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Strict duality and overlapping productivity distributions between formal and informal firms[☆]



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ABSTRACT

This paper develops a multi-industry general equilibrium model where entrepreneurs within each industry can decide to operate formally or informally. The model generates a rich set of predictions including productivity cut-offs for formal and informal firms to operate within different industries. We allow fixed costs to vary across industries, resulting in overlapping productivity distributions between formal and informal firms in the aggregate, but strict duality within industries. In doing so, we are able to generate and test predictions with regard to heterogeneity in informality across industries for the case of Indian manufacturing establishments. Consistent with the model, we find that the overlap between formal and informal establishments in the aggregate is larger than the overlaps within industries. Informality tends to decrease with average industry productivity and establishment size. Finally, more productive industries have greater overlaps in productivity between formal and informal establishments.

1. Introduction

Informal firms are a ubiquitous feature in developing countries and are an important step in the process of development. However, despite their prominence within developing countries, their relationship to and interactions with the formal sector remain an area of active inquiry. A concrete understanding of how the formal and informal sectors interact is of first-order importance to policy makers and informs questions ranging from optimal taxation to the effects of trade liberalization.

Advances in the surveys of informal firms have led to a wealth of informative micro-level data. These data helped bring some clarity to the nature of informality, but also led to new questions related to the interactions between formal and informal firms. Among these questions was how to alter the assumption of strict duality to fit empirical facts about the relative productivities of formal and informal firms. The canonical theoretical model developed by Rauch (1991) explains which entrepreneurs decide to operate informal firms. A central result of the

model is a strict size and productivity dualism. The smallest (least productive) formal firm is still larger (more productive) than the largest (most productive) informal firm. While this is a convenient and intuitive modeling device, empirical research shows that there is a clear overlap between formal and informal firms in productivity and/or firm size distributions.¹

This paper makes two substantive contributions to the understanding of informality. First, we model an alternative explanation for the overlapping productivity distributions at the aggregate level. We show that this overlap is the natural result of the relative entry costs of different industries. Importantly, our formulation also allows for a version of strict duality *within* industries, consistent with theoretical predictions such as Rauch (1991). Our explanation is broadly consistent with two salient features of the aggregate data: (1) on average lower productivity firms tend to be informal and (2) high productivity informal firms in some industries will be more productive than low productivity formal firms in others. One central prediction of the model is that there should

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¹ Examples include Taymaz (2009), Hsieh and Klenow (2010), Nataraj (2011), Busso et al. (2012), Meghir et al. (2015), and Ulyssea (2017).

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be greater overlap between formal and informal productivity distributions in the aggregate than within industries. We test this prediction using Indian manufacturing data and show that there is indeed greater overlap in the aggregate distributions than in all but a handful of very small industries.

Our second contribution is that, beyond simply being an alternative explanation for the overlap, our model allows us to explore important margins related to heterogeneity in informality across industries, which have previously received little attention in the literature. Not only does the model predict that the overlap in aggregate productivity distributions is larger than the overlap in industry-level distributions, it also illustrates why more advanced industries will have greater overlaps relative to less advanced industries. Additionally, the model suggests that informality is negatively related to industry productivity and average firm size. These predictions of the model are also corroborated using data on Indian manufacturing establishments.

Our work builds on two recent studies that make significant contributions in explaining the overlap in productivity distributions. Meghir et al. (2015) address the empirical fact that we observe both formal and informal firms with the same productivity through formal and informal labor markets. In equilibrium, firms may be equally profitable being formal or informal by tailoring their wage offers to different institutional frameworks. At certain productivity levels, firms may be indifferent between hiring employees from formal or informal labor markets; thus we observe both formal and informal firms with the same productivity. Alternatively, Ulyssea (2017) shows that even within industries, there is a productivity overlap generated by the entry of firms who do not know their *ex ante* productivity levels. Moreover, his model draws policy conclusions by modeling both the status of the firm (formal vs. informal) and the amount of labor hired from informal labor markets.

Our model builds on these studies along several margins. First, we embrace a multi-industry framework in order to evaluate how entry costs into different industries and sectors (i.e. formal vs. informal) influence productivity distributions and competition. Second, our model more closely follows the framework of Melitz (2003), where firms make the typical decisions about entry, production, and pricing, but also must choose whether to operate formally or informally. We abstract away from the dual margins in Ulyssea (2017), instead creating strict productivity cut-offs for each sector within each industry. These two elements generate aggregate overlaps while predicting strict duality within industries. Third, we pay particular attention to the within-industry productivity distributions and demonstrate empirically that there is a smaller degree of overlap within industries than in the aggregate productivity distributions for formal and informal firms. We view our modeling of the aggregate productivity overlap as a convenient mechanism to investigate differences in informality across industries and contextualize within-industry overlaps relative to industry characteristics. Our framework does not, however, preclude alternative explanations, particularly through labor markets.

The intuition of the model is straightforward. Suppose there are two industries H and L that have the same additional cost of being formal (i.e. the fee that must be paid to register with the government), but industry H has a slightly higher fixed cost of production. In this example, it would be less expensive for firms to enter both the informal and formal sectors in industry L (relative to the formal and informal sectors in industry H), and therefore the cut-off productivities for each sector in industry L would be lower as well. However, because the fixed costs of production do not differ greatly, the ordering of the cut-offs would most likely be: $\text{Informalentryinto}L < \text{Informalentryinto}H < \text{Formalentryinto}L < \text{Formalentryinto}H$. These cut-offs create a range of productivities where firms would decide to be formal in the low-cost industry, but would not be productive enough to operate formally in the high-cost industry. Therefore firms in this range of productivities between the last two cut-offs will be formal in industry L but informal in industry H leading to an observed overlap in the aggregate productivity distributions for formal

and informal firms.

The broader literature on informality provides a helpful context for this work. It generally falls into three categories. On one end of the spectrum, De Soto (1989, 2000) argues that the informal sector exists due to restrictive institutional constraints. In his view, institutional reforms would unleash the creativity and entrepreneurial spirit of the informal sector. Other authors argue that informality is simply a profit-driven decision, and informal entrepreneurs operate informally to gain a competitive advantage by avoiding costly regulations and taxation (Farrell, 2004; Levy, 2008).

Tracing back to Lewis (1954), the dual view suggests that informal firms exist in a separate economic space, distinct from formal firms. In his verbiage, there exists a “subsistence” sector (informal sector) and a more productive “capitalist” sector (formal sector). Firms in the capitalist sector do not truly compete with subsistence firms due to their superior productivity. His work suggests that informality exists as a stage in the process of development, and, importantly, dissipates as countries develop. This branch of the literature includes seminal theoretical contributions such as Harris and Todaro (1970) and Rauch (1991).²

This research is not intended to be a test between these viewpoints. Important work by Ulyssea (2017) shows that there are firms that fit each of these “opposing” viewpoints. Instead, we view our work as providing additional understanding about the relative productivities of formal and informal firms across industries, and about how important industry attributes are related to within-industry overlaps. In summary, this paper reaches several important conclusions that help frame how we should view informality. First, within a given industry, the largest, most productive firms will be formal. Second, across industries, there will be some informal firms that are more productive than formal firms, generating an overlap in aggregate productivity distributions for formal and informal firms. Finally, more advanced industries, with higher fixed costs, will on average have larger, more productive firms and fewer informal firms. At the same time, these industries will have greater overlaps in productivity distributions as the required productivity levels to operate formally vs. informally become closer.

This paper is divided into five sections. Section 2 develops our model of the macroeconomy and Section 3 presents our main theoretical results. Section 4 examines a central prediction of the model using data on Indian manufacturing establishments. Finally, Section 5 concludes.

2. Model

Our theoretical model builds on the framework developed by Melitz (2003), with two significant differences. First, we add an industry layer to the economy. Second, we embed the choice for firms to be informal or formal. We refer to this decision as a firm’s sectoral choice. These two additions generalize the work of Melitz (2003) and build the necessary framework to examine whether and how formal and informal firms compete.

2.1. Model set-up

2.1.1. Households

Suppose there is a representative household that is endowed with income, Y . The household seeks to maximize its consumption, c , which

² These theoretical models have received some support from empirical investigations done by La Porta and Shleifer (2008, 2014). For instance, they find that 91% of formal, or registered, firms began that way (although *entrepreneurs* could have started firms in different sectors). There is also evidence that suggests that informal firms may produce different goods than formal firms. La Porta and Shleifer (2008) find considerable differences in value added between the formal and informal sector, suggesting that formal firms produce higher value goods than informal firms.

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