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Firm Productivity in Bangladesh Manufacturing Industries

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Summary. — This paper studies the correlates of firm total factor productivity (TFP) in Bangladesh using data from a recent survey of large manufacturing firms. TFP measures are obtained following [Ackerberg, D., Caves, K., & Frazer, G. (2007). Structural identification of production functions. UCLA mimeo] and using firm-specific deflators for output and inputs. Controlling for industry, location, and year fixed effects, we find that firm size and TFP are negatively correlated while firm age and TFP exhibit an inverse U-shaped relationship. We also find that managerial quality and global integration are positively associated with firm TFP. Finally, we find that power supply problems, heavy bureaucracy, and the presence of crime dampen firm TFP.

Key words — total factor productivity, simultaneity and production functions, skilled labor, openness, business environment, Asia, Bangladesh

1. INTRODUCTION

A major stylized fact uncovered by the empirical industry evolution literature in developed as well as developing countries is the enormous degree of heterogeneity in productivity across firms even within narrowly defined manufacturing industries (Bartelsman & Doms, 2000; Tybout, 2000). It has also been shown that long-term growth and development across countries is driven to a large extent by productivity growth (Easterly & Levine, 2001). From a policy perspective, it is therefore crucial to understand which factors underlie the heterogeneity in firm productivity.

The literature has proposed various potential correlates of firm productivity, which can provide micro foundations to several important findings obtained at the aggregate level in cross-country growth studies. A strand of research has focused on the role of openness and international integration for firm total factor productivity (TFP) following the theoretical insights from the endogenous growth literature. A large number of studies show a beneficial effect of exports (e.g., Blalock & Gertler, 2004; Van Biesebroeck, 2005b; Wagner, 2007) or foreign ownership (e.g., Arnold & Javorcik, 2005; Kee, 2006) on firm TFP. A different literature examines the impact of research and development (R&D) activities on firm TFP (e.g., Griliches, 1998). Finally, a recent literature focuses on the role of the business environment for firm TFP (e.g., Dollar, Hallward-Driemeier, & Mengistae, 2005; Hallward-Driemeier, Wallsten, & Xu, 2006). [1]

Our paper contributes to the literature by combining into a single analytical framework correlates of TFP which have been analyzed separately in previous studies: managerial quality, integration into world markets, technology, business environment, and firm size and age. Using data from a recent survey of large

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manufacturing firms in Bangladesh, we estimate consistent TFP measures for the period 1999–2003 following the Ackerberg, Caves, and Frazer (2007) methodology and examine the correlates of firm TFP. An important feature of our study is the use of *firm-specific* output and input price deflators which results in TFP measures capturing true firm efficiency, rather than a mix between efficiency and market power, as in previous studies (see, e.g., Katayama, Lu, & Tybout, 2003).

Bangladesh is an interesting country to study for two reasons. First, the evidence on the correlates of firm productivity in low-income countries is rare. Most productivity studies focus on middle-income countries in Latin America or Eastern Europe due to data availability. While Dollar *et al.* (2005) study firm TFP in low-income countries (Bangladesh included), they focus exclusively on the role of the business environment. Second, the manufacturing sector in Bangladesh is particularly dynamic having experienced a very strong growth in total value-added and exports since the 1990s liberalization, largely driven by the ready-made garments (RMG) industry. [2]

Our econometric results identify several correlates of firm TFP, controlling for industry, location, and year fixed effects. Smaller firms are significantly more productive than firms in the largest size category. Firm age and TFP exhibit an inverse U-shaped relationship. Firms with more educated or experienced managers and firms with foreign ownership are more productive. Firms with more experience in export markets have significantly higher TFP. Firms with quality certifications exhibit higher TFP. However, firms engaged in R&D activities and firms using more computerized machinery do not. While firms with an overdraft facility have higher TFP, firms with access to a bank loan have lower TFP. Power supply problems and crime are negatively associated with firm TFP.

The paper is organized as follows: In Section 2, we describe the data and estimate firm TFP. In Section 3, we examine the correlates of firm TFP. Section 4 concludes.

2. OBTAINING FIRM TFP MEASURES

(a) *Data*

Our analysis uses data from a firm survey conducted by the World Bank in Bangladesh during November 2004–September 2005 covering five industries: food, leather/footwear, pharmaceuticals, RMG, and textiles. The survey collected information on production variables, firm characteristics, and business environment aspects. [3] The sample used in the econometric analysis includes 575 firms. Each firm has at most five years of production data. The majority of firms in the sample belong to the RMG industry (see Appendix Table A1). This reflects the importance of the sub-sector in manufacturing in Bangladesh, but also the sample design, described in the Appendix. Within RMG, 86% of firms belong to the woven sub-industry, 21% to the knitwear sub-industry, and 13% to the sweater sub-industry. Most firms in our sample have more than 50 workers, although the size distribution varies significantly across industries. [4] For example, in the leather/footwear industry about a quarter of the firms have less than 50 workers. About one-half of the firms are located in Dhaka while 17% are located in Chittagong (excluding export processing zones (EPZs)). We finish by highlighting two important features of our sample: it covers mostly (1) firms with more than 50 workers, and (2) young firms (about 80% of firms are less than 20 years old). Hence, our findings are representative only for the segment of larger and relatively young manufacturing firms in Bangladesh.

(b) *Production function estimation*

Firm TFP measures are not observable but can be estimated as residuals from a production function. For each of the five industries, we estimate the following Cobb–Douglas production function, where value-added Y_{it} is produced by a combination of three inputs: labor l_{it}, capital k_{it} (all in logarithms), and a measure of workforce human capital s_{it} [5]:

$$y_{it} = A_{it} + \beta_L l_{it} + \beta_K k_{it} + \beta_S s_{it}. \quad (1)$$

A_{it} is TFP which represents the efficiency of the firm in transforming inputs into value-added.

Using ordinary least squares (OLS) to estimate the production function coefficients $(\beta_L, \beta_K, \beta_S)$ assumes that input choices are exogenous. However, input choices are endogenous. For example, the number of workers hired by a firm and the quantity of materials purchased may depend on unobserved managerial ability, which is part of TFP known to the firm but not observable to the researcher. Since input choices and productivity are correlated,