Consumer Demand with Social Influences: Ben Baller did the IPO

John J. Horton[*] MIT Sloan and NBER

Robert Schultz Wayne State University

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Abstract

For some kinds of goods, rarity itself is valued—"fashionable" goods are demanded in part because they are distinctive. In this paper, we explore the economics of these kinds of goods using data from 18 auctions of a fashion goods that differed in their rarity, with quantities announced to would-be bidders *ex ante*. Constructing demand curves from the realized bids, a naive analysis suggests the firm should have increased the offering by 1700%. However, when the effect of rarity is estimated from the auctions, the quantity chosen is far closer to the theoretical optimum.

1 Introduction

Economists have long-recognized the fact that for some goods, demand does not depend solely on the price and the functional properties of the good, but rather is subject to "social influence" (Pigou, 1913; Leibenstein, 1950; Becker, 1991; Krueger, 2013). Example goods include fashionable clothing, jewelry, artwork, collectibles, concerts, luxury automobiles, and restaurants. For these kinds of good, the conjectured primary social influence is for the (unmet) demand of others to increase individual valuation—consumers gain utility from obtaining a good that few others also consume or possess. Sociologists

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Figure 1: Ben Baller slides in red and black

Notes: These are the slides offered in the IPO.

of fashion have characterized this as a taste for "distinction" (Simmel, 1957). This kind of social influence is sometimes called a "snob effect," but this seems needlessly pejorative and will will call a good where demand increases in rarity a "fashion" good.

In this paper, we consider a firm selling a fashion good. Unlike a firm offering a conventional good, the firm does not face a single demand curve, but a curve that depends on the total quantity produced. Increasing quantity causes movement along the demand curve, but also shifts in the demand curve as it is valued less. Although we give this problem a simple theoretical treatment, our paper is primarily empirical, exploring a designer selling a customized outdoor slipper, or "slide." Figure 1 shows the slides.

The slides in question were manufactured by Straye, but they were customized by Ben Baller, a celebrity jeweler particularly popular in the hip hop community. The slides offered by Mr. Baller had the sentence "Ben Baller did the chain" printed on the tongue. This expression is a lyric from the rapper A$AP Ferg, who rapped "Ferg is the name, Ben Baller did the chain" on the the track "Plain Jane."[1] The implication of this phrase is that A$AP Ferg is sufficiently successful as to be able to afford one of Mr. Baller's creations.

Mr. Baller partnered with an online market place, StockX, to offer the slides in an "IPO." The slides were allocated using a blind Dutch auction with a $50 reserve price. There were two styles of the slide—red and black—and 9 sizes in each were offered, creating 18 distinct auctions. Both slides

[1] `https://genius.com/12495999`

were the same except for color. Total quantities for each color and size were announced *ex ante*.[2] The red slide was considerably rarer than the black slide, despite being functionally equivalent. The rareness of the red slide was not due to any perceived or anticipated difference in demand or difference in production cost for red versus black. In fact, Mr. Baller reportedly did not know beforehand which color would prove more popular. As best we can tell, the choice to make red rare was a kind of "folk experiment" as this was StockX's first IPO.

As we have the full collection of bids, we can construct demand curves under the bid-your-valuation feature of rational Dutch auction bidding. A naive analysis of the demand curves would imply Mr. Baller should have produced as many slides as there were bidders, selling at the reserve price. This would have increased the quantity of red slides offered by an average *factor* of 17 per size, and a factor of 29 in the most under-supplied size. However, further analysis shows this would truly be naive, as we have evidence rarity affect valuation and hence demand.

One strong piece of evidence for rarity entering directly into consumer valuation is that bids for the rarer red slides were considerably higher. Regressing bids on quantities, we find that a 20% increase in total offered quantity reduces bids—and hence shifts in the demand curve—by about 1.6%. Although rarity and redness are confounded, we (a) do have variation in relative rareness by size, which we exploit and (b) we observe that many bidders bid on both the red and black slides (in the same size), and on average, we observe higher bids for red. Furthermore, for each bidder, we can observe their full history of completed orders on StockX and the "colorway" of that order, allowing us to construct individual measures of a taste for black and red. We find no evidence that users seem to have a general color preference that manifests itself if different bids.

When we consider the demand curve shifting because of rarity, we have a very different results for the optimal quantity: Mr. Baller should have increased the quantities, but only by about a factor of 2. As it is, we estimate that increasing the quantity this much would have increased revenue by about 50%. Although we think Mr. Baller likely produced too few slides, he was much closer to optimality than a naive analysis would suggest.

Our paper provides evidence that firms rationally should consider social

[2]This quantity-choosing problem does not come up in IPOs for firms—the quanity is definitionally fixed at 100%.

influences when setting prices. Given how many goods are subject to social influences, understanding this feature of firm decision-making is consequential. Social influence explains the puzzle for why we often observe lines even in the long-run rather than higher prices—more than one armchair economist has seen a line outside a restaurant or a store and remarked that the firm should raise prices. But economists should not be so quick to think they know better how to run a firm than practitioners: scaling up production or raising prices might very well "clear" the market by causing demand to completely evaporate.

Most fashion goods are not allocated through a blind Dutch auction—this is a business innovation by StockX. But most use some kind of quantity-restricting mechanism—they sell them at retail price that is below "naive" demand and allocate through an "ordeal" such as waiting in line (Nichols and Zeckhauser, 1982; Alatas et al., 2012) or entering a lottery for the right to buy. Ordeals also help screen on passion rather than income, and for some brands, their highest end, the sale of hard to get fashion is not really about revenue from those sales but about brand perception which in turn affects more mass market demand.[3]

2 Consumer demand for a fashion good

Suppose the valuation of a good among a unit mass of would-be consumers is

$$v_i = v_0 + \phi(Q) + \epsilon \tag{1}$$

where Q is the quantity produced and ϵ is i.i.d. with cdf F. The term $\phi(Q)$ captures the effect that rarity has on valuation. The term v_0 is the value due to the functional properties of the good. We assume that $\phi'(Q) < 0$ and that $\phi(\infty) = 0$. A consumer will buy the good only if $v_i \geq p$, and so the demand curve for the good is

$$D(p; Q) = 1 - F(p - v_0 - \phi(Q)). \tag{2}$$

[3] Why a firm seeking coolness would choose to do this when one considers the stylized fact that wealth and age are typically positively correlated, but coolness and age are negatively correlated.

Market clearing requires that $Q \equiv D(p;Q)$, and so the effect of increasing quantity offered is

$$1 = \underbrace{\frac{\partial D}{\partial p}\frac{dp}{dQ}}_{\text{Along curve}} + \underbrace{\frac{\partial D}{\partial Q}}_{\text{Shift curve}}. \tag{3}$$

The slope of the inverse demand curve is

$$\frac{dp}{dQ} = \frac{1 - \frac{\partial D}{\partial Q}}{\partial D / \partial p}. \tag{4}$$

The social influence consideration has the effect of a creating a *de facto* steeper demand curve—increasing the quantity lowers price by more than we would expect with a "pure" demand curve. We can see this in the equation—as $\frac{\partial D}{\partial Q} < 0$, the numerator is larger, and since the whole quantity is negative, the slope is steeper.

The situation can be seen in Figure 2, where we plot a collection of demand curves under different quantity scenarios. For a given quantity, say $Q = 0.05$, we can trace out a full demand curve, but only where this curve intersects a vertical line at $Q = 0.05$ a possible equilibrium.

The implication of this steeper demand curve is a greater quantity reduction compared to the pure monopolist problem. Profit-maximization is

$$\max_{Q} p(Q)Q \tag{5}$$

which gives a first order condition of

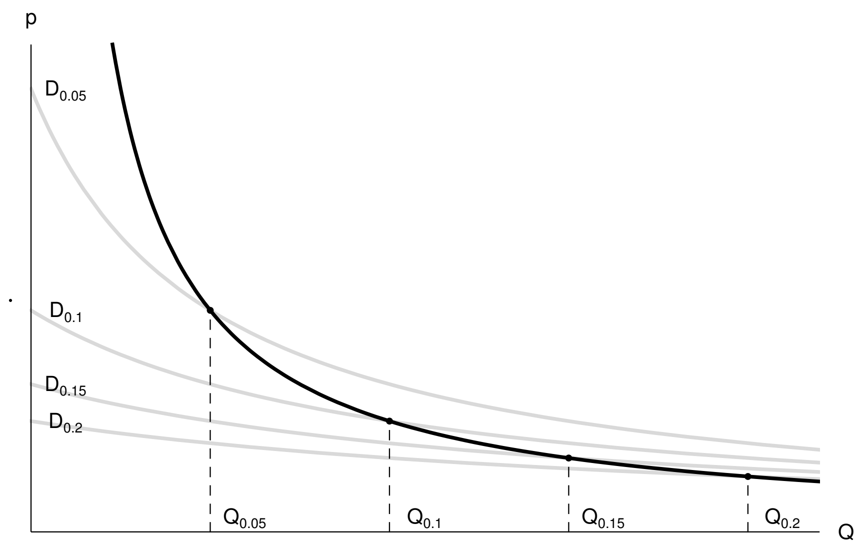
$$\frac{dQ}{dp}Q + p(Q) = 0. \tag{6}$$

$$\frac{Q}{p}\frac{dp}{dQ} = \frac{Q}{p}\left(\frac{1 - \frac{\partial D}{\partial Q}}{\partial D / \partial p}\right) \tag{7}$$

$$= -1 \tag{8}$$

At the profit-maximizing quantity, the elasticity of the price with respect to the quantity is -1, which is occurs when the elasticity of demand with respect to the price (keeping the quantity fixed) is the same as the elasticity

Figure 2: De facto demand curve when total quantity affects demand



of the demand with respect to the quantity (the rarity component) keeping the price fixed.

$$\epsilon_Q^p = \frac{1 - \epsilon_Q^D}{\epsilon_p^D} = (1 - \epsilon_Q^D)\epsilon_D^p. \tag{9}$$

3 Empirical context

The auction itself was run by StockX, an online marketplace founded in 2015 focusing on buying and selling sneakers, handbags, streetwear and watches. The marketplace is only for new goods, and StockX verifies that all goods bought and sold are unused, authentic and free of manufacturers defects. They do this by having sellers ship tentatively sold items to a StockX authentication center, where each item is physically inspected. If the good fails inspection, it is sent back to the seller and the transaction is canceled; if the good passes, it is shipped to the buyer.

This obviously takes time and effort, but that StockX is popular despite these delays reflects the limitations of the non-intermediated secondary market in these goods. There are at least two reasons why intermediation works in this market. The quality of "fakes" or counterfeit goods is often extremely high, and only the most discerning individual with deep expertise would be able to spot a fake. Second, some of these goods are rare and high value. Because the risk of fakes, goods need to be inspected before purchase. This makes for a thin market except in major cities, but even in these cities, private party transactions present a risk of robbery.

Because the platform verifies that all goods are true commodities, StockX can sell them using market mechanisms only appropriate for commodities. In particular, StockX uses a continuous double auction, with buyers and sellers submitting good and size specific time-limited bids and asks. Either side can observe the order book and buy or sell at the bid or ask price. StockX makes the order book and transaction public, so buyers and sellers can make informed choices.

4 Auction results

The chosen production quantities by color and size are shown in Figure 3, in the top panel. The relative rarity of red slides is readily apparent, though we also see substantial variation in the quantity by shoe size. This is an attempt to reflect the distribution of sizes in the population. In Figure 3, in the bottom panel we plot the auction-derived market clearing prices. The scarcer red slides were sold at a considerable premium, though this could be the result of both movement along and a shift of the demand curve.

Bidders were only allowed to place one bid per color and size, but they could bid across colors and sizes. A total of 11,529 were submitted by 7,705 distinct bidders.[4] Bidders were not allowed to bid more than once for the same color and size, but were otherwise allowed to submit as made bids as they wished. Bidders placing multiple bids overwhelmingly bid twice, once on a red slide, once on black slide.

The total number of bids receive by color and size are shown in Figure 4. We can see that black slides attracted more bids in total. This could reflect the fact that red slides were rarer and thus expected to go for a higher clearing price, making entry less attractive. However, the difference in the number of bids was much smaller than the difference in quantities.

[4] The full rules are available here: `https://stockx.com/news/Ben-baller-ipo-official-rules/`.

Figure 3: Ben Baller slide IPO quantities and prices

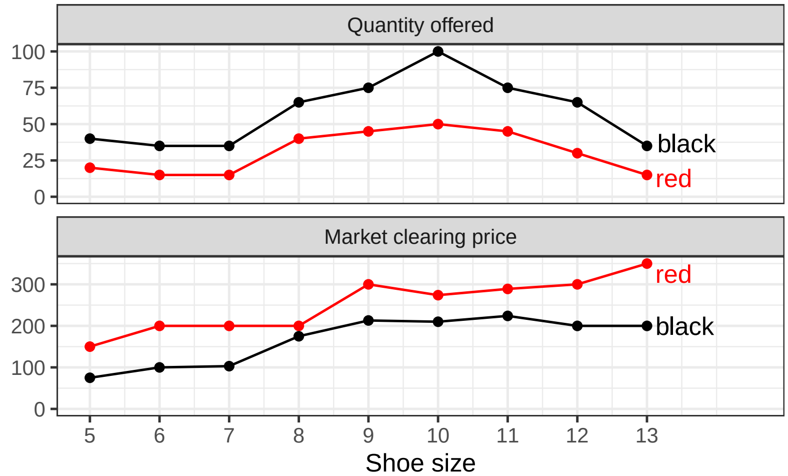
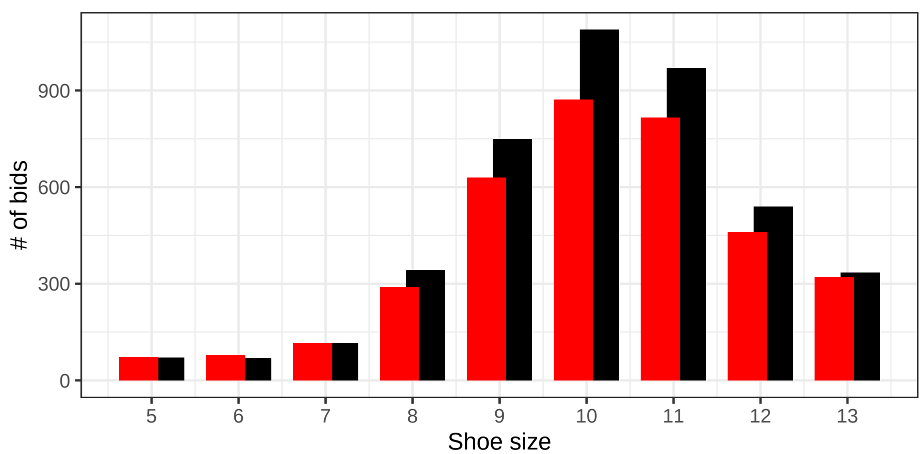
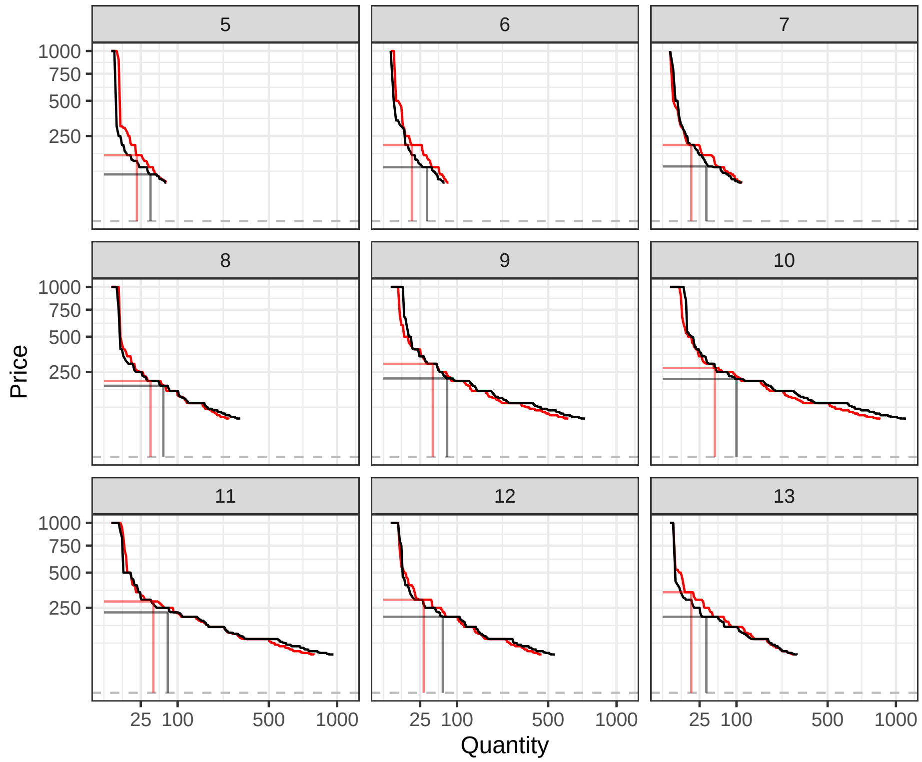


Figure 4: Number of bids received by color and size



Notes: This figure shows the number of bids received per color and size.

Figure 5: Demand schedules for red and black slides, by size



Notes: Demand schedules for the red and black slides.

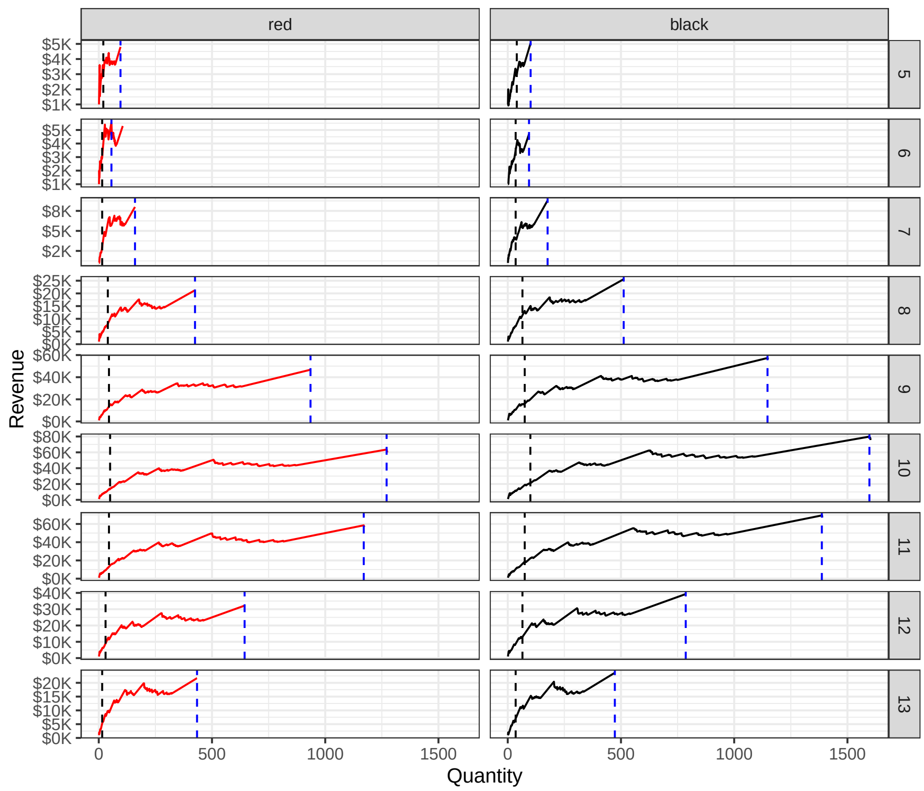
4.1 Constructing demand curves

From these bids, we can construct size- and color-specific demand curves. Figure 5 plots these curves, with the market-clearing price and quantity annotated. Visually, there is not strong evidence that the red slide demand curves are strongly "pushed" out given the greater rarity of red slides, but the effect is more apparent in a regression.

4.2 Counterfactual quantities

If we ignore the possibility that total quantity would affect demand i.e., we assume a fixed demand curve, we can compute the revenue under different counterfactual quantities. Revenue as a function of quantity is plotted in Figure 6. In the revenue plot, for each size and color the curve eventually turns

Figure 6: Revenue as a function of quantity



Notes: This figure shows the revenue for different production quantities.

perfectly straight—this is where we start getting into the bidders bidding exactly the reserve price.

We can see that for every size and color, the revenue-maximizing choice would be to produce the maximum amount to satisfy every bidder and sell at the reserve price.

There is a long "tail" of bidders at the reserve price. This is superficially hard to reconcile—it seems improbable that a large number of would-be buyers have a valuation right at the reserve. However, would-be buyers likely anticipated that StockX might do something for out-of-the-money bidders. In the past, they have rewarded participants with awards like free shipping on future orders. As such, we view the mass of bids right at the reservation price as likely reflecting factors other than a *bona fide* attempt to win the slides.

4.3 Estimating the effects of rarity on valuation

We can look at individual bids to see if there is a difference with respect to the rare red slides. Column (1) of Table 1 reports regressions of the form

$$\log b_i = \beta_0 + \beta_1 \textsc{Red}_i + \epsilon. \tag{10}$$

We can see that bidders bidding on red slides, on average, bid about 5% more.

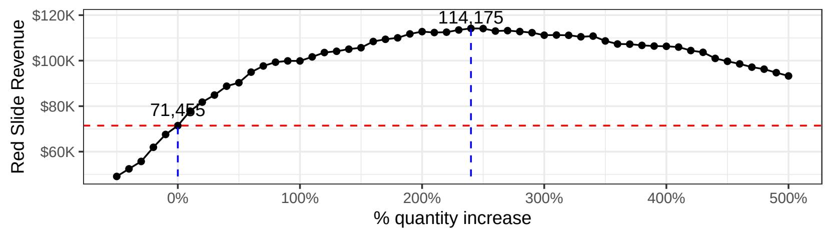
Table 1: Bids and auction item characteristics

	Dependent variable:		
	Log bid		
	(1)	(2)	(3)
Red slide	0.051***	0.044***	
	(0.011)	(0.005)	
log(quantity)			−0.088***
			(0.020)
Constant	4.421***		
	(0.007)		
Sample	All	2 bids/user	Above Reserve
Controls	None	None	Shoe size
Observations	11,529	5,416	7,928
R^2	0.002	0.954	0.004

Notes: This table reports regressions of individual bids on item and bidder characteristics. Significance indicators: $p \leq 0.10 : \dagger$, $p \leq 0.05 : *$, $p \leq 0.01 : **$ and $p \leq .001 : ***$.

Given the limited quantity of red slides, there may be less entry into the red slide auction, and so the limited quantity selects for users with a higher valuation. We can partially address this concern by limiting our attention to only bidders bidding in both auctions, which we do in Column (2). With two bids, we can now add a bidder specific fixed effect. The red premium is about the same, suggesting the higher bids for red is not likely to be a selection effect.

Figure 7: Red slide revenue counterfactual



Notes: This figure plots revenue as a function of production quantity in red slides, using the implied effects on valuation from Table 1.

We do no actually care about "Red"—we care about quantity. In Column (3), we regress the log wage bid on the log quantity, controlling for shoe size, and only using observations above the reserve.

$$\log v_i = \beta_0 + \beta_1 \log Q + \epsilon. \tag{11}$$

We can see the bid elasticity with respect to the quantity is about -0.09.

4.4 Optimal quantities for rare goods

Using the elasticity estimates, in Figure 7, we plot the revenue under different production quantity changes, assuming a constant elasticity of bid valuation with respect to total quantity. As expected, increasing quantity from the status quo increases revenue, but that eventually it flattens and turns negative. The implied profit-maximizing quantity of red slides was about 220% higher than the actual allocation. This would have raised revenue about 60% relative to the *status quo*.

5 Conclusion

The main finding of this paper is that for a kind of good, setting optimal production quantities requires considering a collection of demand curves. Although many goods do not share the properties that make this "rarity" consideration necessary, many do.

Most economists who have examined fashion typically lament how understudied it is despite its clear importance (Robinson, 1961). Fashion has a place somehwat similar to advertising in economics—it reflects an expenditure that, while freely arrived at in a market, hardly seems welfare enhancing, at least at first glance.

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A Structural model

A user i considers each of the j possible auctions. For each auction, they have a belief about the market clearing bid, p_j. The user has some value to winning the bid, v_{ij}. There is an entry cost, c. A user enters is

$$\int_0^{v_{ij}} (v_{ij} - p_j) f(p_j) dp_j \geq c \tag{12}$$

and if they enter, they bid v_{ij}. The valuation is

$$v_{ij} = v_0 m_{ij} \exp(\phi(Q) + \gamma_R + \epsilon_{ij}) \tag{13}$$