs. This standard, however, is only efficient if there are no transactions costs, such as those associated with court fees, enforcement costs, and under the assumption that each individual that brings suit against Mattel receives perfect compensation such that they are indifferent to whether they are party to the accident ex post.

If Mattel suffers from information asymmetries, furthermore, a strict liability standard may not provide the correct amount of prevention if Mattel is incapable of ascertaining the exact amount of precaution taken by its contracting Chinese firms. The costs to Mattel would also generally be higher given this information asymmetry. We therefore posit that Chinese firms are in the best position to prevent accidents at the lowest cost, since they are fully aware of the costs and inputs they employ. One ideal course of action would be to hold Chinese firms strictly liable; this is not a practical solution, however, due to basic issues of sovereignty and politics.

Ex ante regulation could therefore provide a means, at a lower cost, for internalizing the production of unsafe toys. If bilateral precaution is not possible, due to lack of information on the part of consumers, and Chinese firms cannot be held liable, then the government could mandate safety inspections of imported toys. If a standard of care could be set at the socially optimal level of x^* , it would be the same as if we could hold Chinese firms strictly liable. It does not seem like a stretch to propose that the level of

precaution taken by the U.S. government currently might be lower than the social optimum. The U.S. Consumer Product Safety Commission, for example, currently only employs one full-time toy inspector, and fifteen port inspectors to monitor all imports arriving in America [19].

7.3 Conclusion

The reason we propose that the government regulate as opposed to the toy manufacturers is that the monopsony market failure extends beyond toys. It is this author's opinion that reputation will force large firms such as Mattel to take greater precautions and inspect their contracting factories more carefully. If the market structure persists, however, Chinese firms will still be under pressure to cut costs; they will merely have to find other ways to do so. The sweatshop and child labor scandals prior to the turn of the century can be seen as just another manner in which Chinese firms cut costs. The only difference recently is that the negative externality was borne upon American consumers as opposed to Chinese children. Robin Munro of the China Labour Bulletin in Hong Kong maintains that labor conditions in China still remain lacking in comparison to U.S. standards, while "long hours of overtime are still expected and worker safety remains a distant concept" [6]. The issue in China, and what might eventually correct their market power discrepancy, is their evolution to a free-market economy and their transformation from manufacturing products that require cheap labor and poor regulations to producing goods that are technically advanced and of good quality [6].

In this study we delineated the correlation between a monopsony structure and pressures on production firms residing in that market to cut costs. We also provided econometric evidence that large importing firms might hold market power in China, and suggestions for future study as to whether pressures to cut costs translate to production of goods that are of lower quality. These findings are hardly conclusive or encompassing; rather, they should be seen as evidence for one possible explanation of the toy safety phenomema in 2007, as well as encouragement for future studies of market power in developing nations and what externalities they might engender.

Appendix

Table I: Original Results

Dependent Variable: BEAINDEX

Method: Two-Stage Least Squares
 Date: 11/25/07 Time: 15:46
 Sample(adjusted): 1 30
 Included observations: 30 after adjusting endpoints
 Weighting series: LOG(REVENUES)
 Instrument list: LOG(INVENTORIES) C LOG(TOYINPUTS)
 HARMINDEX TARRIFEDINDEX DOMTOYPRICES LOG(TREND)
 LOG(CAPITAL) LOG(LABOR)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	115.2121	17.27559	6.669066	0.0000
LOG(REVENUES)	-7.525173	3.249921	-2.315494	0.0291
LOG(CAPITAL)	2.120168	0.828170	2.560062	0.0169
LOG(LABOR)	5.863460	3.720486	1.575993	0.1276
DOMTOYPRICES	-0.112140	0.046127	-2.431104	0.0226
Weighted Statistics				
R-squared	0.762370	Mean dependent var		96.87115
Adjusted R-squared	0.724350	S.D. dependent var		3.090643
S.E. of regression	1.622663	Sum squared resid		65.82584
F-statistic	3.597319	Durbin-Watson stat		1.281815
Prob(F-statistic)	0.018949			
Unweighted Statistics				
R-squared	0.216001	Mean dependent var		96.87333
Adjusted R-squared	0.090562	S.D. dependent var		1.700088
S.E. of regression	1.621280	Sum squared resid		65.71373
Durbin-Watson stat	1.271111			

Table II: Correlation Coefficients

	C	LOG(REVENUES)	LOG(CAPITAL)	LOG(LABOR)	DOMTOYPRICES
C	278.7756	-0.966705	4.823361	-24.97145	0.083206
LOG(REVENUES)	-0.966705	8.939259	-1.648844	-8.620244	0.045836
LOG(CAPITAL)	4.823361	-1.648844	0.529301	1.036080	-0.006290
LOG(LABOR)	-24.97145	-8.620244	1.036080	10.89597	-0.062571
DOMTOYPRICES	0.083206	0.045836	-0.006290	-0.062571	0.001510

Table III: Log(labor) Regression

Dependent Variable: LOG(LABOR)

Method: Least Squares

Date: 11/25/07 Time: 18:03

Sample(adjusted): 1 30

Included observations: 30 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	2.950905	2.207006	1.337063	0.1932
BEAINDEX	0.008863	0.016141	0.549110	0.5878
LOG(REVENUES)	0.595983	0.102749	5.800366	0.0000
LOG(CAPITAL)	0.021612	0.057934	0.373046	0.7123
DOMTOYPRICES	0.005716	0.003582	1.595925	0.1231
R-squared	0.833674	Mean dependent var		12.94169
Adjusted R-squared	0.807062	S.D. dependent var		0.269811
S.E. of regression	0.118514	Akaike info criterion		-1.276562
Sum squared resid	0.351138	Schwarz criterion		-1.043029
Log likelihood	24.14843	F-statistic		31.32684
Durbin-Watson stat	2.326107	Prob(F-statistic)		0.000000

Table IV: Log(capital) Regression

Dependent Variable: LOG(CAPITAL)

Method: Least Squares

Date: 11/25/07 Time: 18:05

Sample(adjusted): 1 30

Included observations: 30 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-10.79957	4.140140	-2.608503	0.0149
LOG(LABOR)	0.495406	0.730264	0.678394	0.5035
LOG(REVENUES)	1.152557	0.504414	2.284942	0.0307
DOMTOYPRICES	-0.012577	0.012203	-1.030708	0.3122
R-squared	0.650294	Mean dependent var		10.48050
Adjusted R-squared	0.609943	S.D. dependent var		0.703183
S.E. of regression	0.439169	Akaike info criterion		1.315703
Sum squared resid	5.014615	Schwarz criterion		1.502529
Log likelihood	-15.73555	F-statistic		16.11605
Durbin-Watson stat	2.190745	Prob(F-statistic)		0.000004

Table V: Residuals

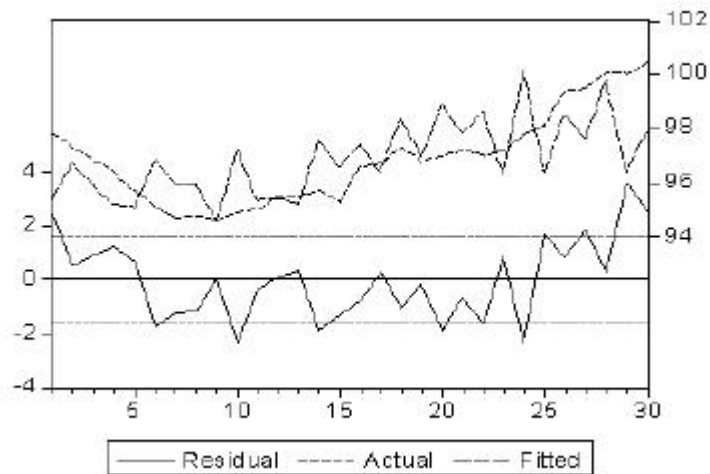


Table VI: White Test

White Heteroskedasticity Test:				
F-statistic	0.611952	Probability	0.817379	
Obs*R-squared	10.90576	Probability	0.693423	
Test Equation:				
Dependent Variable: STD_RESID^2				
Method: Least Squares				
Date: 11/25/07 Time: 15:46				
Sample: 1 30				
Included observations: 30				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-342.7724	3492.761	-0.098138	0.9231
LOG(REVENUES)	279.8264	667.3767	0.419293	0.6809
(LOG(REVENUES))^2	-56.61219	55.21771	-1.025254	0.3215
(LOG(REVENUES))*(LOG(CAPITAL))	-7.244365	22.03916	-0.328704	0.7469
(LOG(REVENUES))*(LOG(LABOR))	125.7745	84.71166	1.484736	0.1583
(LOG(REVENUES))*D	-2.465419	1.736962	-1.419386	0.1762
OMTOYPRICES				
LOG(CAPITAL)	-89.10564	114.7247	-0.776691	0.4494
(LOG(CAPITAL))^2	-3.713852	3.641774	-1.019792	0.3240
(LOG(CAPITAL))*(LOG(LABOR))	22.70236	22.21347	1.022009	0.3230
(LOG(CAPITAL))*DOM	-0.275037	0.325083	-0.846051	0.4108
MTOYPRICES				
LOG(LABOR)	-185.3208	1031.010	-0.179747	0.8598
(LOG(LABOR))^2	-83.47413	48.22439	-1.730953	0.1040
(LOG(LABOR))*DOM	3.542343	2.438397	1.452734	0.1669
TOYPRICES				
DOMTOYPRICES	0.708098	10.93141	0.064776	0.9492
DOMTOYPRICES^2	-0.047138	0.022394	-2.104968	0.0526
R-squared	0.363525	Mean dependent var	2.194195	
Adjusted R-squared	-0.230517	S.D. dependent var	2.828117	
S.E. of regression	3.137193	Akaike info criterion	5.431387	
Sum squared resid	147.6297	Schwarz criterion	6.131986	
Log likelihood	-66.47081	F-statistic	0.611952	
Durbin-Watson stat	1.737361	Prob(F-statistic)	0.817379	

Table VII: Final Results

Dependent Variable: BEAINDEX

Method: Two-Stage Least Squares

Date: 11/25/07 Time: 12:47

Sample(adjusted): 1 30

Included observations: 30 after adjusting endpoints

Weighting series: LOG(REVENUES)

White Heteroskedasticity-Consistent Standard Errors & Covariance

Instrument list: LOG(INVENTORIES) C LOG(TOYINPUTS)

HARMINDEX TARRIFEDINDEX DOMTOYPRICES LOG(TREND)

LOG(CAPITAL) LOG(LABOR)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	115.2121	16.69658	6.900341	0.0000
LOG(REVENUES)	-7.525173	2.989859	-2.516899	0.0186
LOG(CAPITAL)	2.120168	0.727531	2.914196	0.0074
LOG(LABOR)	5.863460	3.300905	1.776319	0.0879
DOMTOYPRICES	-0.112140	0.038863	-2.885550	0.0079
Weighted Statistics				
R-squared	0.762370	Mean dependent var		96.87115
Adjusted R-squared	0.724350	S.D. dependent var		3.090643
S.E. of regression	1.622663	Sum squared resid		65.82584
F-statistic	3.597319	Durbin-Watson stat		1.281815
Prob(F-statistic)	0.018949			
Unweighted Statistics				
R-squared	0.216001	Mean dependent var		96.87333
Adjusted R-squared	0.090562	S.D. dependent var		1.700088
S.E. of regression	1.621280	Sum squared resid		65.71373
Durbin-Watson stat	1.271111			

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