Nobody’s Business but My Own: 
Self Employment and Small Enterprise 
in Economic Development

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ABSTRACT
In most poor countries, small firms and self employment are the dominant forms of business 
enterprise – even in the manufacturing sector. For rich countries, in contrast, self-employed 
people account for very small shares of manufacturing employment and output. This paper 
builds on Lucas (1978) to ask whether structural changes of this kind are driven by 
productivity differences. A model, calibrated to Japanese time series data, is shown to mimic 
key features of cross-country and time series data. The results support the idea that changes in 
aggregate productivity account for much of the cross-country variation in establishment size 
and self-employment rates.

JEL Classifications: O1 (Economic Development); L11 (Production and Market Structure; 
Size Distribution of Firms); J23 (Self Employment)

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1. Introduction

Small businesses dominate the economic life of most developing countries. In Accra and Agra, Dhaka and Dakar, family firms and the self employed account for the bulk of production and employment. This is true not only in agriculture and the service sector, but also in manufacturing. From cramped workshops and backyard foundries emerges an astonishing array of manufactured goods: clothing, footwear, pottery, metal products, processed foods, cement blocks, to name a few. In Ghana, as an illustration, more than 75 percent of the manufacturing workforce reports being self-employed, and fewer than 15 percent of manufacturing workers are employed in establishments with more than 10 workers (Republic of Ghana 1987, 1991).

In most rich countries, by contrast, small enterprises play a relatively minor role in economic activity – particularly in manufacturing. For example, in the United States, manufacturing establishments with fewer than 5 employees accounted for less than 1 percent of the value added in 1997, while firms with more than 500 employees accounted for almost half the value added (U.S. Census Bureau 2002). These data are consistent with a broad range of cross-section and time series evidence suggesting that as countries grow richer, small businesses and own-account work play a diminishing economic role.

What accounts for the differing importance of small firms and the self employed in rich and poor countries? Can a neoclassical model adequately capture the relationship between economic development and the structure of production and employment? Is the small average firm size in poor countries necessarily the outcome of bad policy choices?

This paper attempts to shed light on such questions by analyzing a model that incorporates establishment size explicitly. The model, based on the Lucas span-of-control framework (1978), is explored quantitatively, using parameters drawn from Japanese time series data. The calibrated model suggests that the large differences observed across countries in establishment size and employment structure can be explained to a surprising extent by differences in productivity. Although distortionary policies – such as taxes that

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1 There are a great many small manufacturing establishments; the 1997 Census of Manufacturing reported that firms with 1 to 4 employees represented about one third of all establishments. But these establishments employed only 1.5 percent of the manufacturing workforce and produced only 0.8 percent of value added.
repress the growth of larger firms – undoubtedly play a role in exacerbating these effects, there would be substantial differences across countries even in the absence of distortions. Moreover, the model suggests that it is efficient in poor countries for many lower-skilled people to remain self-employed.

Section 2 of this paper briefly summarizes key facts concerning establishment size and economic growth, along with previous literature. Section 3 presents a dynamic general equilibrium model that is used to address the research questions. Section 4 describes the procedure by which the parameters of the model were chosen and the strategy for using the model to address research questions. Section 5 reports some results of interest, and Section 6 concludes.

2. Background and literature

As early as the classical economists, observers have noted that economic growth is accompanied by a concentration of production in ever-larger units and by a corresponding decline in self employment and family enterprises. In more recent times, empirical work by Kuznets (1966), among others, documented this tendency in cross-country data. Kuznets suggested that one of the principal “characteristics of modern economic growth” was a series of shifts in the structure of production: from small to large firms; from self employment to wage work; and from unincorporated enterprises to large corporations. A number of types of data reinforce this view today.

The International Labor Organization reports national-level data on the employment status of manufacturing workers for more than 50 countries for the years 1988-93 (ILO 1993). Table 1 shows the ratio of employers and own-account workers (a single category in the data) to all workers, in all countries with available data. (For convenience, denote this as the “entrepreneur-workforce ratio.”) The data indicate clearly that in poor countries, relatively large proportions of the workforce are employers or own-account workers. Few people in poor countries work for wages – even in the manufacturing sector.\(^2\) Clearly this is

\(^2\) For the most part, this paper will focus on the data for manufacturing alone, as a way to control for differences across countries that arise due to differences in the sectoral composition of output. Furthermore, note that the ILO data combine “entrepreneurs” and “own-account workers” in a single category; it is not possible to distinguish between the two. Finally, note that the data implicitly treat two other categories of workers, “unpaid
not true in rich countries. In the United States, the entrepreneur-workforce ratio for manufacturing was less than 0.02. In Bangladesh and Nigeria, by contrast, the ratio was almost 0.80. Although some rich countries, such as Italy, are known for having vital small business sectors, these are relatively modest outliers: there is a surprisingly close relationship between per capita product and the entrepreneur-workforce ratio. The cross-section data thus support the idea that fundamental differences exist at the establishment level between today's poor and rich countries.

Although it is difficult to obtain time series data that reflect the same range of income per capita as the cross section, the experiences of a few rapidly growing countries suggest that the time series data are broadly consistent with the cross section. Table 2 shows time series data for Japan (ILO 1940, 1990, 1993). Similar data are available for other countries. Both in the time series and the cross section, the data reveal a pronounced negative relationship between real per capita GDP and the entrepreneur-workforce ratio.

What accounts for the profusion of small firms in poor countries? Is it an efficient arrangement of economic activity in countries where productivity is low? Or is it an archaic (and presumably inefficient) feature of societies where the market has not fully taken root? Alternatively, is it a response to distortionary policies that penalize large firms and discourage small ones from expanding?

Within the development literature, there is a longstanding recognition that small firms are important in poor countries. In addition to Kuznets, Hirschman (1958), Rostow (1960), Lewis (1965), and many of their contemporaries recognized that structural changes in employment and firm size were a central feature of economic growth. However, as Fafchamps (1994) points out, these authors implicitly viewed heterogeneity of firm size in developing countries as a disequilibrium phenomenon, with small firms destined to vanish as economies eventually adjusted to new technologies requiring a larger scale of production.

Within the more recent literature on development, a number of authors have focused on the empirical determinants of self employment and the constraints to firm growth. Biggs and Srivastava (1996) draw on a number of surveys to characterize manufacturing

family laborers” and “those not classifiable by status” as employees, rather than employers. In the data, and in the model economy below, these individuals are treated as workers rather than as self employed.
enterprises in Africa. Liedholm and Mead (1999) and Tybout (2000) assess the literature on manufacturing firms in developing countries. These papers acknowledge that small firms are important, but the general view is that the smallest firms are relatively unproductive and would fade in importance if market failures and regulatory obstacles were removed.

3. **A model of establishment size**

To account for the observed abundance of small firms in poor countries, we need a model in which firm size is defined and in which productivity levels can vary. Standard models of neoclassical growth assume constant returns to scale at the level of the firm. As a result, these models do not address questions of establishment size.

Within the literature on industrial organization, there is a substantial body of theory on the nature of the firm and on firm size. (See, for example, Coase 1937, Stigler 1968, Alchian and Demsetz 1972, Williamson 1985 and 1989, Holmström and Tirole 1989, and Hart and Moore 1990.) These models, however, have little to say about changes in firm size in the course of economic growth. Kremer (1993) offers an explanation for firm-size differences across countries. In his model, firm size depends on the complexity of production processes and the distribution of skills among workers. In this view, low-skill economies tend to have small firms producing goods of low technological complexity.

3.1 **Firm size in the Lucas framework**

An alternative approach is proposed by Lucas (1978), who points out that a distribution of firm size can be generated from heterogeneity in any fixed factor of production. This model has the virtue of allowing for a robust size distribution of firms within a particular industry, even when the workers possess essentially equivalent skill levels. The Lucas framework makes it possible to ask questions about how various fixed factors may affect the size distribution of firms in an entire industry. Some papers using this approach include Evans and Jovanovic (1989), Hopenhayn (1992), Jovanovic (1994), and Lloyd-Ellis and Bernhardt (2000). The model that follows paper draws heavily on the Lucas framework, while embedding it in a dynamic general equilibrium setting that explicitly incorporates self employment.
A lucid explication of this framework is offered in Lucas’s original paper. In this simple model, labor and capital are two variable inputs, hired by entrepreneurs. Individuals differ in entrepreneurial ability, which Lucas models as a fixed factor, exogenously distributed and inelastically supplied. Individuals can choose between two modes of earning a living: either they can work for a wage, \( w \), or they can manage a firm. If they become managers, they forego any wage income and instead receive the rents from operating a technology that displays decreasing returns to the variable inputs. In equilibrium, all individuals with entrepreneurial ability above some threshold value will earn more in rents than they would as wage workers. The equilibrium wage is the one that clears the labor market: at that wage, those individuals who choose to be entrepreneurs will hire precisely the same amount of labor as supplied by the individuals who choose wage work over entrepreneurship.

In Lucas’s model, capital accumulation will make labor more productive and thus tend, all else equal, to increase wages. (It will also increase profits, but proportionally less.) Thus, wage work will become relatively more profitable. As capital accumulates, fewer individuals will choose to manage their own firms, while more choose to work as wage laborers. Thus, there will be progressively fewer firms with larger numbers of employees.

A “firm” in this model consists of an entrepreneur, a technology, and some workers. This may not be a good model for thinking about industrial organization in an economy with extensive subcontracting, or about conglomerates that consist of many separate production entities. But it may be a useful way to think about plant size, and it seems particularly useful in thinking about the small firms that proliferate in poor countries: tailor shops, carpenters, metal fabricators, and others. Why do some individuals work for themselves, while others run firms with five, six, or twenty employees? Why does the distribution of firm size differ across economies?

### 3.2 A model with self employment

To address these questions, this paper considers a set of model economies in which the size distribution of firms is determined by a Lucas span-of-control framework. All of the model economies are identical except in terms of their exogenously fixed productivity levels. Each economy grows over time through the accumulation of capital, but there is no
technological progress within any economy. Each economy thus converges to a Solow-type steady state. Much of the analysis that follows compares steady states across economies.

Within each economy, there is a single sector producing a composite good that can be consumed or used as capital. People in the model economy differ \textit{ex ante} only in their entrepreneurial ability. Because self employment is an important feature in the data, I add this as an explicit alternative to the Lucas framework. Thus, in each period, people can choose among three alternative forms of employment: wage work, self employment, and full-time entrepreneurship. Workers receive the market wage, \( w \), while full-time entrepreneurs receive the rents from operating a firm. The self-employed divide their time between physical production and other entrepreneurial activities needed for operation of an establishment. They receive some entrepreneurial rents as well as a return to labor effort. Individuals make their employment decisions in such a way as to maximize earnings. (They are indifferent, in terms of utility, between the three uses of their time).

The intuition of the Lucas model holds in these economies. Those individuals with the highest entrepreneurial ability will become full-time managers, while those with the lowest levels will work for wages. People with intermediate levels of ability can split the difference. Self employment allows them essentially to be part-time workers and part-time managers. The opportunity cost of foregone labor is lower than for full-time managers, but the size of their firms is limited in a way that makes this option unattractive for the most highly skilled managers.

Formally, in each model economy, there is a measure one of infinitely-lived people, indexed on the interval \([0, 1]\) by entrepreneurial ability, \( x \). There is a distribution \( \Delta(x) \) over skill types. Preferences are defined over lifetime consumption streams \( \{c_i(x)\}_{t=0}^{\infty} \) by:

\[
U = \sum_{t=0}^{\infty} \beta^t u(c_i(x))
\]

In addition to skills, individuals are endowed with one unit of labor in each time period, which is supplied inelastically; and with \( k_0 \) units of initial capital. For simplicity, both initial capital and the skill distribution are taken as identical across all economies.
At each date, a single good is produced; this can be consumed or saved as capital to be used in the next time period. Production can take place in two types of establishments: those operated by full-time entrepreneurs and those operated by the self-employed. In either type of establishment, an individual’s entrepreneurial ability, \( x \), determines the output attained from given levels of capital and labor. Thus, the entrepreneur’s choices of \( n \) and \( k \) depend on her level of entrepreneurial ability, \( x \). Optimal establishment size thus varies across individual entrepreneurs.

The two types of establishments differ in two respects. First, the self-employed face a size restriction on their firms: they may use no more than \( \alpha \) units of labor input, where \( 0 \leq \alpha \leq 1 \). This reflects the time constraint faced by the self-employed. Second, self-employed entrepreneurs have an advantage in managerial efficiency, relative to full-time entrepreneurs. This reflects the substantial incentive advantage that the self-employed face with respect to labor supervision. Specifically, this advantage is represented by a scalar term \( A_{SE} \) that enters multiplicatively into the managerial technology.

An individual of type \( x \) who is a full-time manager of a firm with \( n \) workers and \( k \) units of capital in country \( i \) produces output:

\[
y = x A_i \left[ f(n,k) \right]^\theta,
\]

where \( f \) is constant returns to scale, increasing, and concave in each argument, and where \( 0 < \theta < 1 \). The parameter \( \theta \) reflects the fact that production displays decreasing returns to scale in capital and labor, due to the fixed factor (entrepreneurial ability).

An individual of type \( x \) who is self-employed produces output according to the production function:

\[
y = x A_{SE} A_i \left[ f(n,k) \right]^\theta
\]

where \( f \) and \( \theta \) are the same as above and \( 0 \leq n \leq \alpha \leq 1 \). As noted above, the parameter \( A_{SE} \) is an indicator of productivity in establishments operated by the self-employed, relative to
productivity in establishments operated by full-time entrepreneurs. Note that $A_{SE}$ is modeled as invariant across countries.

### 3.3 Occupational choice

An individual in this economy chooses the type of employment that will maximize income. The returns from wage work are simply $w_i$, which the individual takes as given. All individuals are homogeneous as wage workers; differences in entrepreneurial ability do not alter labor productivity. The individual compares this wage with potential earnings from self employment or full-time management, which are determined as follows.

The returns from self-employment consist of entrepreneurial rents as well as the market value of the time available for labor. Thus, a self-employed individual earns $\pi_{SE}^x(x)$, where this income includes returns to labor as well as rents:

$$\pi_{SE}^x(x) = \max_{\alpha, k} xA_{SE} A_i \left[ f(n_i, k_i) \right]^{\alpha} - r_i k_i + w_i (\alpha - n_i)$$

(4)

Note that the self-employed forego $(1 - \alpha)$ units of time to manage their enterprise; of the remaining $\alpha$ units, they may hire out any labor that is not used in their own enterprises. This reflects the fact that many self-employed people operate their own businesses on a part-time basis, while also hiring out labor to other enterprises.

An individual who operates a firm as a full-time manager will receive only the entrepreneurial rents. These individuals use their entire time endowment to manage firms and thus receive no wage income. Thus, a full-time manager with ability level $x$ earns income of:

$$\pi_{FT}^x(x) = \max_{\alpha, k} x A_i \left[ f(n_i, k_i) \right]^{\alpha} - w_i n_i - r_i k_i$$

(5)

### 3.4 Consumer’s problem

Having chosen an employment option to maximize income, the individual faces a straightforward problem in allocating this income to consumption and to savings.
Denote the individual's maximum income from employment in a given period as:

\[ \pi_i(x) = \max \{ w_i, \pi_i^{SE}(x), \pi_i^{FT}(x) \} \] (6)

The individual's decision rules can be represented by marker functions. Let \( m_i(x) = 1 \) if the individual earns maximum income from full-time management, and let \( m_i(x) = 0 \) otherwise. Similarly, let \( s_i(x) = 1 \) if the individual earns maximum income from self-employment, and let \( s_i(x) = 0 \) otherwise.

The problem of a consumer with entrepreneurial ability \( x \) can be written as:

\[
\max_{c_t, n_t, m_t, s_t} \sum_{t=0}^{\infty} \beta^t u(c_t(x))
\]

\[
\text{s.t. } c_t(x) + k_{t+1}^s(x) \leq (1 + r_t - \delta) k_t^s(x) + \pi_t(x)
\]

\[
c_t(x), k_t^s(x) \geq 0 \quad \forall \ t
\] (7)

where \( k_t^s \) denotes the capital supplied by the consumer (in contrast with \( k_t^d \), which denotes capital demanded by a particular entrepreneur).

3.5 Equilibrium

An equilibrium for this economy consists of sequences:

\( \{c_t(x), n_t(x), k_t^s(x), k_t^d(x), w_t, r_t, y_t(x), m_t(x), s_t(x)\}_{t=0}^{\infty} \forall x \in [0,1] \)

such that:

(i) The consumer's problem is solved for all individuals \( x \in [0,1] \).

(ii) All establishments are maximizing profits, taking prices as given.

(iii) The usual feasibility and market clearing conditions are satisfied, for all \( t \).

The market-clearing condition for the goods market is given in Equation (8), which holds that consumption plus investment must not exceed the sum of production from the self-employed and from establishments operated by full-time entrepreneurs.
On the right-hand side of Equation (8), the first term gives the output of all firms operated by full-time entrepreneurs, while the second term gives the output of the self-employed.

Market-clearing in the wage labor market is given in Equation (9). This condition requires that the demand for wage labor by full-time entrepreneurs must not exceed the supply. In particular, the left-hand side of Equation (9) is the total amount of labor used by full-time entrepreneurs, and the second term gives the supply of wage labor from the self-employed.

Finally, the market for capital services clears when:

\[
\int_{0}^{1} k_i^d(x) d\Delta(x) \leq \int_{0}^{1} k^*_i(x) d\Delta(x)
\]

The structure of the model immediately implies that people's work choices, \( m_i(x) \) and \( s_i(x) \), will be (weakly) monotonic in \( x \). In other words, at each date, there will be two cutoff levels of entrepreneurial ability \( z_{1t} \) and \( z_{2t} \), such that everyone with a skill level below \( z_{1t} \) will work, and everyone with a skill level above \( z_{2t} \) will be a full-time manager, while individuals with intermediate levels of entrepreneurial ability (i.e., \( x \in [z_{1t}, z_{2t}] \)) will be self-employed. For some parameter values, there may be no self-employed people in the economy.

4. Quantitative Experiment

To compute solutions for the model, functional forms must be specified and parameter values assigned. For simplicity, this paper takes \( u(c) = \log(c) \). For the production technology, it uses the standard CES form \( f(n,k) = \left[ \gamma n + (1 - \gamma) k \right]^{\frac{1}{\gamma}} \). Finally, the
distribution for entrepreneurial ability, $A(x)$, is taken to be a symmetric bell shape, which is modeled as a beta distribution, with parameters $a = b = 18$.

The model parameters are chosen to match key features of Japanese time series data. During the 20th century, Japan’s economy has grown at a remarkable rate, and its structural transformation has included striking changes in firm size and the structure of employment. In 1930, for example, almost one-third of Japanese workers were self-employed or full-time entrepreneurs, including 29.1 percent of manufacturing workers. By 1992, only 8.6 percent of manufacturing workers were self-employed. Thus, Japan’s experience over time mirrors the phenomenon observed in comparisons of rich and poor countries today.

Parameter values are chosen so that the model economy will match Japan’s income, capital stock, factor shares, and self employment levels at two moments in time (1930 and 1992). Details are provided in Gollin (2002b). Output from the calibrated model is then compared with data on the Japanese economy. To the extent that the calibration succeeds in replicating key features of the Japanese data, it encourages us to use the model as a tool for considering the cross-country data as well as time series data from other countries.

Most of the parameter values are straightforward. Using standard approaches, it is possible to arrive at a value of 0.0477 for the depreciation rate and 0.9564 for the discount rate, with an implied steady-state value for $r$ of 0.0933.

An important parameter in the model is $\theta$, which gives the returns to scale associated with the CES production function. In the model, the fraction $(1 - \theta)$ represents the share of output retained as rents by entrepreneurs. It is essentially impossible to find macro data that distinguish effectively between entrepreneurial rents and returns to capital, for any economy. There is substantial evidence, however, that capital and labor shares are relatively constant both across countries and over time, with labor shares around 0.65 to 0.70 and capital shares are around 0.20 to 0.25 in many observations. These figures suggest that entrepreneurial returns could be in the neighborhood of 0.10 of output, which corresponds to a value of $\theta = 0.90$. This is the value used in the calibration. Modest changes in the value of $\theta$ have little impact on the qualitative results of the model.

Two additional parameters of interest relate to the production function. The parameter $\gamma$ is the CES “share parameters”, and $\rho$ is related to the elasticity of substitution
between capital and labor. The calibration is quite sensitive to the value of $\rho$; Lucas’s original paper (1978) showed that capital accumulation would result in a declining fraction of entrepreneurs if and only if the elasticity of substitution was less than unity.

For this paper, $\gamma$ and $\rho$ are drawn from aggregate observations for Japan in the 1930s and 1980s, using the first-order condition that:

$$
\frac{\gamma}{1 - \gamma} \left( \frac{rK}{wN} \right) = \left( \frac{K}{N} \right)^\rho,
$$

which given two dates yields two equations in two unknowns. The solution values for the parameters are $\rho = -0.4393$ and $\gamma = 0.3095$. This value for $\rho$ implies an elasticity of substitution between capital and labor of $\sigma = 0.695$, well within the range considered plausible by many economists.

There are two final parameters in the model: the time limit on self-employment labor, $\alpha$, and the managerial efficiency advantage of the self employed, $A_{se}$. The latter of these is not identified separately from the aggregate productivity parameter $A$. Thus, I must calibrate the two parameters simultaneously with my normalization of $A$.

In keeping with the approach that I seek to use for the cross-section analysis, I model the Japanese economies in 1930 and 1992 as representing the steady states of two separate model economies with differing levels of total factor productivity. I normalize $A$ so that the output of the model economy is measured in thousands of real 1985 international dollars. Japan’s output per capita in 1930 was $1,539$, which implies a value for $A$ in this economy of $1.034$. Japan’s output per capita in 1992 was 9.8 times higher, in real terms, than its output per capita in 1930. To attain this magnitude of difference in output per capita in the model economy, I need to set $A$ for the second economy at a value of $5.86$.

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3 The two parameters are, however, separately identified, as they have slightly different effects in the model. Since $\alpha$ essentially places a limit on the time worked by a self-employed person, it can be interpreted as reflecting the opportunity cost of self employment in terms of lost labor income. This becomes a relatively more important effect as wage rates rise in the economy. Thus, lowering the value of $\alpha$, holding everything else constant, is likely to decrease the attractiveness of self employment in all economies – but relatively more so in economies with high wage rates (i.e., high values of $A$). By contrast, $A_{se}$ shifts the advantage of self employment equally across all economies. The two instruments are thus sufficient to match the data.

4 This seems to imply a TFP growth rate of about 2.8 percent annually, which is broadly speaking consistent with Maddison’s estimates of Japan’s long-run TFP growth. Note, however, that my approach here treats the two economies as representing separate steady states, rather than a single economy in which
Given these values for $A$, in addition to the parameter values above, I calibrate $\alpha$ and $A_{se}$ to match the observed rates of entrepreneurship in Japanese manufacturing in 1930 and 1992. The relevant facts are that in 1930, the fraction of employers and own-account workers in the manufacturing workforce was 0.292. In 1992, the fraction was 0.086. To match the data, I find implied an implied value $\alpha$ of 0.425 and a value for $A_{se}$ of 1.31. To provide some interpretation of these numbers, the real-world interpretation is that self employed people use only forty percent of their work time to perform physical production activities (e.g., sewing, hammering, etc.) but are about one-third more productive in terms of TFP than firms of comparable size operated by full-time managers. Although there is no obvious test of these parameters, they both appear to fall within plausible ranges.\textsuperscript{5}

Table 3 summarizes the parameter values used in the quantitative experiments described below.

5. \textbf{Results}

By construction, the calibrated model economy exactly replicates the entrepreneur-workforce ratios for the Japanese manufacturing sector in 1930 and 1992.\textsuperscript{6} Perhaps more surprising, the model economy also reproduces several other features of the Japanese time series data, including factor shares. For example, the employee compensation shares of GDP in the model economy are close to those observed in the data. In 1930, the employee compensation share for the model economy was 0.4080, while the data give a figure of 0.3435. For 1992, the model economy gives 0.6287, while the data show 0.6040.

The model economy does not offer insights into the transitional dynamics of the Japanese economy – a subject of considerable interest in the literature, starting with King and Rebelo (1993), Hayashi (1989), and Christiano (1989), and continuing through Parente

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\textsuperscript{5} This is consistent with a number of observations suggesting that the productivity of small and micro firms is higher than that of larger firms (e.g., Liedholm 1993) or at least comparable (e.g., Tybout 2000).

\textsuperscript{6} To be precise, by “the calibrated model economy,” I mean the entire cross section of model economies, which differ in productivity levels. By focusing on this cross section, I abstract from the transition behaviour of each individual economy. This approach differs also from one in which productivity growth is exogenous and anticipated.
and Prescott (1994), Gilchrist and Williams (2004), and others. These papers focus attention on the behavior of factor prices and shares during the course of Japan’s rapid growth, with an implicit argument that transitional dynamics alone cannot account for the observed patterns of the data. The current paper does not provide insight into these questions, because it focuses on a cross section of steady-state equilibria, rather than on pure transitional dynamics. Essentially by construction, this model economy yields constant rates of return to capital. It does, however, provide some insight into observed factor shares.

Instead of comparing the model to Japan’s time series, then, it is perhaps more informative to compare it with other cross-section and time series observations. The following paragraphs report several different comparisons. First, entrepreneur-workforce ratios from the model economy are compared to time series data for three groups of countries: rapidly growing economies in East and Southeast Asia, OECD countries, and the world’s poor countries. Second, entrepreneur-workforce ratios from the model are compared to cross-section data for all countries with available data. Third, the entrepreneur-workforce ratios from the model are compared to pooled cross-section and time series data from all available observations. Next, similar comparisons are made using factor shares from the model economy and from a number of actual economies. In all these cases, the model economy offers a good representation of the data.

5.1 Entrepreneur-workforce ratios

The model economy is designed to illuminate the relationship between growth and the structure of employment. Thus, it is useful to see how well it succeeds in characterizing the changes observed in a number of rapidly growing economies. Figure 1 shows time series data for the entrepreneur-workforce ratio for the model economy and a number of East and Southeast Asian economies that experienced rapid growth in the period since the Second World War.

The results are striking. The model economy appears to display roughly the same pattern as the data for Thailand and Malaysia, and it parallels the data for Korea. Across this set of countries and over time, there appears to be a relatively uniform trend in the entrepreneur-workforce ratio, and the model economy displays a similar trend. The model’s
predictions are too high, almost uniformly, but the shape of the graph corresponds well to the data.

Does the model perform equally well in matching entrepreneur-workforce ratios from rich countries? For OECD countries in general, the model generally overpredicts the share of entrepreneurs in the workforce for these countries, although it matches the data reasonably well for Denmark and Italy. In general, the model predicts that the fraction of entrepreneurs should remain fairly flat for countries with per capita income in excess of $5,000. This corresponds to time series observations for most rich countries. For poor countries, the model also does a reasonably good job of matching the data.

Consider next the panel created by pooling all available time series and cross section data, as shown in Figure 2. Here, the model’s fit is sufficiently good that the predicted values of the model yield an R-squared value of 0.581 with respect to the actual values, compared to an R-squared value of 0.628 for a polynomial regression of the data on a constant term, real per capita GDP, its inverse, its square, and its cube. Although the model slightly underpredicts the fraction of entrepreneurs in the workforce in poor countries and overpredicts the fraction in rich countries, the model succeeds in capturing the general shape and pattern of the data.

5.2 Factor shares

To some extent, the model has been constructed to match the data on entrepreneur-workforce ratios. It is interesting then to compare its predictions in another dimension: with cross-section and time series data on factor shares.

In the United States and most other rich countries, the wage share of output is often found to be between 0.65 and 0.75, with the capital share generally computed as the residual. The wage share has shown remarkably little variation over time.

Across countries, however, employee compensation as a share of output is substantially lower in poor countries. This is occasionally interpreted as implying that labor shares are lower in poor countries than in rich countries, but in fact employee compensation is only a partial measure of labor income. Part of the income of the self-employed also should be viewed as labor income and included in calculations of the labor share. Gollin
(2002a) argues that the apparent disparities in labor shares are related to differences across countries in the importance of self employment and the corresponding differences in the share of national income accruing to business proprietors. The model presented here helps to account for the observed patterns of factor shares.

Figure 3 shows employee compensation shares of national income across countries and compares data with the output of the model. The model does a reasonably good job of matching the data. Most of the observations from actual economies are relatively close to the path predicted for the model economies. The model slightly overpredicts the employee compensation share, particularly for rich countries, but it shows that changes in productivity alone can generate substantial changes in the share of employee compensation in output.

As with the entrepreneur-workforce data, it is striking that the model predicts relatively flat employee compensation shares for rich countries. This is consistent with the time series data for current rich countries, which show little trend over time in the employee compensation share. At the same time, the model predicts a rapid increase in the employee compensation share for poor countries. Thus, the model’s predictions are consistent with both cross-section and time series data on factor shares.

It is important to note that the behavior of the employee compensation share is not directly determined by the fraction of employees in the economy, since it also depends on wage rates. Thus, the employee compensation share is independent of the data reported above on the fraction of entrepreneurs in the workforce.

Still another variable of interest in the model economy is the fraction of output accruing to the owners of sole proprietorships as operating surplus. Operating surplus is defined as value added less net indirect taxes, less employee compensation, less gross fixed capital formation. For actual economies, the operating surplus of private unincorporated enterprises (OSPUE) is often reported in the national income and product accounts. For the model economy, there is no category of business establishments that directly corresponds to “private unincorporated enterprises.” However, it is reasonable to assume that the establishments operated by self-employed people are both private and unincorporated.

Figure 4 shows the operating surplus of self-employed people in the model economy, as a share of total product. The line representing the model economy is contrasted with data
on OSPUE for a sample of actual economies. The model economy generally understates the observed levels of OSPUE/GDP. Interestingly, however, the model seems to capture the approximate levels and curvature of the data.

6. Conclusions and Implications

Previous theories of development have largely abstracted from questions of establishment size, despite substantial evidence that average establishment size – and particularly the level of self-employment – changes dramatically as economies grow. This paper suggests that a model with explicit treatment of establishment size and self-employment can reproduce a number of disparate features of the data. Not only can such a model mimic the data on entrepreneur-workforce ratios across a wide range of countries, but the model also performs well in explaining cross-country observations of factor shares and other national income accounting statistics.

The model economies do not, of course, fit the data perfectly. This is not surprising, given that the model economies abstract altogether from policies that affect firm size and self-employment rates. The importance of such policies is addressed in Gollin (2003). But given that a model without distortionary policies accounts for about two-thirds of the variation in the cross-section data (as measured by an R-squared of 0.673), it appears that productivity differences across countries may account for much of the observed heterogeneity in firm size and self-employment rates.

This is not to suggest, however, that policies are unimportant. For example, Table 1 shows that Bolivia, with a real per capita GDP of $1,721, had an entrepreneur-workforce ratio almost double that of the Philippines, a country with essentially the same level of real per capita GDP. Policies and regulation may play an important part in accounting for such differences (as in de Soto, 1989).

Nonetheless, the model reminds us that we need not invoke policy distortions to account for the broad prevalence of self employment in poor countries. Even in the absence of distortions, countries like Bolivia and the Philippines should be expected to have higher levels of self employment – and more small firms – than would be found in rich countries.
This insight has important implications for development policies aimed at small enterprises and the informal sector. Policies aimed at favoring large firms over small ones in poor countries, in the interests of promoting “efficiency” or “modernization,” are likely to be misguided. Indeed, any efforts to alter the prevailing size distribution of firms should be appraised critically. There may be value in programs that redress missing markets or remove distortions, such as micro-credit schemes or liberalization of laws that inhibit the formation and expansion of firms. But in the poorest countries, it is unreasonable to imagine that such policies will make the “informal sector” disappear or lead to huge reductions in self-employment rates. Moreover, distortions aimed at altering the size distribution of firms may be costly, in terms of aggregate output, for poor countries.

REFERENCES


Table 1: Proportion of workforce consisting of entrepreneurs, own-account workers, and unpaid family laborers: manufacturing sector and entire economy. Countries are ordered by real GDP per capita.

<table>
<thead>
<tr>
<th>Country</th>
<th>GDP per Capita</th>
<th>Manuf. Sector</th>
<th>Total Labor Force</th>
<th>Country</th>
<th>GDP per Capita</th>
<th>Manuf. Sector</th>
<th>Total Labor Force</th>
</tr>
</thead>
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<td>Central Af. Rep.</td>
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Source: Data on real GDP per capita are taken from the Penn World Tables, Mark 5.6. Figures are given in constant dollar terms, using 1985 as a base year, and following a Chain Index. Data on labor force structure are taken from International Labor Organization Yearbook, 1993.
Table 2: Employers and own account workers as share of manufacturing workforce in Japan.

<table>
<thead>
<tr>
<th>Year</th>
<th>Real per capita GDP</th>
<th>Entrepreneurs as share of manufacturing workforce</th>
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<tr>
<td>1930</td>
<td>1539</td>
<td>0.292</td>
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<tr>
<td>1947</td>
<td>1400</td>
<td>0.163</td>
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<td>1950</td>
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<td>1955</td>
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<td>1960</td>
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<td>1965</td>
<td>4491</td>
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<td>1970</td>
<td>7307</td>
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<td>1975</td>
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<td>0.099</td>
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<td>0.106</td>
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<td>1985</td>
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<tr>
<td>1992</td>
<td>15105</td>
<td>0.086</td>
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Source: ILO Yearbooks of Labour Statistics, various years; PWT v. 5.6; and Maddison (1991).
Table 3: Parameter values for quantitative experiment.

<table>
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<tr>
<th>Parameter</th>
<th>Value</th>
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<td>$\beta$</td>
<td>0.9564</td>
<td>Discount factor</td>
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<tr>
<td>$\delta$</td>
<td>0.0477</td>
<td>Depreciation rate</td>
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<tr>
<td>$\theta$</td>
<td>0.90</td>
<td>Exponent on $g \Rightarrow$ entrepreneur's share $= 0.10$</td>
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<tr>
<td>$\gamma$</td>
<td>0.3095</td>
<td>Labor coefficient in $f$</td>
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<tr>
<td>$\rho$</td>
<td>$-0.4393$</td>
<td>Exponent on $f \Rightarrow \sigma = 0.7016$</td>
</tr>
<tr>
<td>$\Delta(x)$</td>
<td>$\beta(18, 18)$</td>
<td>Distribution of entrepreneurial ability</td>
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<tr>
<td>$\alpha$</td>
<td>0.425</td>
<td>Upper bound on labor input of the self-employed</td>
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<tr>
<td>$A_{SE}$</td>
<td>1.31</td>
<td>Managerial productivity advantage of the self-employed</td>
</tr>
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Figure 1: Employers and own-account workers as share of manufacturing workforce, six East Asian economies and model economy.
Figure 2: Entrepreneurs and own account workers as share of total workforce: panel data and model economy.
Figure 3: Employee compensation as a share of total product, model economy and actual economies.

Source: Data on employee compensation shares in actual economies are taken from United Nations, National Accounts Statistics: Main Aggregates and Detailed Tables, 1992, Parts I and II (New York: United Nations Publishing Division, 1994). Data on real per capita GDP are from Penn World Tables v. 5.6 for 1990 or appropriate year. Data on model economy are taken from model output.
Figure 4: Operating surplus of private unincorporated enterprises for actual economies compared with mixed income of the self-employed for the model economy.