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Does institutional quality affect firm performance? Insights from a semiparametric approach ^{*}

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Abstract

Using a novel modeling approach, and cross-country firm level data for the textiles industry, we examine the impact of institutional quality on firm performance. Our methodology allows us to estimate the marginal impact of institutional quality on productivity of *each firm*. Our results bring into question conventional wisdom about the desirable characteristics of market institutions, which is based on empirical evidence about the impact of institutional quality on the *average firm*. We demonstrate, for example, that once both the direct impact of a change in institutional quality on total factor productivity and the indirect impact through changes in efficiency of use of factor inputs are taken into account, an *increase* in labor market rigidity may have a positive impact on firm output, at least for some firms. We also demonstrate that there are significant intra-country variations in the marginal impact of institutional quality, such that the characteristics of “winners” and “losers” will have to be taken into account before policy is introduced to change institutional quality in any direction.

Keywords: Institutional quality; Firm performance; Marginal effect; Textiles industry

JEL codes: C14, D24, K31, O43

1 Introduction

It is well understood that the institutional environment in a country, which defines formal and informal rules that economic agents have to adhere to when they interact with each other, affects its economic performance. Efficient institutions reduce transactions cost and cost of enforcing contracts, thereby facilitating transactions that, in turn, enhance economic performance. Researchers have demonstrated that factors that characterize the economic environment, such as property rights, legal institutions and labor market institutions affect not only macro variables such as growth (Levine, 1998; Nickell & Layard, 1999; Acemoglu & Johnson, 2005), indeed much more than factors such as geography and trade (Rodrik, *et al*, 2004), but also micro variables such as firm performance (Dollar *et al*, 2005; Commander & Svejnar, 2011). In other words, “good” institutional quality is essential for economic growth, and there is a conventional wisdom about the nature of institutions that are desirable. A key problem that requires further attention is that the genesis of this wisdom lies in evidence about the impact of institutional quality on economic growth and unemployment in the *average* country or region, sales growth (or some other performance measure) of the *average* firm, and unemployment duration of the *average* laborer. The regression models from which the marginal effects of institutional quality are calculated (i.e., the coefficients) do not allow them to vary across firm (country). Note that here we interpret these constant regression parameters (marginal effects) as *average* effects or effects on the *average firm*. The focus on the average obscures the fact that the characterization of an institution as “good” or “bad” is a difficult exercise.

Consider, for example, the conventional wisdoms about labor market institutions. It has been argued that lack of labor market flexibility, and the corresponding ability to hire and fire laborers without incurring significant cost, can inhibit economic growth (Eichengreen & Iversen, 1999), and increase the unemployment rate (Saint-Paul, 2004). From a macroeconomic perspective therefore, flexible labor markets are desirable, and indeed this has been the popular wisdom among policymakers for some time. Micro level evidence, however, suggest that the “rigidity” of the labor market can have beneficial implications for the long term growth potential of firms. Labor market rigidity induce firms to invest in training and on-the-job learning (Storm & Naastepad, 2007). Indeed, part time labor contracts and short term labor contracts, that are generally outcomes of labor market flexibility, are associated with significantly less work-

related training (Arulampalam & Booth, 2002). Available evidence also suggest that incentives such as employment security can improve employee commitment, and are positively correlated with performance enhancing strategies such as greater investment in R&D and new technology (Michie & Sheehan, 1999).

Similarly, conventional wisdom suggests that social safety nets such as significant or prolonged unemployment benefits have undesirable impact on the magnitude and duration of unemployment (Katz & Meyer, 1990). In political discourse, therefore, it has become stylized to think of reduction in social safety nets as providing incentives that reduce (long term) unemployment. However, this popular wisdom does not take into account the possible impact of social safety nets on long term productivity of the laborers and their ability to bear search costs that can enhance x-efficiency. It is well understood by development economists that if income shocks resulting from unemployment significantly reduces nutritional intake, the productivity of the laborers, and hence likelihood of gaining employment, are adversely affected (Dasgupta, 1993). These benefits also enable out-of-work laborers to bear the search cost of finding employment that are consistent with their skills, thereby enhancing post-employment x-efficiency. Indeed, Acemoglu and Shimer (2000) demonstrate that an increase in unemployment insurance increases labor productivity by encouraging laborers to look for high productivity jobs and also by encouraging firms to create such jobs.

From the above discussion, it is evident as to why it would be imprudent to make a judgment about the desirability of an institution on the basis of its impact on the headline economic performance measures (e.g., growth and unemployment rates) of the *average* country or region or firm. Institutions that characterize social safety nets, for example, may have considerably different impact on countries, depending on factors such as the availability of non-wage sources of income and consumption. Further, within countries, the impact of institutions might differ considerably across economic agents such as firms, depending on their characteristics such as size and ownership. In other words, greater insight into the impact of institutions on economic performance requires that we examine both within-country distributions of the impact of institutional quality on performance of microeconomic agents such as firms, as well as the differences in these distributions across countries. More generally, the discussion has to involve more than the point estimates of the impact of these institutions on the performance of the average firm.

The standard regression models with constant coefficients (in a linear (or log-linear) models) can not address heterogeneity in the marginal effects across firms (countries).

In this paper, we use a novel methodology that treats institutions and firm characteristics such as ownership as facilitating factors that can have an impact on both total factor productivity, as well as on the efficiency with which factor inputs are used. The methodology allows us to estimate the impact of institutional quality on the performance of individual firms, thereby allowing us to examine within-country distributions of this impact, and to compare the distributions across countries. In contrast, the use of standard regression will give coefficients that are exactly the same for firms and all countries, such that the marginal effect of each institutional variable will be the same for all firms within and across countries. This is clearly very restrictive. We focus on three different institutions, namely, a measure of the overall environment in which firms operate, a measure of labor market flexibility, and a measure of the quality of a country's social safety net. For our estimation, we use data from the textile industry in in which developing countries (where institutional quality matters more at the margin than in developed countries) have comparative advantage.

Our results suggest two important things that bring into question the veracity of the conventional wisdom about the desirable characteristics of institutions, and hence about the desirable direction of change of institutional quality in developing countries. First, our results suggest that the marginal impact of institutional quality on firm performance varies significantly within countries. Hence, any change in institutional quality for the "better", based on conventional wisdom, could have winners and losers, such that the overall impact on headline variables such as economic growth would depend on the distribution of these marginal impacts. Policymakers might also have to take into account whether the losers, if any, belong disproportionately to vulnerable groups such as small and medium enterprises. Second, they indicate that conventional wisdom about the desirable characteristics of institutions may have to be re-evaluated, especially once both the direct impact of institutions on firm performance through total factor productivity and the indirect impact through efficiency of use of factor inputs are taken into account. An increase in labor market rigidity may have a positive impact on firm output, for example. The contribution of our paper, therefore, is twofold: (a) it provides *prima facie* evidence that the empirical results that form the basis of conventional wisdom about the devel-

opment of market institutions may not stand up to closer scrutiny, and (b) it suggests a novel, and arguably more reliable, way to empirically examine the impact of institutions on economic performance.

The rest of the paper is organized as follows: In Section 2, we discuss the empirical strategy. The data are discussed in Section 3, and the empirical results in Section 4. The latter section also highlights the key observations that can be made on the basis of our results. Section 5 concludes.

2 Empirical strategy

2.1 Stylized modeling approach

The stylized literature models firm performance as a linear function of among other things, measures of institutional and governance quality. Bhaumik and Estrin (2007), for example, model output (or sales) as a function of firm-specific characteristics such as factor inputs and ownership, as well as institutional (and economic) characteristics of the regions in which the firms are located. In other words, output of the i^{th} firm is given by

$$Y_i = f(X_i, Z_i) \tag{1}$$

where y is output (or sales), x is a vector of factor inputs and other firm level characteristics, and E is a vector of region or country level institutional features that are common to a number of firms. Under the assumption of Cobb-Douglas functional form, this yields the following linear regression model:

$$Y_i = \theta_0 + \Theta' X_i + \Phi' E_i + u_i \tag{2}$$

where u_i is the *iid* error term.¹ In effect, therefore, the regression model estimates the impact of the institutional characteristics on total factor productivity (TFP) growth² of the average firm.

¹In this specification, Y is generally the natural logarithm of output while each component of the X vector is natural logarithm of the factor inputs. But we continue with the same notation for the sake of continuity.

²In a standard Cobb-Douglas model (without any institutional characteristics) the intercept term is often viewed as total factor productivity growth because it represents residual output growth rate, i.e., the output growth after subtracting the contribution of inputs. Thus, in the formulation above in (2) TFP would be captured by $\theta_0 + \Phi' E_i$. In this formulation TFP varies with firm but the contribution of a particular E variable on TFP growth will be constant for all firms.

This approach has two important shortcomings. First, as discussed above, it does not capture the impact of institutional quality on individual firms, even though it may have significantly different impact on firm performance, depending on firm characteristics such as size and ownership. A natural extension of this model would be to have a model that allows institutional quality variables to have firm-specific effect on TFP growth. A partial linear model reformulation 2 would allow this.

$$Y_i = \theta_0(Z_i) + \Theta' X_i + u_i \quad (3)$$

where Z is a vector of variables that include both the components of the E vector and firm-level characteristics such as ownership. In this formulation θ_0 is a nonparametric function of the Z variables, such that these environmental factors are allowed to affect TFP growth in a flexible manner in the sense that these effects do not rely on any functional form of θ_0 . Furthermore, the effect of one Z variable (say Z_k) on TFP growth will also depend on the level of all the Z variables ($Z_k, k = 1, \dots, K$). This captures non-linearity in the institutional variables and TFP growth relationship, as well as their cross-effects.

Although the above model captures non-linearity and cross-effects of the Z variables on productivity, the overall effect of these Z variables is neutral to the standard inputs X . That is, the partial linear model fails to take into account the fact that the firm characteristics and institutional factors can affect productivity through the efficiency with which factor inputs are converted into output. Put differently, the institutional quality variables not only affects TFP, but also the productivity of factor inputs such as labor and capital. The model in (3) captures the direct effect of the Z variables. There can, however, be an indirect effect. For example, labor institutions are much more likely to affect productivity through improved training and x-efficiency (indirect effect) than through the direct effect. In other words, the empirical relationship between output and inputs should ideally capture the way in which both institutional quality and firm characteristics such as size and quality affect both the efficiency with which factor inputs are used and the direct effect. To accommodate this, we reformulate the model in equation 2 as:

$$Y_i = \theta_0(Z_i) + \Theta'(Z_i)X_i + u_i \quad (4)$$

where Z is a vector of variables that include both the components of the E vector and firm-level characteristics such as ownership. Note that in this model TFP growth will depend on the X variables. That is, TFP growth is not necessarily neutral and the neutrality hypothesis can be econometrically tested. The econometrics of this new modeling approach is discussed next in the following section.

2.2 Formulation of the new non-neutral TFP model

In line with the above discussion, we write the production function in more general form, viz.,

$$Y_i = E(Y_i|X_i, Z_i) + u_i \quad (5)$$

where Y_i denotes the natural logarithm of a scalar output for the i th observation, X_i is a k -vector of log of inputs, Z_i is a q -vector of environmental factors, u_i is an *iid* noise term.

2.2.1 Neutral TFP growth model

First, we specify $E(Y_i|X_i, Z_i)$ as

$$E(Y_i|X_i, Z_i) = \theta(Z_i) + X_i'\beta \quad (6)$$

where $\theta(\cdot)$ denotes an unknown smooth (i.e., nonparametric) function, and β denotes a k -vector of parameters. This specification is popularized by Robinson (1988) and is in line with the TFP model used in Griffith, *et al* (2004). The parameters in this specification are of most interest since they can be interpreted as input elasticities. This specification implies that

$$Y_i = \theta(Z_i) + X_i'\beta + u_i \quad (7)$$

To estimate β , we take the conditional expectation $E(\cdot|Z_i)$ for both sides of (7),

$$E(Y_i|Z_i) = \theta(Z_i) + E(X_i'|Z_i)\beta + E(u_i|Z_i) \quad (8)$$

Subtracting (8) from (7) would yield

$$Y_i^* = X_i^{*'}\beta + u_i \quad (9)$$

assuming $E(u_i|Z_i) = 0$, where $Y_i^* = Y_i - E(Y_i|Z_i)$ and $X_i^{*'} = (X_i - E(X_i|Z_i))'$. One would then be able to estimate β using ordinary least squares, assuming $E(X_i^*u_i|Z_i) = 0$:

$$\hat{\beta} = \left(\sum_{i=1}^n X_i^* X_i^{*'} \right)^{-1} \sum_{i=1}^n X_i^* Y_i^* \quad (10)$$

where n denotes sample size. Note that one could empirically estimate $E(Y_i|Z_i)$ and $E(X_i|Z_i)$ using Nadaraya-Watson kernel estimator as $\sum_i K(Z_i, z)T_i / \sum_i K(Z_i, z)$, where $T_i \in \{X_i, Y_i\}$, $K(\cdot)$ denotes a product kernel function, and z denotes the datum at which the kernel function is evaluated.

2.2.2 Non-neutral TFP growth model

The previous model allows the Z variables to explain TFP growth in a fully flexible manner. The only limitation of the model is that the Z variables affect TFP growth in a neutral fashion. The specification we use in this section allows indirect effects via the input elasticities which are affected by the Z variables (Li *et al.* (2002) calls this semiparametric smooth coefficient model because it allows the β coefficients to be some unknown smooth functions of Z_i). Here the conditional expectation is written as

$$\begin{aligned} E(Y_i|X_i, Z_i) &= \theta(Z_i) + X_i'\beta(Z_i) \\ &= W_i'\gamma(Z_i) \end{aligned} \quad (11)$$

where both $\theta(\cdot)$ and $\beta(\cdot)$ denote unknown smooth functions of the Z variables, $W_i' = [1 \ X_i']$, $\gamma'(Z_i) = [\theta(Z_i) \ \beta'(Z_i)]$, both W_i and $\gamma(Z_i)$ are of dimension $(k+1) \times 1$. This specification implies that

$$Y_i = W_i'\gamma(Z_i) + u_i \quad (12)$$

Pre-multiplying (12) by W_i and taking the conditional expectation $E(\cdot|Z_i)$ would yield

$$E(W_i Y_i | Z_i) = E(W_i W_i' | Z_i) \gamma(Z_i) \quad (13)$$

assuming $E(W_i u_i | Z_i) = 0$. One would then be able to employ kernel method to estimate $\gamma(Z_i)$ as

$$\hat{\gamma}(z) = \left[\sum_{i=1}^n W_i W_i' K_h(Z_i, z) \right]^{-1} \sum_{i=1}^n W_i Y_i K_h(Z_i, z) \quad (14)$$

where $K_h(\cdot)$ denotes generalized product kernel function (Li & Racine, 2006), z denotes the datum at which the kernel function is evaluated, h denotes the bandwidth parameter, which can be selected via the least-squares cross-validation method (Li & Racine, 2010) by minimizing the objective function $\sum_{i=1}^n [Y_i - W_i' \hat{\gamma}_{-i}(Z_i)]^2 M(Z_i)$, where $W_i' \hat{\gamma}_{-i}(Z_i) = W_i' \left[\sum_{j \neq i}^n W_j W_j' K_h(Z_j, z_i) \right]^{-1} \sum_{j \neq i}^n W_j Y_j K_h(Z_j, z_i)$ is the leave-one-out kernel conditional mean, and $0 \leq M(\cdot) \leq 1$ is a weight function that serves to avoid difficulties caused by dividing by zero.

2.2.3 Constrained non-neutral TFP growth model

While the semiparametric specification of Li *et al* (2002) is more flexible, the price one has to pay for the flexibility is the higher probability of empirical violations of economic conditions. In estimating a flexible model, one cannot guarantee positive estimates of input elasticities for each observation. Negative input elasticity implies negative marginal products, which is counter-intuitive. To overcome this shortcoming, we propose a constrained semiparametric smooth coefficient model, where we are able to guarantee that all the input elasticity estimates are non-negative. To do this, we rewrite (14) as

$$\hat{\gamma}(z) = \sum_{i=1}^n A_i(W_i, Z_i, z) Y_i \quad (15)$$

where $A_i(\cdot) = \left[\sum_i W_i W_i' K_h(Z_i, z) \right]^{-1} W_i K_h(Z_i, z)$. The idea of imposing the observation-specific constraints is simply re-weighting each observation of the dependent variable, Y_i . To do this, we rewrite (15) as

$$\hat{\gamma}(z) = n \cdot \sum_{i=1}^n A_i(W_i, Z_i, z) \cdot p_u \cdot Y_i \quad (16)$$

where $p_u = n^{-1}$ denotes the uniform weights. The unconstrained semiparametric smooth coefficient estimator is given in (16). To impose the constraints, we can write the constrained estimator as

$$\hat{\gamma}^*(z) = n \cdot \sum_{i=1}^n A_i(W_i, Z_i, z) \cdot p_i \cdot Y_i \quad (17)$$

where $\hat{\gamma}^*(z)$ denotes the constrained smooth coefficient estimator, p_i denotes the observation-specific weights, and $\sum_i p_i = 1$. To select optimal p_i , we follow the Racine *et al* (2011) approach and minimize the L_2 norm criterion function:

$$\sum_i (p_i - p_u)^2 \quad (18)$$

subject to $\hat{\beta}(z) \geq 0$

This is a quadratic programming procedure. We used the *quadprog* package in *R* to solve for optimal p_i . Since we observed some economic violations (i.e., negative marginal product) in our application, we applied this approach to impose the constraints on each smooth coefficient.³

3 Data

For the empirical exercise, we bring together data from three different sources. The firm-level data on measures of output and input, size and ownership are obtained from the World Bank Enterprise Surveys which collect data from manufacturing sector firms from around the world. The surveys use standardized survey instruments, making data from different countries comparable. We pool together cross-section data sets from countries that were surveyed between 2002 and 2005. Nominal variables used for the estimation of the production function were converted into real US dollars, thereby making them comparable across the countries.

The firm level data set also gives us our measure of firm size which is a categorical variable that ranks firms on a 5-point scale. The categories themselves are based on the number of employees. It also gives us our control for ownership. We have continuous data for proportion of a firm that is owned by the state, domestic private investors and foreign investors. However, with a few exceptions, the largest shareholder of each firm whether the state, domestic private or foreign owned close to 100 percent of the shares. Hence, instead of using the continuous

³R codes for imposing these constraints are available from the authors upon request.

variables, we use dummy variables to indicate the type of the controlling owner. Since fewer than 2 percent of domestic firms are state owned, it is meaningless to distinguish between state-owned and privately-owned firms. We, therefore, control for foreign ownership alone. In our sample, 4.5 percent of the firms are foreign owned.

We merge this firm level data with country level measures of institutional quality from two different sources. We use two measures of labor market institutions, as reported in Botero *et al.* We use an index of employment protection that captures the degree of labor market flexibility, with a larger index value indicating greater restrictions or, conversely, lesser flexibility. We also use an index that captures the extent of protection provided to employees against old age, death and disability, sickness and health care coverage, and unemployment benefits, i.e., the degree of protection provided by social safety nets. The value of the index increases with the extent of protection.

Finally, as a measure of the quality of the business environment, we use the indices of institutional quality provided by the Heritage Foundation (see Johnson *et al.*, 1998; Klapper *et al.*, 2004). The index ranges in value from 0 to 100, with institutional quality or quality of business environment increasing in the value of the index. The components of the index, which includes sub-indices capturing environmental factors such as the degree of property rights protection and the extent of corruption, are highly correlated with each other, and the index is also correlated with other measures of institutional quality such as the Corruption Perception Index published by Transparency International. Hence, we use the overall index of economic freedom as opposed to the sub-indices.

Our data are limited in part because of missing information in the World Bank Enterprise Survey data, and in part because the Botero *et al.* (2004) paper does not provide measures of labor market institutions for all countries. An outcome of this limitation is that for most individual industries we either have relatively small samples, or little cross-sectional variation with respect to countries. Since the focus of our analysis is the impact of institutional quality on firm performance, and given that measures of institutional quality are only available at the country level, our sample has to be spread across a fair number of countries. At the same time, it is stylized in the literature to estimate production functions separately for individual industries, based on the reasonable assumption that the marginal impact of factor inputs on

output vary across industries, such that we require a reasonably large sample for each industry that is analyzed. Only one industry – textiles and garments – meet both these criteria. It gives us a cross-section of 1625 firms, spread across nine developing countries: Brazil, China, Egypt, India, Indonesia, Malawi, Pakistan, South Africa and Zambia.

The textiles and garments industry however has characteristics that are quite suitable for our analysis. To begin with, it is an industry in which developing countries have comparative advantage. Recent estimates suggest that the ratio of the share of textiles and garments in exports of individual developing countries to the ratio of textiles and garments in world exports is significantly greater than one for many developing countries, indicating that developing countries have a comparative advantage in these products (Nordås, 2004).

INSERT Table 1 about here.

At the same time, the nine countries in our sample also have quite different levels of institutional quality (Table 1). Consider, for example, economic freedom, which is our measure of the quality of the business environment. At one extreme we have a country like South Africa with an index of economic freedom that is 67.1, very close to the threshold of 70 for mostly free countries, and at the other end we have India with an index value of 51.2, just above the threshold of 50 below which lie the repressed countries. The indices capturing the quality (or nature) of labor market institutions too vary significantly across the countries. At the one extreme, we have countries such as South Africa (1.04) that have quite flexible employment laws, and at the other extreme we have countries such as Brazil (2.40) where there is a fair degree of rigidity. Similarly, in countries like Malawi (0) and Zambia (0.32) there is very little (or no) protection for laborers in the form of social safety nets, and, at the other extreme, countries like China (2.24) and Egypt (2.22) provide a fair degree of protection.

In other words, even though difficulties with the data require us to focus on one industry, the chosen industry is one in which developing countries have comparative advantage, such that it is important for export growth (and consequently employment generation) in these countries. It is sufficiently large to provide significant variations across firms with respect to characteristics such as size and ownership. It also includes data from nine countries that are significantly different with respect to the quality (or nature) of their institutions. In other words, there is a fair degree of variation in the values of Z vectors of the firms in our sample. Our empirical exercise,

discussed below, should therefore provide us with strong *prima facie* evidence about within and between country variations in the impact of institutional quality on firm performance, our proxy for performance of microeconomic agents within the economy.

4 Regression results

The regression results are reported in Table 2. To recapitulate, in neutral TFP model, the intercept term is treated as a nonparametric function of institutional quality and firm characteristics variables such as age, size and ownership. Hence, there is a separate estimate of the intercept term for each observation. However, the coefficients of the factor inputs, namely, materials, labor and capital do not vary across observations. On the other hand, in the SPSC model, the coefficients of the factor inputs are also treated as nonparametric functions of the institutional variables and firm characteristics. Hence, the estimates of the coefficients of the factor inputs (and hence also the estimates of returns to scale) are observation-specific so long as the Z variables are observation-specific. In Table 2, therefore, we report the distributions of the aforementioned estimates.⁴ The coefficient estimates suggest that the returns to scale for the median firm is 1.00, which is consistent with our expectations about returns to scale of mature industries. The estimates also indicate that the median marginal contribution of capital to the output firm is less than those of labor and material inputs, which is consistent with selective evidence about significant investment in physical capital – specifically, power looms – in textiles industries in developing countries (Bhaumik *et al*, 2008). Importantly, it is immediately obvious that there is a fairly wide range of values for the estimated coefficients, even within a single 3-digit industry, such that the use of a point estimate for the *average* (or the median) firm is not very meaningful.

INSERT Table 2 about here.

In Figure 1, we plot the averages of marginal impact of institutional quality on (log) output for each country in the sample, against institutional quality in these countries. We do so to focus on heterogeneity of inter-country differences. Note that since the dependent variable is in log and the institutional variables are indices, the marginal effects (when multiplied by 100) can

⁴When the model is estimated without imposing constraints to make the estimated marginal products non-negative, we find 0.53% violations for β_1 , 6.86% for β_2 , 2.44% for β_3 .

be interpreted as percentage changes. In panel (a) of the figure, we plot the Botero *et al* (2004) index of employment law, one of our measures of institutional quality, along the horizontal axis, and the estimated marginal impact of this index on (log) output along the vertical axis. In panel (b), we have the Botero *et al.* (2004) index for social security along the horizontal axis, and in panel (c) we have the Heritage Foundation index for economic freedom. The trend lines fitted to the scatter plots capture the correlation between these marginal impacts and institutional quality.

INSERT Figure 1 about here.

To begin with, note that, for any level of institutional quality, the marginal impact on the average firm can vary significantly. For example, in panel (a), despite having roughly the same degree of labor market rigidity (around 1.75), the marginal impact of greater labor market rigidity on the average firm is markedly different in Malawi (-0.46), Indonesia (-0.05) and Egypt (0.05). Similarly, in panel (c), despite having roughly the same degree of economic freedom (around 55.5), the marginal impact of an increase in economic freedom on the average firm is noticeably different between Pakistan and Egypt (-0.02) and Indonesia (-0.002). The most plausible interpretation of these observations is that the the marginal impact of a change in the quality of an institution depends on other environmental factors, such that an increase in the quality of any one institution can have the desired impact on firm performance (and hence wider economic performance) only if the other institutions and factors such as firm size and firm ownership are “favorable”.

At the same time, the trend lines fitted to the scatter plots indicate that the marginal impact of a change in institutional quality might be correlated with the current level of institutional quality. For example, the scatter plot in panel (a) suggests that the marginal impact of an increase in labor market rigidity on output growth of the average firm would be greater in a country with a relatively low level of rigidity than in a country with a relatively high level of rigidity. Similarly, the scatter plot in panel (c) suggests that the marginal impact of an increase in economic freedom on output growth of an average firm would be higher in countries where economic freedom is high than where economic freedom is low, i.e., the gains from increase in economic freedom increases at an exponential rate as the level of this freedom increases. The observation about the relationship between the marginal impact of an increase in economic

freedom and the level of economic freedom itself is largely consistent with the conventional wisdom that is based on results derived from variations of equation (2). But the implication for the impact of an increase in labor market rigidity is not as clear. In our case, the marginal impact of an increase in this rigidity on the output growth of the average firm is *positive* for countries with low levels of rigidity, i.e., firms in these countries could benefit from greater labor market rigidity. This observation runs counter to the conventional wisdom about the impact of labor market rigidity, but is perfectly plausible if a low level of labor market rigidity reflects the presence of a widespread informal sector, and if replacement of informal with formal sector inevitably increases labor market rigidity.

Observation 1. *The impact of an increase in institutional quality on firm performance may be non-monotonic and non-linear. In some cases, benefits (measured, for example, as output growth) can be substantial but only if the level of institutional quality exceeds some threshold. In some other cases, by contrast, firms may benefit from what conventional wisdom would suggest is a reduction in institutional quality.*

INSERT Figure 2 about here.

Thus far, we have focused on the marginal impact of changes in institutional quality on the average firm in the countries in our sample. However, from Table 2, we have already noted that there can be considerable variations in the marginal impact across firms within each country. To recapitulate, our methodology allows us to estimate the marginal impact of a change in institutional quality on output growth of every firm in the sample. Therefore, in Figure 2, we highlight the distributions of the firm level marginal impact of institutional qualities (on output) for each of the countries in the sample. The vertical lines represent the distributions of the firm level marginal impacts in each of the countries, and the red horizontal lines indicate the means of the distributions that were used to generate the scatter plots in Figure 1. Consider now panel (a), in which we highlight the distributions of the marginal impact of labor market rigidity. Brazil, India and Indonesia have very similar average values of the marginal impact, even though the underlying distributions are very different. Similarly, in panel (c), the averages of the marginal impact of economic freedom (on output) are very similar for Malawi, South Africa and Zambia, even though their underlying distributions are very different. These graphs also suggest that it is perhaps not meaningful to focus on inter-country differences in the impact

of institutional quality on economic performance of micro agents; intra-country variation in this impact could be much greater than inter-country differences in the average impact.

Observation 2a. *The focus on the average impact of a change in institutional quality on firm performance may be misleading. One has to consider the entire underlying distribution of the impact of this change on firm level performance.*

Observation 2b. *Intra-country variations in the marginal impact of institutional quality on firm performance may be greater than inter-country differences in the averages of these underlying country level distributions.*

INSERT Figure 3 about here.

We then focus on the non-neutral model and, in Figure 3, we highlight the distributions of the estimated firm-specific coefficients of the (log) labor and (log) capital variables (which are labor and capital elasticities), and the associated firm-specific returns to scale. The input elasticities are often interpreted as input share (cost share of inputs to the total value of output), which holds under profit maximization behavior in a competitive market conditions (inputs and output). The graphs once again demonstrate that there is considerable intra-country variation in these estimates, in part reflecting the co-existence of smaller and less efficient firms and larger efficient firms that has been discussed in studies about textiles industries in these countries (e.g., Bhaumik *et al*, 2008). The graphs also suggest that both intra- and inter-country variations in the labor elasticity (share) is much greater than variations in the capital elasticity (share) and in the estimates of returns to scale. This observation suggests that international trade in capital goods may have led to convergence in productivity of capital across countries (at least on average). It also suggests that since labor is less mobile across countries and is also more heterogeneous both within and between countries, greater heterogeneity in labor productivity persists within and across countries.

Observation 3. *There is greater intra- and inter-country heterogeneity in the firm level labor productivity, than in the productivity of capital and returns to scale at the firm level.*

INSERT Figure 4 about here.

Next, as in Figure 1, we plot the averages of marginal impact of institutional quality on output growth for each country in the sample, against institutional quality in these countries. However, to recapitulate, in the non-neutral model, we take into consideration not only the direct impact of a change in institutional quality on output through changes in total factor productivity, but also the indirect impact through changes in the efficiency with which factor inputs are used. It is easy to see that once these indirect effects are taken into consideration, some of the key results derived from Figure 1 are reversed. For example, the scatter plot in panel (a) of Figure 4 suggests that the marginal impact of an increase in labor market rigidity on output growth of the average firm would be *greater* in a country with a relatively *high* level of rigidity than in a country with a relatively low level of rigidity. By contrast, the scatter plot in panel (c) suggests that the marginal impact of an increase in economic freedom on the output growth of an average firm would be higher in countries where economic freedom is low than where economic freedom is high, i.e., the gains from increase in economic freedom increases at a diminishing rate. The implications of these reversals of results, relative to those reported in Figure 1, are significant. If, as in our case, the marginal impact of an increase in labor market rigidity is positive for higher levels of rigidity and negative for lower levels of rigidity, policymakers can aim to raise the level of this rigidity beyond some threshold and benefit from further tightening of employment laws thereafter. At the same time, the benefits from increasing economic freedom beyond some threshold may not be significant. In other words, the results based on the non-neutral model raise considerable doubts about the conventional wisdoms about what constitutes the desirable direction of change and level of institutional quality.

Observation 4. *Once both the direct impact of a change in institutional quality on firm performance through total factor productivity and the indirect impact through impact on efficiency of use of factor inputs are taken into consideration, the conventional wisdom about the desirable direction of change and level of institutional quality requires re-evaluation.*

INSERT Figure 5 about here.

Finally, in Figure 5, we highlight the intra-country distributions of the marginal impact of institutional quality on output growth of firms, for the non-neutral model. As in the case of Figure 2, for each country in the sample, the vertical lines represent the range of marginal impact on firm level output growth, and the red horizontal lines represent the averages of

these distributions. These graphs confirm that intra-country variations within the distributions of the marginal impact of institutional change on firm performance are greater than inter-country differences in the associated averages. We tested the non-neutral model where all the coefficients are nonparametric functions of the Z variables against a parametric model where all the coefficients are linear parametric functions of the Z variables. Both models capture observation-specific coefficients. However, the consistent model specification test proposed by Li et al. (2002) showed that the non-neutral model is preferred for our application.

5 Conclusion

In this paper, we use a novel econometric approach to examine the impact of institutional quality on firm performance in the textiles industry, across nine developing countries. Our approach has two major advantages. First, we are able to estimate the marginal impact of institutional quality on individual firms. Second, we are able to estimate not just the direct impact of institutional quality on firm performance – output growth, in our case – but also the indirect impact by way of the efficiency with which factor inputs are transformed into output. Our results, which we discuss in the previous section, suggest the following:

- There is considerable intra-country variation in the marginal impact of institutional quality on firm performance (i.e., output). Since, at any given point in time, institutional quality is the same for all firms within a country, certainly for a given industry, this implies that, *ceteris paribus*, institutional quality does not have the same impact on the performance of all firms. In other words, while an improvement in institutional quality can enhance performance of some firms, the impact may be low or indeed negative for many other firms. This suggests that improvement in the quality of institutions may not be *sufficient* for enhancing firm performance (measured in terms of change in output).
- Conventional wisdom about the desirable direction of changes in institutional quality, as well as desirable levels of quality, requires re-evaluation. Our results indicate, for example, that an increase in labor market rigidity may actually have a positive impact on output growth of firms, if the level of rigidity is already fairly high. This is consistent with the literature on the impact of labor market rigidity on training. At the same time, we find

that an increase in the degree of economic freedom may not have a significant impact on output growth of firms once this freedom exceeds some threshold.

- While differences in institutional quality can affect the efficiency with which all factor inputs are converted into output, and indeed the returns to scale at the firm level, the efficiency of labor inputs are most affected. This is evident from Figure 3. Hence, if policymakers have to prioritize the list of institutional deficiencies that they should address, the institutions that can affect labor productivity may have to be given top priority.

Our analysis does provide strong *prima facie* evidence that the issue of the impact of changes in institutional quality on economic performance at the micro level requires closer examination, especially in the context of policy decisions about desirable level and direction of change of various institutions.

References

- [1] Acemoglu, Daron & Johnson, Simon (2005). Unbundling institutions, *Journal of Political Economy* **113**, 949-995.
- [2] Acemoglu, Daron & Shimer, Robert (2000). Productivity gains from unemployment insurance, *European Economic Review* **44**, 1195-1224.
- [3] Arulampalam, Wiji & Booth, Alison L. (2002). Training and labour market flexibility: Is there a trade off? *British Journal of Industrial Relations* **36**, 521-536.
- [4] Bhaumik, Sumon Kumar & Estrin, Saul (2007). How transition paths differ: Enterprise performance in Russia and China, *Journal of Development Economics* **82**, 374-392.
- [5] Bhaumik, Sumon Kumar, Gangopadhyay, Shubhashis & Krishnan, Shagun (2008). Policy, economic federalism, and product market entry: The Indian experience, *European Journal of Development Research* **20**, 1-30.
- [6] Botero, Juan *et al.* (2004). The regulation of labor, *Quarterly Journal of Economics* **119**, 1339-1382.
- [7] Commander, Simon & Svejnar, Jan (2011). Business environment, exports, ownership, and firm performance, *Review of Economics and Statistics* **93**, 309-337.
- [8] Dasgupta, Partha (1993). *An Inquiry into Well-Being and Destitution*, New York: Oxford University Press.
- [9] Dollar, David, Hallward-Driemeier, Mary & Mengistae, Taye (2005). Investment climate and firm performance in developing countries, *Economic Development and Cultural Change* **54**, 1-31.
- [10] Eichengreen, Barry & Iversen, T. (1999). Institutions and economic performance: Evidence from the labour market, *Oxford Review of Economic Policy* **15**, 121-138.
- [11] Griffith, Rachel, Redding, Stephen & Van Reenen, John (2004). Mapping the two faces of R&D: Productivity growth in a panel of OECD industries, *Review of Economics and Statistics* **86**, 883-895.

- [12] Johnson, Simon, Kaufman, Daniel & Zoido-Lobaton, Pablo (1998). Regulatory discretion and the unofficial economy, *American Economic Review* **88**, 387-392.
- [13] Katz, Lawrence & Meyer, Bruce (1990). The impact of the potential duration of unemployment benefits on the duration of unemployment, *Journal of Public Economics* **41**, 45-72.
- [14] Klapper, Leora, Laeven, Luc & Rajan, Raghuram (2004). Business environment and firm entry, Working paper no. 3232, The World Bank, Washington, D.C.
- [15] Levine, Ross (1998). The legal environment, banks and long run economic growth, *Journal of Money, Credit and Banking* **30**, 596-613.
- [16] Li, Qi, Huang, Cliff, Li, Dong & Fu, Tsu-tan (2002). Semiparametric smooth coefficient models, *Journal of Business and Economic Statistics* **20**, 412-422.
- [17] Li, Qi and Racine, Jeffrey (2006). *Nonparametric Econometrics: Theory and Practice*, Princeton University Press.
- [18] Li, Qi and Racine, Jeffrey (2010). Smooth varying-coefficient estimation and inference for qualitative and quantitative data, *Econometric Theory* **26**, 1-31.
- [19] Michie, Jonathan & Sheehan, Maura (1999). HMR practices, R&D expenditure and innovative investment: Evidence from the UKs 1990 workplace industrial relations surveys (WIRS), *Industrial and Corporate Change* **8**, 211-234.
- [20] Nickell, Stephen & Layard, Richard (1999), Labor market institutions and economic performance, In: Ashenfelter, Orley & Card, David (Eds.), *Handbook of Labor Economics*, Volume 3, Elsevier, Chapter 46, pp. 3029-3084.
- [21] Nordås, Hildegunn (2004). The global textile and clothing industry post the agreement on textiles and clothing, Discussion paper no. 5, World Trade Organization, Geneva, Switzerland.
- [22] Racine, Jeffrey, Parmeter, Christopher & Du, Pang(2011). Constrained nonparametric kernel regression: Estimation and inference, Unpublished manuscript, Binghamton University, New York, USA, Downloadable from <http://www.eco.uc3m.es/temp/Racine.pdf>.

- [23] Robinson, Peter (1988). Root-n-consistent semiparametric regression, *Econometrica* **56**, 931-954.
- [24] Saint-Paul, Gilles (2004). Why are European countries diverging in their unemployment experience? *Journal of Economic Perspectives* **18**, 49-68.
- [25] Storm, Servaas & Naastepad, C.W.M. (2007). Why labour market regulation may pay off: Worker motivation, coordination and economic growth. Economic and labour market paper no. 2007/4, Employment analysis and research unit, International Labour Office, Geneva.

Table 1: Measures of institutional quality

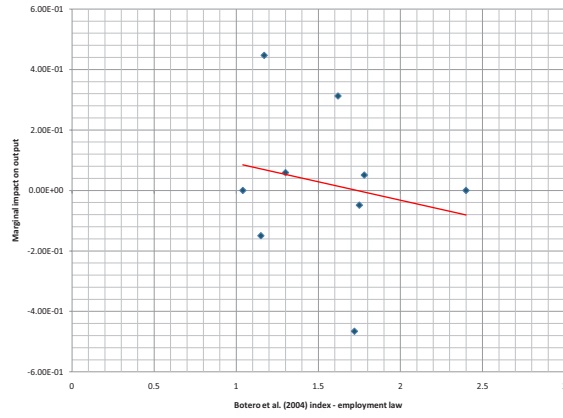
Country	Employment law	Social security	Economic freedom
Brazil	2.40	1.65	63.4
China	1.62	2.24	52.6
Egypt	1.62	2.22	55.5
India	1.30	1.20	51.2
Indonesia	1.75	0.53	55.8
Malawi	1.72	0	54.7
Pakistan	1.17	1.39	55.8
South Africa	1.04	1.69	67.1
Zambia	1.15	0.32	59.6

Table 2: Regression estimates

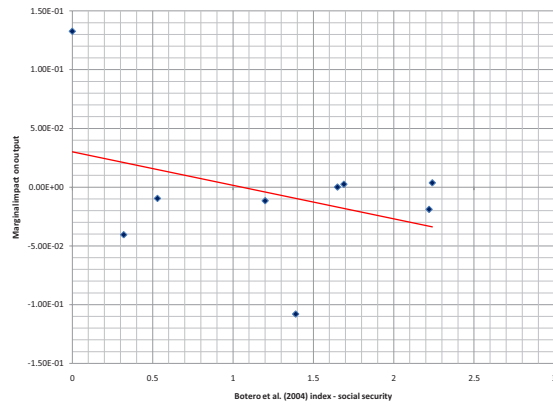
Percentile	Robinson model		SPSC model			Returns to scale
	Intercept	Intercept	(Log) materials	(Log) labor	(Log) capital	
1 st	0.84	0.54	0.12	0.001	0.18e-09	0.78
10 th	1.18	0.89	0.19	0.13	0.08	0.87
25 th	1.28	1.02	0.29	0.31	0.15	0.95
50 th	1.36	1.07	0.39	0.39	0.22	1.00
75 th	1.61	1.48	0.48	0.44	0.24	1.02
90 th	2.58	2.05	0.58	0.59	0.34	1.06
99 th	3.77	3.52	0.73	0.83	0.42	1.20

Figure 1: Impact of institutional quality on output growth (Robinson model)

(a) Employment law



(b) Social security



(c) Economic freedom

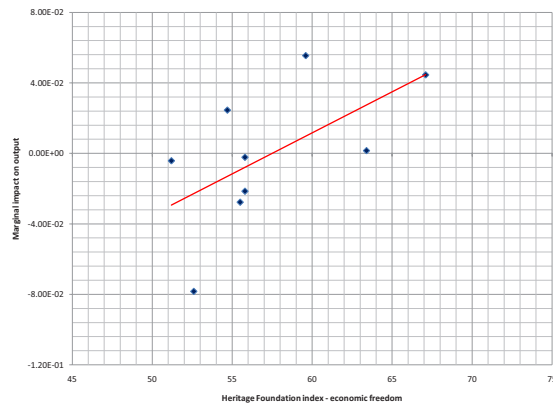
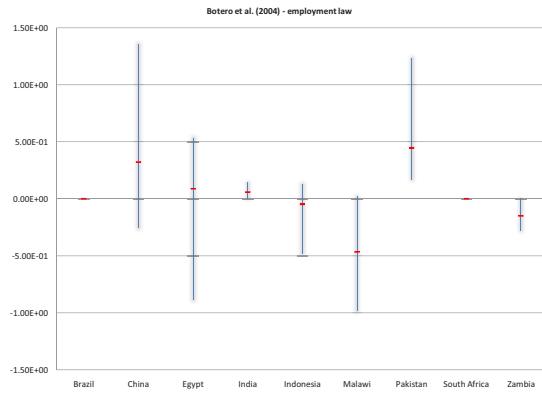
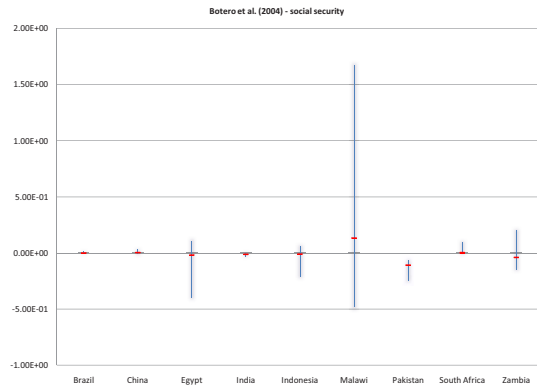


Figure 2: Distribution of marginal impact of institutional quality (Robinson model)

(a) Employment law



(b) Social security



(c) Economic freedom

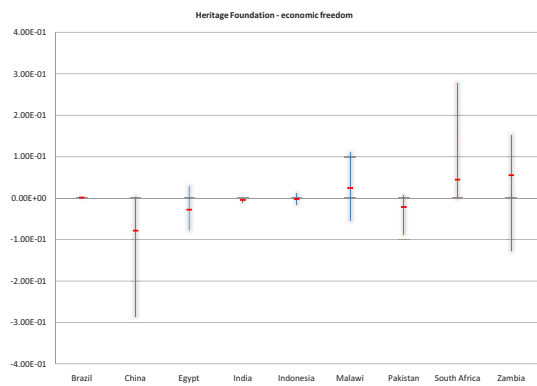
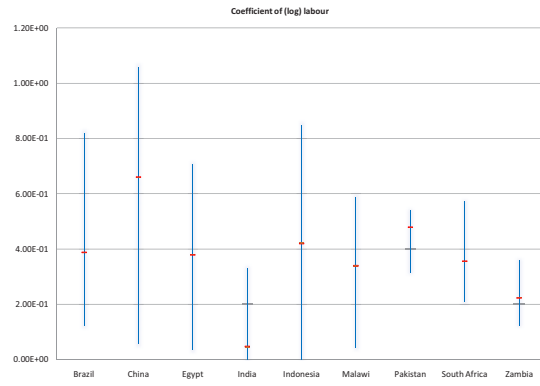
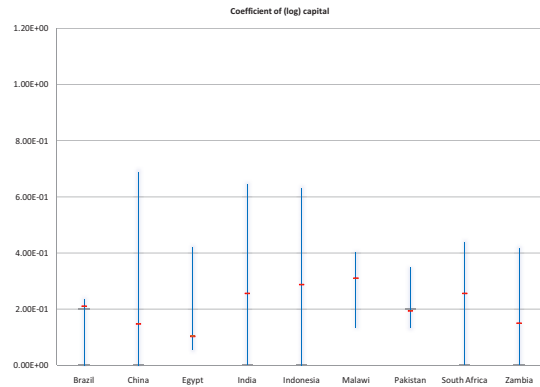


Figure 3: Distribution of coefficient estimates and returns to scale (SPSC model)

(a) (Log) labour



(b) (Log) capital



(c) Returns to scale

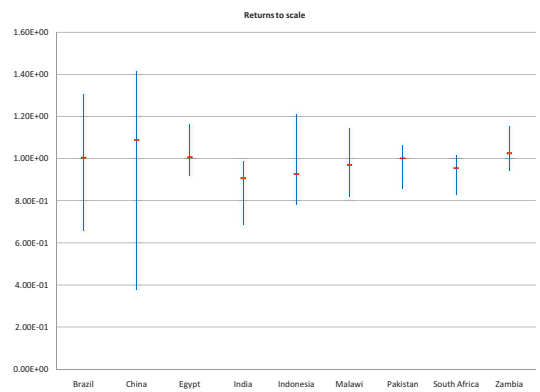
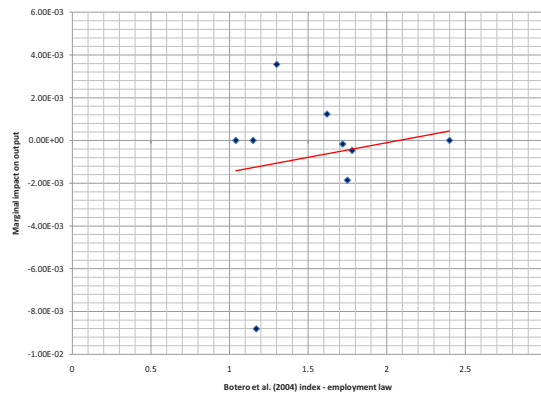
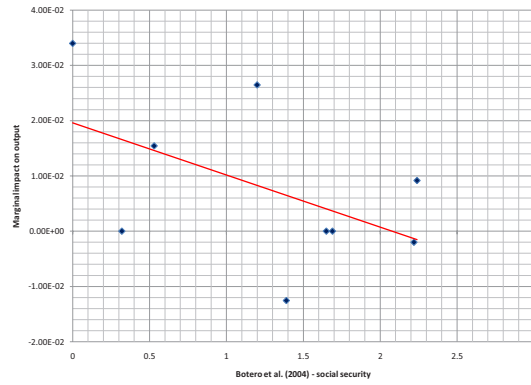


Figure 4: Impact of institutional quality on output growth (SPSC model)

(a) Employment law



(b) Social security



(c) Economic freedom

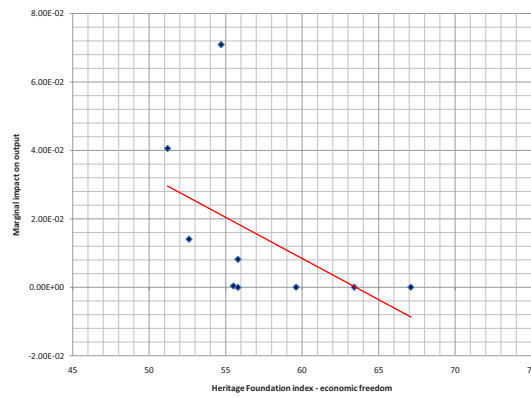
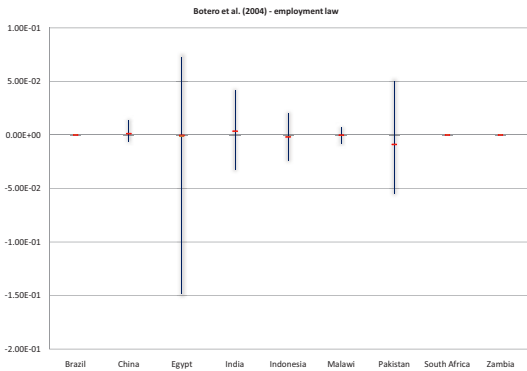
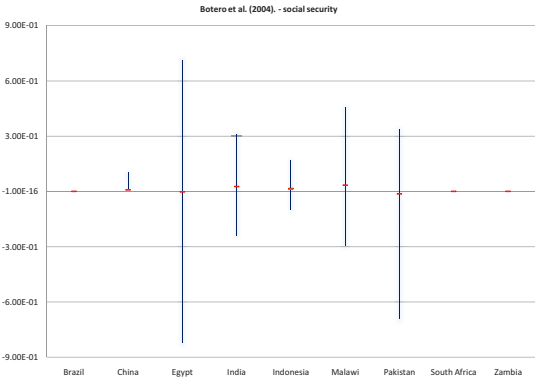


Figure 5: Distribution of marginal impact of institutional quality (SPSC model)

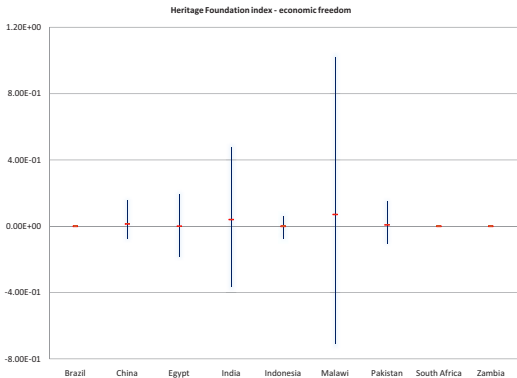
(a) Employment law



(b) Social security



(c) Economic freedom



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