



## Does competition lead to customization?



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### ABSTRACT

This paper proposes a theory of competition and customization. When firms allocate their production to both custom-made and standardized products, the fraction of sales from the former will increase in the face of increased competition. Recent surveys conducted by the World Bank on Chinese firms provide a rare direct measure of customization that allows us to test the above-mentioned prediction. We find empirical results consistent with the prediction.

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## 1. Introduction

We study customization as a strategy firms use to cope with competition. We define customization as the costly alteration of a product to tailor it to clients' needs or tastes. One can buy a standardized kitchen cabinet which can be functional but does not perfectly fit the kitchen layout or the tone of the home's interior design. Alternatively, one can order a custom-made kitchen cabinet, functional *and* perfectly matching the interior design.<sup>1</sup>

We focus on customization because the World Bank Enterprise Surveys suggest that it is common in manufacturing.<sup>2</sup> Specifically, the surveys ask firms the percentage of their sales made exclusively to clients' unique specification, with the following remarks: "i.e. you cannot sell to other clients." In China, 41.3% of total sales across all 1511 manufacturing firms surveyed in 2003 (reporting figures for 2002) belongs to customized products. Of the 1041 Thai manufacturing firms and

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<sup>1</sup> Customization differs from product proliferation. Polo Ralph Lauren, for example, engages in product proliferation by providing numerous varieties of clothing in color, size, style, etc. More varieties raise the chance of finding a good match but does not eliminate the chance that consumers do not find the ideal clothes they desire. Customization refers to tailor-made clothes, in which case the tailor measures the client's body for exact sizes and asks about the exact colors and styles that the clients desire.

<sup>2</sup> The percentage of customized sales out of total sales for an industry or for all manufacturing firms in a country so reported are calculated as the weighted average of such percentage per firm, where the weights are the sales of each firm. The more specific surveys from which these figures are calculated are the Productivity and Investment Climate Study Thailand (PICS-2007), Productivity and Investment Climate Study Survey 2, Malaysia 2007, and World Bank Investment Climate Survey for China.

1080 Malaysian manufacturing firms surveyed in 2007 (reporting figures for 2006), these figures are 44.2% and 39.5%, respectively. While such a percentage varies considerably across industries, customization is generally a non-negligible part of any industry.<sup>3</sup>

In [Section 2](#), we offer a theoretical mechanism through which competition leads to customization. In a spatial competition model à la [Hotelling \(1929\)](#) and [Salop \(1979\)](#), competition intensifies when there is an increase in the number of firms because firms locate closer to one another. What these firms offer, therefore, become less differentiated in the eyes of the consumers. As such, their price competition intensifies. We show that such an increase in competition leads to *an increase in the fraction of sales from customization*. We also show that if this increased competition is caused by a larger market size, firms have an even stronger incentive to customize. The intuition is that custom-made products allow the firm to exercise greater market power over their clients relative to the case where it only offers a standardized product. Customization, therefore, makes the erosion of the firm's profit less dramatic when competition intensifies. Our result remains robust to a number of alternative modeling assumptions.

In [Section 3](#), we use the detailed firm-level information from the World Bank Enterprise Survey for China in 2003 (for convenience, we call this the *Survey for Chinese Enterprises*; hereafter SCE) to test the prediction that increased competition leads to a larger share of customized sales. The effect of competition on customization has seldom been investigated empirically, primarily due to the difficulty of measuring customization.<sup>4</sup> The SCE asks firms about the proportion of their own sales that is custom-made, providing us a direct measure of customization, which has not been available previously. The SCE also enables us to measure competition using each firm's proportion of its competitors' output that is produced locally.

Consistent with our model, we find increased competition to be significantly associated with a higher degree of customization. This result is robust to the inclusion of more controls, using instrumental variable estimation, using fractional logit estimation, outliers, and using an alternative measure of competition. To gauge the economic significance of this result, we calculate that a one standard deviation increase in our competition measure is associated with a 7.58% increase in the percentage of custom-made products/services, or 18.72% relative to the mean of the proportion of customized sales.

[Loginova \(2010\)](#) and [Loginova and Wang \(2011\)](#) have crafted out interesting models of customization. To model customizing, we follow [Loginova and Wang \(2011\)](#), which assumes that investing in customization technology allows firms to offer a set of clients their ideal product varieties. Our model differs from Loginova and Wang in at least three aspects. First, to focus on customization, we do not consider the case in which one firm's product is superior to others in the eyes of all consumers. Second, as data show that firms sell both customized and standardized products, we extend the notion of customization in Loginova and Wang to include customization for only a subset of clients. Third, we opt for Salop's circumference instead of a Hotelling interval, so as to incorporate endogenous entry and therefore the level of competition and the ensuing impact on customization.<sup>5</sup> The way in which we model customized products is also similar in spirit to [Alexandrov's \(2008\)](#) "fat products," which mean that firms can develop products that cover an interval in the space of characteristics. Different from Alexandrov, however, our analysis distinguishes between customized and standardized products and focuses on the effect of competition on the relative intensity of customization.

It is worth emphasizing that customization is conceptually different from product differentiation. For example, in a spatial competition framework, greater entry usually reduces product differentiation, which, in turn, reduces market power and is not in line with the purpose of customization. Our model makes an explicit distinction between differentiation and customization by assuming that a firm, beside choosing its locations in the product space as an effort to *differentiate itself from other firms*, can exert extra effort to *customize its product to a set of consumers*. We show that under increased competition, even though firms become less differentiated due to larger entry, their shares of sales from customized products increase.<sup>6</sup>

The difficulty of measuring customization may be a reason behind its relatively thin empirical research. The closest study of ours is [Holmes and Stevens \(2014\)](#), which estimates a structural model in which an industry is divided between a "primary segment" and a "specialty segment" using confidential plant-level data in the US. Their interpretation of the specialty segment is that these are plants that produce customized products. They estimate that "in most industries, more than half of the plants in an industry can be classified as being specialty segment plants." This U.S. estimate echoes our descriptive statistics mentioned earlier that customization accounts for a significant portion in manufacturing. Their quantitative results show that in the face of a surge in import competition (say, from China), the specialty segment tends to grow significantly more important as a percentage of domestic shipments. They also document the greater survival of plants in specialty segments relative to those in primary segments in the face of fiercer competition. These findings are consistent with our theoretical and empirical results that competition tends to drive up the relative importance of customization. An important message

<sup>3</sup> This percentage is higher than 14% for 7 out of 9 manufacturing industries in China.

<sup>4</sup> In addition, [Holmes and Schmitz \(2010\)](#) stress the difficulty of measuring competition as well. As we will discuss in [Section 3](#), our competition measure allows us to circumvent a few common problems of measuring competition.

<sup>5</sup> A circumference with uniformly distributed customers makes no location a priori better than another. Hence, the study of the entry of firms can be more tractable.

<sup>6</sup> The discussion here pertains to the distinction between customization and horizontal product differentiation. It is interesting to note that [Shaked and Sutton \(1982\)](#) have shown that quality (vertical) differentiation can help to relax price competition.

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