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Apprenticeship Contracts, Small Enterprises, and Credit Markets in Ghana

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Apprenticeship Contracts, Small Enterprises, and Credit Markets in Ghana

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Many studies of manufacturing enterprises in Africa, particularly those focused on small firms, have noted the importance of apprenticeship in the backgrounds of individual entrepreneurs (House, Ikiara & McCormick, 1991; Harris, 1971), as a component of current labor forces (Liedholm & Mead, 1986), and as a mechanism for providing training (Squire, 1981; Berry, 1985). In most of these studies, however, discussions of apprenticeship are incidental to the main subject, and attention has rarely been focused on the institution itself. Although there is a small literature in education and anthropology focusing on the structure and educational content of individual firms' apprenticeship programs, the economics literature includes no systematic portrait of either the prevalence and scope of apprenticeship in manufacturing or the microeconomic details of the contracts involved. This paper begins the process of filling in both those gaps by providing a quantitative assessment of the importance of apprenticeship in Ghanaian manufacturing and presenting an analysis of the contractual relationships between apprentices and employers that characterize this institution.

The analysis of the determinants of the structure of apprenticeship contracts places the institution at the intersection of labor and financial markets, highlighting the relationship between firms' behavior in credit markets and contract choice in the apprenticeship arena. The discussion extends our examination of contracting behavior in manufacturing and of African economic institutions more generally. The growing literature on economic institutions in developing countries provides a strong source of motivation for this work.

A second motivation comes from the role of apprenticeship as a training institution in Africa, where skilled labor is generally considered to be quite scarce. The past two decades have seen a dramatic expansion of educational systems throughout the continent (see Psacharopolous and Woodhall, 1985, and Knight and Sabot, 1990), many of which have included the establishment of government vocational and technical schools geared toward the provision of skilled workers to the manufacturing sector. In many countries these schools exist alongside the traditional apprenticeship system. While a great deal has been written about the expansion of formal education in Africa, with particular attention on evaluating the impact of education on productivity, earnings, inequality, and growth (see Collier and Lal, 1986 and Knight and Sabot 1990) little is known about the role of apprenticeship in generating human capital for the manufacturing sector. Understanding the structure
of apprenticeship contracts is a first step toward an analysis of the usefulness of the institution in skill formation, productivity increase and growth in the manufacturing sector.

This paper takes that first step by creating a descriptive portrait and beginning an institutional analysis using the results of a 1992 survey of 185 manufacturing firms in Ghana. The paper presents three major findings. First, the training of apprentices is both a widespread current activity and part of the training of a large fraction of entrepreneurs and manufacturing workers. A broad quantitative discussion of the incidence of apprenticeship is presented in Section II. Second, there are two primary types of contracts apparent in the data: those in which apprentices pay fees for their training, and those in which they do not. A description of these contracting forms, their importance, and some characteristics of the individuals and firms who participate in them is presented in Section III.

The third finding is that, for those firms training apprentices, the choice of contract type appears to be strongly correlated with other characteristics of the firm, particularly its use of credit. Firms charging fees are more likely to use informal rather than formal sources of working capital, so that apprentice fees are one among many informal sources of firm finance. An analytical framework for the examination of contract choice is presented in Section IV, while Section V includes an application of this framework using the Ghanaian data.

As background for the discussions of the prevalence and structure of apprenticeship contracts, the paper begins with a description of the data and the study from which it is drawn, presented in Section I. Finally, Section VI presents a summary and, most important, raises some questions for future research in this area.

I. The Data

The data used in this study are drawn from a survey of 185 manufacturing firms in Ghana conducted in the summer of 1992. The survey was the pilot study for the Regional Program on Enterprise Development (RPED), a multi-year study of the manufacturing sector in several African countries (Cameroon, Côte d’Ivoire, Ghana, Kenya, Rwanda, Burundi, Tanzania, Zambia and Zimbabwe). The RPED is organized by the Africa Region Technical Department of the World Bank, and funded by a number of European and the Canadian governments. The field work for the Ghana study was conducted by a team of researchers from the Centre for
the Study of African Economies at Oxford University and the Department of Economics at the University of Legon in Ghana.

The RPED is designed to provide an overview of the performance of manufacturing firms in the post structural adjustment period for these economies, and focuses on a wide variety of areas of firm behavior. The survey instrument, which was administered to the firm owners or managers, includes modules covering: the history of the firm; current production and sales; the personal history of the entrepreneur; labor force structure, wages and apprenticeship contracts; use and adaptation of technology; firm response to the regulatory environment; and experience with conflict and conflict resolution. The instrument also includes a survey for a sample of each firm's workers and apprentices, which yielded an additional sample of 545 workers and 212 apprentices. This paper uses data drawn from almost all of the modules, and hence allows for an examination of apprenticeship contracts within the context of a broad range of firm characteristics and activities. This analysis focuses on Ghana only. While comparative cross-country analysis is a long term goal of this line of research, it seems best to begin with detailed single country analyses. Ghana is a good starting point both because, as the pilot, the data were available for analysis earlier and because preliminary analyses indicate that apprenticeship is more prevalent in Ghana than in the other RPED countries. This is consistent with other findings (Liedholm & Mead, 1986) which indicate that apprenticeship institutions are more common in West than in East Africa.

The sample was drawn from four manufacturing sectors: food and beverage processing, woodworking and furniture, textiles and garments, and metal working. The final sample of 185 firms used in this paper included 42 in food, 54 in woodworking and furniture, 41 in textiles and garments, and 48 in metal working. The sample included firms from across the size spectrum. Forty of the firms are micro enterprises with fewer than 5 workers, 81 are small firms having 5 to 29 workers, 39 are medium sized in the 30 to 99 worker range, and 25 are large enterprises with more than 100 workers. The firms represent the full spectrum of ownership structure, ranging from individually owned small enterprises to subsidiaries of multinational corporations and

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1 Details about the sampling frame and sample construction are available in Baah-Nuakoh & Teal (1993).
parastatal operations. The background paper for the Ghana survey (Department of Economics, University of Ghana, 1992) indicates that these four sectors account for 77% of manufacturing enterprises and 65% of manufacturing employment, so that this study gives quite broad coverage of the sector as a whole.

II. Apprenticeship: Prevalence & Concentration

The quantitative importance of apprenticeship in the manufacturing sector can be measured in three dimensions: the fraction of current entrepreneurs who were trained as apprentices, the fraction of workers in the sub-sample who were trained as apprentices, and the fraction of firms which are currently training apprentices. All three of these measures point to a number of conclusions.

First, apprenticeship is fairly widespread in Ghanaian manufacturing. Of the 151 individual entrepreneurs interviewed in the survey (managers of multinational enterprises, parastatals, and other corporate entities were omitted from this module), 82, or 56%, had been apprentices. Most (74%) had done their training in the field in which they were currently in business. Of the 545 workers in the sample, 45% had been trained as apprentices. Finally, 97 of the firms, or 52%, were training apprentices at the time of the survey. These findings are consistent with other small enterprise surveys in the region. Liedholm and Chuta (1976) found that apprentices comprised 42% of the labor forces of small firms in Sierra Leone, and also note that most entrepreneurs in manufacturing had learned their trades as apprentices. Steel and Webster (1992) find that 44% of Ghanian microentrepreneurs who entered business after 1984 had been apprentices, results quite similar to those obtained here.

Second, apprenticeship training is most important in the small firms, as seen in Table 1 below. Firms owned by former apprentices are smaller, and were smaller at the time of their founding, than are firms owned by individuals who were not apprentices. Former apprentices account for 62% of owners of firms with fewer than 30 workers, but only 23% of owners of firms with more than 30. The mean current size of firms owned by former apprentices is 14 workers, and the mean size at the time of founding of these firms was 8 workers. The mean size of non-apprentice owned firms is 58 workers, having been an average of 38 workers at founding. Similarly, the mean size of firms in which apprentices are trained is 33, while the mean size of firms not
training apprentices is 77. This does not mean, however, that apprenticeship is not found in the larger firms, since Table 1 indicates that 36% of the large firms in the sample were training apprentices. As we shall see in Section III, however, the nature of the apprenticeship programs in large firms differs substantially from that found in the smaller firms.

Table 1
Apprenticeship and Firm Size

<table>
<thead>
<tr>
<th>Firm Size ( # of workers)</th>
<th>% of Entrepreneurs who were apprentices</th>
<th>% of Workers who were apprentices</th>
<th>% of Firms training apprentices</th>
</tr>
</thead>
<tbody>
<tr>
<td>Micro (&lt; 5)</td>
<td>54</td>
<td>37</td>
<td>37</td>
</tr>
<tr>
<td>Small (5 - 29)</td>
<td>66</td>
<td>57</td>
<td>72</td>
</tr>
<tr>
<td>Medium (30-99)</td>
<td>30</td>
<td>43</td>
<td>38</td>
</tr>
<tr>
<td>Large (100 + )</td>
<td>9</td>
<td>30</td>
<td>36</td>
</tr>
</tbody>
</table>

Third, apprenticeship training is least important in the food sector, but of similar importance in each of the other three sectors, as seen in Table 2.

Table 2
Apprenticeship and Sector

<table>
<thead>
<tr>
<th>Sector</th>
<th>% of Entrepreneurs who were apprentices</th>
<th>% of Workers who were apprentices</th>
<th>% of Firms training apprentices</th>
</tr>
</thead>
<tbody>
<tr>
<td>Food</td>
<td>20</td>
<td>21</td>
<td>17</td>
</tr>
<tr>
<td>Textile</td>
<td>69</td>
<td>46</td>
<td>56</td>
</tr>
<tr>
<td>Wood</td>
<td>59</td>
<td>53</td>
<td>68</td>
</tr>
<tr>
<td>Metal</td>
<td>55</td>
<td>54</td>
<td>62</td>
</tr>
</tbody>
</table>

The relative unimportance of apprenticeship in the food sector is driven in part by the size distribution of firms in this sector. Forty-eight percent of food firms are either large enterprises or micro enterprises, the sizes in which apprenticeship is least common. In addition, however, only 16.7% of the small firms in the food
sector employ apprentices. This is probably due to the low level of skills required by food processing activities (most of the firms are either micro bakeries or large automated beverage processors), which is also evidenced by the fact that in those food firms where apprentices are trained, the mean duration of the training is less than half the mean duration of training in other sectors.

Fourth, entrepreneurs who were themselves trained as apprentices are nearly twice as likely to train apprentices as are those who were not. Thirty-eight percent of the owners who were not apprentices were training apprentices at the time of the survey, compared with 74% of owners who were apprentices. Unsurprisingly, apprenticeship training is passed from generation to generation. Apprenticeship is widely considered to be training for self-employment, and that impression is borne out in these data as well.

Most of the apprentices in the sample are training in skilled production activities: as tailors and dressmakers in the garment sector, as welders in metalworking, as furniture makers and joiners in the wood sector, and as bakers in the food processing sector. Some of the larger firms' apprentices are training in the maintenance and repair of equipment, but the dominant training received by apprentices is in productive crafts.

Although apprenticeship is a widespread practice, particularly among small firms, it is not a single undifferentiated institution. Details about the variety of apprenticeship contracts offered in Ghanaian manufacturing are presented in the next section.

III. Apprenticeship Contracts

Apprenticeship is a form of skill acquisition in the context of production, or on-the-job training. The apprentice, in addition to learning his trade, provides labor services to the firm. The apprentice/firm relationship, therefore, includes two types of transactions, one being the provision of labor services by the apprentice to the firm, the other being the provision of training services by the firm to the apprentice. The two facets of the apprentice/firm relationship give rise to two components of the financial relationship between apprentices and firms. We might expect that the labor services and training services would be exchange directly, and payments made only when the values of the two services are unequal, so that monetary flows between the two parties would be the net value of the compensation due to the apprentice for his labor.
minus that due to the firm for the training. In this case, then, we would see three kinds of arrangements: payments by firms to apprentices when the value of labor services exceeds the value of training, payments by apprentices to firms when the value of training exceeds the value of labor services, and no payments of either type when the values of the labor and training services are equal. This approach to understanding the financial arrangements surrounding apprenticeship is clearly described in Coy(1989).

In reality, however, the monetary arrangements surrounding apprenticeship training in Ghanaian manufacturing are more complex. First, in addition to wage payments, many apprentices receive allowances for food, housing, clothing, or transportation. These payments are made both in cash and in kind, but are identified by firms as distinct from wage payments. In larger firms, these allowances are paid to all workers, and have been used as a way to generate non-taxable compensation. In smaller firms, allowances are often paid to apprentices even when wages are not. Historically, apprentices often lived with their masters during training, and while this practice has largely died out, provision of basic living expenses by the master continues to be a common feature of these contracts. In the following analysis, these allowances will be included in apprentice earnings as payments by firms to apprentices, though we will measure them separately when possible.

Second, and more important, we also see contracts in which apprentices both pay fees to the firm and receive wages and/or living allowances in return. In total, then, there are four types of apprenticeship contracts offered by the 97 firms in the sample which trained apprentices in 1992. The characteristics of these contracts, their relative importance in the sample, and some characteristics of the individuals and firms engaged in them are presented in the Table 3.

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2 The government recently passed a compensation consolidation act, so that allowances will not be paid separately from wages in the future.
Table 3  
Apprenticeship Contracts

<table>
<thead>
<tr>
<th></th>
<th>Type 1</th>
<th>Type 2</th>
<th>Type 3</th>
<th>Type 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fee Charged</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Apprentices Paid</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Number of Firms</td>
<td>6</td>
<td>34</td>
<td>41</td>
<td>16</td>
</tr>
<tr>
<td>Share of Firms (percent)</td>
<td>6</td>
<td>35</td>
<td>43</td>
<td>16</td>
</tr>
<tr>
<td>Number of Food Firms</td>
<td>1</td>
<td>4</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>Number of Textile Firms</td>
<td>3</td>
<td>1</td>
<td>10</td>
<td>2</td>
</tr>
<tr>
<td>Number of Wood Firms</td>
<td>0</td>
<td>15</td>
<td>19</td>
<td>3</td>
</tr>
<tr>
<td>Number of Metal Firms</td>
<td>2</td>
<td>14</td>
<td>12</td>
<td>2</td>
</tr>
<tr>
<td>Mean Firm Size (# workers and apprentices)</td>
<td>42</td>
<td>49</td>
<td>13</td>
<td>12</td>
</tr>
<tr>
<td>Mean monthly earnings of apprentices (cedis)</td>
<td>0</td>
<td>13302</td>
<td>5442</td>
<td>0</td>
</tr>
<tr>
<td>Mean monthly wages of apprentices (cedis)</td>
<td>0</td>
<td>9650</td>
<td>2579</td>
<td>0</td>
</tr>
<tr>
<td>Mean monthly allowances of apprentices (cedis)</td>
<td>0</td>
<td>3695</td>
<td>2645</td>
<td>0</td>
</tr>
<tr>
<td>Percent of firms paying allowances but not wages</td>
<td>-</td>
<td>6</td>
<td>58</td>
<td>-</td>
</tr>
<tr>
<td>Mean total apprenticeship fee (cash + kind)</td>
<td>0</td>
<td>0</td>
<td>33985</td>
<td>35100</td>
</tr>
<tr>
<td>Mean cash fee paid at start of apprenticeship</td>
<td>0</td>
<td>0</td>
<td>17037</td>
<td>28125</td>
</tr>
<tr>
<td>Mean cash fee paid at end of apprenticeship</td>
<td>0</td>
<td>0</td>
<td>8536</td>
<td>4062</td>
</tr>
<tr>
<td>Mean kind fee paid at start of apprenticeship</td>
<td>0</td>
<td>0</td>
<td>3087</td>
<td>1275</td>
</tr>
<tr>
<td>Mean kind fee paid at end of apprenticeship</td>
<td>0</td>
<td>0</td>
<td>4090</td>
<td>1637</td>
</tr>
<tr>
<td>Mean duration of apprenticeship in years</td>
<td>1.7</td>
<td>2.2</td>
<td>2.9</td>
<td>2.6</td>
</tr>
<tr>
<td>Mean age of apprentices</td>
<td>17</td>
<td>22</td>
<td>21</td>
<td>23</td>
</tr>
<tr>
<td>Mean years of education of apprentices</td>
<td>11</td>
<td>11</td>
<td>10</td>
<td>11</td>
</tr>
<tr>
<td>Mean share of workers who are female (%)</td>
<td>50</td>
<td>5</td>
<td>12</td>
<td>73</td>
</tr>
</tbody>
</table>
The evidence in the table illustrates several important features of the pattern of apprenticeship contracts. First, the most common contract forms, types 2 and 3, both involve payments of wages or allowances. The clear distinction between contract types is around the payment of fees rather than the payment of wages and allowances. The significance of this distinction will be explored in the next two sections.

Second, both contract types in which apprentices are not paid, types 1 and 4, are dominated by textile and garment firms, and these are also the contract forms in which there is a high concentration of female apprentices. In many of these seamstress operations, the apprentices not only pay initial fees and provide their own sewing machines, they also pay monthly tuition. In essence, these firms operate largely as schools where young women spend the period between formal education and marriage, and the training of apprentices is a significant source of revenue for these entrepreneurs. Steel and Webster (1992) describe a seamstress who used expanded training of apprentices as a means to survive during periods of low demand for output.

Third, although garment firms are more likely to charge apprentices fees than are firms in other sectors, the practice is not limited to these firms. A significant fraction of both wood and metal firms also charge apprenticeship fees. This implies that a discussion of contracting behavior is more than an examination of sector-specific institutions, and must be driven by factors that are common across sectors.

Fourth, firms that charge fees are substantially smaller than firms that do not. Apprenticeship fees are part of a training institution which seems to be unique to the "informal" sector. The basic characteristics of this institution as it exists in both West and East Africa, including the payment of fees, the provision of living allowances, and the marking of the end of training with a party hosted by the apprentice, have been described elsewhere in the economics (Berry 1985; Bas, 1989), education (King, 1977) and anthropology (Coy, 1989) literatures. All of these authors have described the institutions in some detail, and their work shows that the basic characteristics are very similar across countries, although the institution appears to be most common in West Africa.

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3 Several of these young women told me that their dressmaking apprenticeship was a form of dowry, selected and paid for by their fathers, since these marketable skills would make them more attractive potential wives.
None of the authors, however, have attempted to explain why these "traditional" apprenticeship programs are structured as they are, though each has identified one characteristic as particularly salient. King focuses on the fact that under such arrangements in both Kenya and Nigeria "apprentices pay for their training." Berry, in a discussion of apprenticeship among mechanics in Nigeria, where wages are not provided but living allowances are, states that "Although apprentices were not very skilled or efficient, the fact that they did not have to be paid was crucial in a trade where receipts are likely to be irregular and working capital is therefore implicitly expensive." (Berry, 1985, p. 142) Although neither statement is fully accurate for our sample, both reflect a significant factor driving the structure of apprenticeship contracts in small-scale manufacturing. An analytical approach to understanding apprenticeship contracts incorporating these ideas is presented in the next section.

IV. Human Capital Theory

Since apprenticeship is a particular form of on-the-job training, apprenticeship contracts can be analyzed using basic human capital theory, following the discussion of training in Becker (1975). Assuming that labor and training markets are competitive and capital markets are perfect, the cost of training, which is also the returns received by the firm for providing it, is exactly equal to the present value of the stream of returns generated by the training. Given that framework, some simple theory provides a mechanism for understanding the apprenticeship contracts described above.

Assume that training takes place in period 0, after which time the apprentice is qualified in his trade, and works for one period. The training entails a cost, $C$, which includes the time spent by the master and other employees in working with the apprentice. During the training period, the apprentice's productivity is $M_P^o$, which is the marginal product of an unskilled worker in this firm or outside. Once the training is completed, the apprentice's productivity rises to $M_P^i$ if he stays in the firm, and $M_P^i$ if he goes to work elsewhere. The assumption of competitive markets implies that $C = (M_P^i - M_P^o)/(1 + r)$, where $r$ is the one period interest rate.
The relationship of the apprentice’s productivities inside and outside the firm provides a measure of the degree of firm-specificity of the training. Define an index of firm specificity, \( a \), as:

\[
a = \frac{(\text{MP}_1' - \text{MP}_2)}{(\text{MP}_1 - \text{MP}_0)}
\]

Fully specific training, which raises the apprentice's productivity only if he stays in the firm, is equivalent to \( a=0 \). Fully general training, which is as productive in other firms as it is in the firm providing it, corresponds to \( a=1 \). Intermediate cases can be indexed by values of \( a \) between zero and one.

Investments in fully general human capital will be made entirely by workers, since the returns to such training cannot be capture by firms. As Becker and others point out (Hashimoto, 1981; Hashimoto and Yu, 1980) workers may also make part of the investment in specific human capital. Because such human capital has value only as long as the employment relationship is maintained, both parties have an interest in avoiding inefficient terminations of this relationship. Sharing this investment, so that both workers and firms bear some costs and reap some benefits, avoids inefficient separation decisions by both parties. In such cases, a worker would accept a wage lower than his marginal productivity during training and receive a share of the returns to this investment thereafter, generating a positively sloped wage profile. For simplicity, in the analysis that follows we will assume that firms bear all the costs of specific training, so the apprentice pays a share of the total training cost which is exactly proportional to the degree of generality of the human capital, generating an apprentice investment of \( aC \). The thrust of the results, however, is the same if the worker also shares in the cost of specific human capital investments.

Although the apprentice will ultimately bear training costs of \( aC \), there are a number of strategies that can be used for financing this investment, each giving rise to particular contract forms. Payments can be made either as deductions from wages or as direct payment to entrepreneurs, and can take place before, during, or after the training occurs. Payments made before the training may be thought of as "apprentice financing" of training, payments made during training are "pay as you go financing," while payments made after training
occur in the context of "employer financing." While these payment strategies can occur in combination, it is useful to begin by describing them independently.

Under a fully pay as you go strategy, apprentices pay the full amount of their training cost through deductions from wages during the training period, receiving \( W_0 = MP_0 - aC \). Once training is completed, the worker receives \( W_1 = MP_0 + a(MP_1 - MP_0) \) if he stays with the firm and \( W_{1^*} = MP_{1^*} \) if he leaves the firm and works elsewhere. Given the definition of \( a \), \( W_1 = W_{1^*} \). If \( MP_0 - aC \geq 0 \), this type of financing arrangement is consistent with contract types 1 and 2, in which no fees are paid and zero or positive wages are received during training. If \( MP_0 - aC < 0 \), we would see a contract in which wages are zero and fees are paid on a continuous basis during training. This would be a variant of contract type 4, but no contracts of this type were observed in these data.

A second strategy is for the apprentice to finance the training before it begins. To finance the full amount, he pays a fee of \( aC \) at the beginning of period 0, and receives a wage of \( W_0 = MP_0 \) during the training period. His second period wages are the same as under the previous strategy. This strategy would be manifested as contract type 3, in which both fees and wages during training are positive. Apprentices may also choose to finance only part of their training in advance, paying for the rest through deductions from wages during the training period. In that case the apprentice pays a fee of \( F < aC \) before training begins and receives wages of \( W_0 = MP_0 - aC + F \) during training. His post-training wages will be the same as in the strategies described above. This strategy is consistent with both contract types 3 and 4, where 4 is a special case in which \( MP_0 - aC + F = 0 \).

Employer financing strategies allow apprentices to pay their share of training costs by deductions from wages in the second period. Under full employer financing, the apprentice would bear none of the costs during training, receiving a wage of \( W_0 = MP_0 \). At the end of training the apprentice would owe the firm \( aC(1+r) \), which would be paid as a deduction from his wage in the post-training period, which would then be \( W_1 = MP_0 \). If the apprentice bears part of the cost during training, he receives \( W_0 > MP_0 - aC \) but less than \( MP_0 \) during training, at the end of which time he owes the firm \( [aC - (MP_0 - W_0)](1+r) \). Repayment through wage deductions in the post-training period yields \( W_1 = MP_0 + (1+r)(MP_0 - W_0) \). The second term reflects the fact
that the worker receives the return on that fraction of the cost of training he actually paid through wage
deduction during the training period. This wage is less than the wage he would receive in alternative
employment. This employer financing of training, where no fees are paid, is consistent with contract types 1
and 2.

Both apprentice and employer financing arrangements contain credit components, and therefore give
rise to default risk and moral hazard issues. Mechanisms for dealing with these issues can be incorporated
into contracts by reducing the incentives to default and providing contract enforcement mechanisms to deter
individually desirable breaches of contract. Some of these characteristics of contracts and enforcement
mechanisms are described below.

When apprentices finance their training by paying fees in advance, firms then have an incentive to fail
to provide that training or to dismiss the apprentice before training is completed. One mechanism for reducing
default incentives is for the apprentice to defer part of the payment of the fee to the end of the training period.
Forty percent of the firms in which fees are paid defer some of the cash portion to the end of training, deferring
an average of 20%. Older firms are less likely to have deferred fees, indicating that reputation factors may
provide another disincentive for breach of contract. While firms do not engage in repeated contracts with any
individual apprentice, they do need to continue to attract apprentices, and hence must worry about reputation
effects. Firms for which apprenticeship is more important also may find reputation more important, which is
verified by our finding that firms in which apprentices form a larger fraction of the labor force are less likely to
receive deferred fees.

Under employer financing the apprentice has an incentive to borrow the training costs from the firm,
and then leave for a higher paying job without paying them back. To prevent this, firms might require

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4 These issues are not the same as those surrounding the sharing of investments in specific human capital.
Those arrangements are made to avoid inefficient separations, but not failure to repay debts or to provide
services that have already been paid for, as is the case regarding the financing of the apprentice’s portion of the
investment, which is the issue under consideration here.

5 It should be noted that this is different from the firm having financed investment in specific human capital
and wishing to retain the worker in order to appropriate the returns. In that case, the worker has not borrowed
from the firm, and the worker’s earnings would not be enhanced by leaving, so there is no real problem of
apprentices to post a performance bond at the beginning of the training period, which will be refunded once the worker’s debt has been paid off. While this is possible, it seems unlikely, since an apprentice who could post a bond large enough to cover his debt would therefore also be able to pay that amount as a fee, thereby financing that part of his training himself. A second type of bonding scheme is through deferred compensation in which workers are paid lower wages during the training period and higher wages during the post-training period. By deferring some of the compensation to the later period, the firm induces the apprentice to stay. This mechanism would be indistinguishable in practice from shared investments in specific human capital, as both would generate upward sloping wage profiles.

Both types of moral hazard problems may be diminished by external contract enforcement mechanisms. Agreements between apprentices and masters which generate a bonding of the apprentice to the master while also defining the master’s obligations may be made verbally or in writing. External enforcement of these agreements may be provided by the legal system, trade unions, crafts associations and other social networks. Nearly half of the firms in the sample have unionized labor forces or belong to trade associations which set explicit rules governing apprenticeship. Among the firms in which fees are charged, it is common for the beginning and/or the end of apprenticeship to be marked by a ceremony hosted by the apprentice and his family. This ceremony is generally the source of the in-kind fees recorded in the data, and may be the reason for some of the deferred fees as well. The ceremony usually includes the provision of drinks by the apprentice and the pouring of libation to the ancestors. These ceremonies are attended by relatives, friends and business associates of both the master and the apprentice. Masters and apprentices often come from the same social network, with 85% of the apprentices in the sample having found their masters through the recommendations of friends and relatives. The guests at the ceremony, including the ancestors, are witnesses to the contract itself, and the social network and kinship ties provide a strong external enforcement mechanism.

Apprenticeship contracts can be written to combine several of these financing strategies, so that the apprentice may finance part of the training as initial fees, part through deductions from wages, and part through moral hazard. Under employer financing of general human capital, the worker can actually benefit from leaving before his debt is repaid.
lower wages in the post-training period. Although the characteristics of contracts can be observed, the combination of strategies underlying each contract cannot be. We can, however, describe the circumstances under which each strategy might be expected to be chosen, and attempt to relate these circumstances to observed contract types. This will allow us to generate some hypotheses which can then be examined by a closer look at the data, an exercise carried out in the following section.

V. The Determinants of Contract Choice

The choice of financing strategies, and hence the choice of contract type, is influenced by the characteristics of the training itself as well as by attributes of the firms and individuals participating in the apprenticeship. The foregoing discussion indicated that a contract type which does not involve payments of fees by apprentices can be generated by both pay as you go and employer financing strategies. Therefore, the only clear distinction between strategies that can be made through an examination of contract types is between those which involve some apprentice financing through fee payments (contract types 3 and 4) and those which do not (contract types 1 and 2). The following analysis consequently focuses on the determinants of the use of apprentice financing as evidenced by the charging of fees.

Before turning to a discussion of contract choice it is useful to present some evidence about the validity of interpreting apprentice fees as apprentice financing. The cost of training includes both time and equipment, and these data indicate that firms charging fees are more than three times as likely to require their apprentices to provide their own tools than are firms that do not charge. In providing their own tools these apprentices are financing the capital costs of their training, so it seems reasonable to interpret the fees as payment for the labor and materials costs of training.

Contract choice should be influenced by the degree of specificity of the training. The more specific the training, the lower the cost of training to be borne by the apprentice. This would make it easier for the apprentice to finance the training through deductions from wages, as in contract types 1 and 2. More specific training also gives rise to steep wage profiles designed to induce the worker to stay with the firm. Such profiles would also be used when employers finance the acquisition of general training, which is the second strategy.
giving rise to contract types 1 and 2. For these reasons, we would expect that contracts without fees would, on average, involve a greater fraction of specific training.

The dataset does not include information about the content of training, but we can use information about the post-training behavior of apprentices as a proxy. The more specific the training, the greater the probability that the apprentice will continue working for the firm after training is completed. If the training offered by firms that do not charge fees is indeed more specific, we would see a larger fraction of these apprentices continuing in the firm. The dataset provides three means for examining this relationship, and the relevant data are presented in Table 4.

| Table 4 |
|-------------------------------|----------------|
| **Specific Training and Contract Type** |                |
| Mean share of apprentices finishing training last year who stayed on at the firm | Fee Paid | No Fee Paid |
| Mean share of current apprentices surveyed who plan to stay on when training is completed | 12% | 50% |
| Share of surveyed workers currently working in the firm in which they did apprenticeship who paid a fee for that apprenticeship | 28% |
| Share of surveyed workers currently working in firms other than that in which they did apprenticeship who paid a fee for that apprenticeship | 55% |

These data support the hypothesis that firms that do not charge fees offer more specific training than do firms in which fees are paid.

We would also expect that firms offering specific training or employer financing of general training would offer post-training earnings profiles designed to discourage quits. That is, we would expect more specific training to be associated with steeper earnings profiles providing higher returns to seniority. This is indeed the case for these data, in which the returns to an additional year of seniority among workers in firms in which apprentices are not charged fees is more than twice as high (4.6% compared to 2.0%) as in firms where fees
are charged. This behavior is consistent with Hashimoto's argument about the sharing of investments in specific human capital, as well as with the foregoing discussion of employer financing. It should be noted that decisions about the type of training to offer and the financing strategy involved may be made simultaneously. A firm offering more specific training will bear a larger fraction of the costs, and the ability to do so may be driven by the same factors determining the firm's use of employer financing of the worker's share of costs.

In addition to the specificity of training, contract choice is also influenced by the characteristics of firms and apprentices. The evidence in Table 3 indicated that firms charging fees are significantly smaller on average than those not charging fees. Small size in and of itself, however, is not a characteristic that should exert independent influence on contract choice. Firm size is endogenous and determined by a number of other factors which may also influence the choice of contract type. A principal task of the rest of this analysis will be to identify factors which, although they may be correlated with size, are more reasonable sources of differences in firm behavior.

One set of possibilities is related to the general labor market behavior of larger firms. There is a large literature (see Brown and Medoff 1989) documenting the widespread existence of large earnings differentials associated with employment in larger firms. The factors that cause large firms to "overpay" their workers may also cause them to "undercharge" their apprentices, so that contract choice is simply an extension of a broader class of uncompetitive labor market behavior. If larger firms do not charge fees as part of a general pattern of

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6 These estimates were obtained by estimating an earnings function for the 191 individuals in the sample of workers who are employed by firms currently training apprentices. The returns to experience were allowed to differ according to the fee charging practice of the individuals' employers. T-tests indicate that the coefficients are different at a 5% significance level.

7 A second characteristic of training one would expect to be relevant to contract choice is total training costs. In particular, lower training costs make it more likely that the apprentice can pay for his share through deductions from wages during the training period. There is no clear association, however, between the level of training costs and the choice between apprentice and employer financing. Once costs are too high to be borne easily as wage deductions, there is no obvious reason to expect apprentice or employer financing to be more likely.

Similarly, the duration of training, which might affect costs, is also influenced by financing decisions. Employer financing requires that the apprentice stay on after training is completed, and would give rise to longer measured apprenticeships for any given training costs. While Table 3 indicates that apprenticeships in which fees are charged are of longer average duration, this could be due to a number of factors, including the more general nature of the training they provide, and cannot be clearly related to costs.
Do firms that do not charge fees provide rents to their workers and apprentices? The evidence in Table 3 indicated that apprentices who are not charged fees do indeed earn more during their apprenticeships than do their fee paying counterparts, but these differences could be generated by differences in the degree of specificity of the training and overall training costs, and thus cannot be easily interpreted as rents. These apprentices may well be advantaged, but we cannot measure this advantage using current earnings without having data on training costs.

There is strong evidence, however, that non-apprentice employees are indeed advantaged by employment in larger firms. Teal and Jones (1994) find evidence of large employer size effects in estimates for the whole sample of workers. Estimates for the sub-sample of workers employed in firms offering apprenticeship also show a substantial advantage to employment in larger firms. Medium sized firms pay 40% more than do firms with fewer than 30 workers, while large firms pay 73% more.

The fact that employees of larger firms earn rents does not necessarily imply that employees of all firms in which no fees are charged also earn rents, since the correlation between contract choice and size is not perfect. Among the 24 firms with more than 30 workers, 5 charge fees, and there is no statistically significant difference in wages between these two groups. Among the 73 firms with fewer than 30 workers, 21 do not charge their apprentices. Interestingly, among the smaller firms, those that do charge their apprentices actually pay their workers more. Overall, there is no clear evidence that all firms that do not charge fees also pay rents to their employees. To the extent that the decision to charge fees is strongly correlated with firm size, however, broader explanations of large firm behavior, particularly wage premia, may provide insight into contract choice.

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8 The premiums for small, medium, and large firms relative to micro enterprises are 21%, 38% and 55% respectively.
One source of these wage premia which may also explain contract choice is unionization. Larger firms are more likely to be unionized, and the unions do raise wages by an estimated 9% (Teal and Jones, 1994). If unions also cause firms to undercharge for training, or forbid the charging of fees, unionization would also drive contract choice. Seventeen of the firms in this sample are unionized, and none of them charge fees. Although it is possible that unionization and contract choice are both caused by a third factor (perhaps the profitability of the firm), it seems reasonable to attribute at least part of the decision not to charge fees to the union influence. There are 23 non-union firms that also do not charge fees, so the union factor is not a complete explanation of contract choice.

A second common explanation of employer size wage premia is rent sharing. If larger employers are able to earn economic profits or rents, they may share these rents with their workers and apprentices. There are several potential sources of rents. Market power in output markets would allow these firms to charge higher prices. These data include no obvious measure of market power, so we cannot directly explore the relationship between market power, profits, and contract choice. Quantity discounts on raw materials are a second source of rents. Differences in the nature of raw materials used across firm sizes make direct comparisons of raw materials costs impossible, although our subsequent discussion will explore difference in value added which may capture variation in input costs relative to output values.

If firms face differential costs of financing their working capital needs, this would also give rise to rents for those firms having cheaper or easier access to funds. Differential costs of working capital would also give rise to variation in contract choice if, as we described above, choice of contract type is based on a decision about financing of training. Employer financing of training is a form of informal credit from firms to apprentices, and we would expect to see firms finance training when they have access to funds at a lower interest rate than that available to apprentices, or where they are able to access more funds than apprentices can. This is the idea that Berry reflected in her discussion of the expense of working capital to firms using apprentices.

Although a firm's access to or cost of financing cannot be measured, their behavior in other arenas involving financing can be used as an indicator. If the hypothesis above is correct, firms that charge
apprenticeship fees will differ from firms that do not in terms of their use of alternative sources of finance, their relationships with other business partners, and their behavior and experience in credit markets generally. In particular, we would expect that firms which charge fees to their apprentices would differ from other firms in their mechanisms for obtaining working capital.

Normally, businesses meet their working capital needs through some combination of their own liquidity and "formal" sources of credit such as banks and their input suppliers. Firms with weak cash flow and lacking access to bank and supplier credit will use informal sources of finance such as borrowing from money lenders, holding funds with informal savings collectors or mobile bankers in order to have access to funds at month's end, and requiring advance payments from customers. This use of informal finance can be seen as a "spillover" from formal financing markets, in which agents who are rationed out of formal sources turn to informal markets.

From the perspective of contract choice, we would expect that firms with good cash flows and/or access to formal finance at reasonable costs would be able to finance their apprentices' training, and would be less likely to charge fees. These firms would also face lower working capital costs, and could share the advantage this provides with workers by not charging fees. The charging of fees to apprentices, which is similar to the practice of requiring advance payments from customers, is itself a form of informal finance, since the fees are generally paid before the training is received. We would expect, therefore, that firms charging apprentices fees would also be using other informal sources of credit. To the extent that these sources are more expensive than formal sources, these firms would not be earning rents that could be shared with workers.

Data about several features of firms' credit and financial market behavior are presented in Table 5 below. While it would be desirable to include a measure of the strength of the firms' cash flows, the dataset does not include information that would allow such a measure to be constructed. The first panel of the table presents average value added (value of sales minus cost of raw materials) per worker per year. This is a blunt

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9 Supplier credit lies at the border between "formal" and "informal" credit. For this analysis it is treated as formal, since supplier credit is a common feature of business practices in developed manufacturing sectors throughout the world, and part of their "formal" credit practices.
measure of the availability of rents to the firm, and is relevant for examination of our rent sharing hypothesis. These data were available for only 91 of the 97 firms. The next part of the table deals with relationships with the banking sector. A firm is considered to have received bank credit if it had either a loan or an overdraft facility at a bank or other formal financial institution in the last three years. Bank accounts include both demand and time deposits at all formal financial institutions.

The third section deals with contractual relationships with suppliers. Firms were asked to describe the form of payment (cash, credit, or advance payment) they used with the primary suppliers of their three major raw materials, and then to give the details of the last transaction of each type they conducted. Each firm can engage in all three types of transactions. A firm is said to receive supplier credit if any of its principal raw materials suppliers extends credit. The table presents two characteristics of supplier credit for those firms receiving it. The first is the mean value of the elapsed time between delivery of the goods and final payment, and the second is the implicit interest rate paid for the credit, measured in terms of the cash discount foregone.

The fourth section deals with informal credit. Firms were asked if they had borrowed money on the informal credit market (this includes loans from friends, relatives, suppliers, clients, other enterprises and informal moneylenders) in the past three years. They were also asked if they had participated in any informal savings groups, or had used the services of a mobile banker or savings collector, who is an individual who holds cash for safekeeping in exchange for a fee.

The fifth section of the table deals with contractual relations with customers. Again, the firms were asked to describe the form of payment they used with their most important customers, or that they used most frequently, in the case where they had a large number of infrequent customers. They were also asked to describe the details of their most recent transaction of each type.
Table 5  
Contract Type and Firm Credit Market Behavior

<table>
<thead>
<tr>
<th>Fee Charged</th>
<th>Type 1</th>
<th>Type 2</th>
<th>Type 3</th>
<th>Type 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td></td>
</tr>
</tbody>
</table>

I. Value added per worker per year (cedis)  
- Type 1: 414852  
- Type 2: 830324  
- Type 3: 173183  
- Type 4: 322103

II. Relations with Banking Sector  
- Share of firms receiving bank loans (%): 16, 6, 0, 6  
- Share of firms receiving overdraft facilities (%): 33, 17, 7, 6  
- Share of firms holding bank accounts (%): 100, 79, 63, 75

III. Relations with Suppliers  
- Share of firms receiving credit from suppliers (%): 33, 35, 32, 19  
- Mean length of supplier credit for those receiving it (days): 45, 51, 29, 9  
- Mean implied interest on supplier credit for those receiving it (%): 7, 4, 13, 10

IV. Informal Credit Markets  
- Share of firms receiving informal credit (%): 33, 26, 51, 44  
- Share of firms using informal safekeeping services or mobile bankers (%): 0, 4, 18, 19  
- Share of firms participating in informal savings groups (%): 0, 3, 7, 0

V. Relations with Customers  
- Share of firms making sales on cash basis (%): 50, 38, 66, 75  
- Share of firms making sales on credit basis (%): 67, 62, 27, 44  
- Share of firms receiving advance payment from customers (%): 50, 44, 68, 56

** indicates that a t-test for a difference in means between firms that charge and those that do not is significant at a 5% level. * indicates the test is significant at 10%.
The data in the table indicate the following. Firms that charge for apprenticeship have significantly lower value added per worker, indicating less access to rents than do firms that do not charge. Second, these firms are less involved with the banking sector, both as borrowers and as depositors, than are firms offering the other form of contract, indicating limited use of the banking system as a source of working capital. Third, while firms that charge their apprentices were no less likely to have received credit from suppliers than were firms that did not charge, they did get shorter repayment periods and pay higher interest rates, in terms of foregone cash discounts, than did the other firms. This evidence all supports the hypothesis that firms without strong cash flows or access to formal sector credit are more likely to charge fees.

In addition, firms that charge fees are more likely to be involved in the informal credit market, both as borrowers and as users of savings collectors than are firms that do not. Finally, firms charging apprenticeship fees were more likely to deal in cash or advance payment with their clients, and less likely to extend them credit. Since the elapsed time between order and delivery of goods is far less than the mean duration of apprenticeship, it seems reasonable to conclude that firms which do not finance their production costs out of working capital would be unlikely to finance training. Worker financing of training is itself a source of informal credit. The evidence indicates that firms which are more likely to use informal credit use several forms of informal credit, including borrowing from their customers in the form of advance payment, and borrowing from their apprentices in the form of advance fees. Contract choice in apprenticeship markets, then, seems to mimic financing choices in other arenas, and to be part of an overall financing strategy emphasizing informal credit arrangements.

The relationship between these credit market behaviors and apprenticeship contract choice is summarized in Table 6, which presents the results of a probit estimation of the influence of such capital market features on the probability that a firm charges a fee to apprentices. The dependent variable takes the value 1 if the firm charges a fee. The independent variables include sectoral dummies, firm size, and value added per worker, followed by a series of dummy variables which take the value 1 if: the firm made sales on a cash basis, made sales on a credit basis, made sales with advance payment, received bank credit, held bank accounts,
received informal credit, and used informal mobile banking services.\textsuperscript{10} The effect of each variable on the probability a firm charges fees, calculated as the mean of the effect across all observations, is reported in the second column for each set of estimates. For the continuous variable, this represents the change in probability in response to a one unit change in the value of the variable. For the dummy variables, it represents the difference in the probability of charging a fee generated by having rather than not having that characteristic.

The table reports estimates of two versions of the probit, one which excludes and one which includes the value added measure.

There is substantial correlation among the independent variables, particularly those related to banking and informal credit, resulting in imprecise estimates. One mechanism for dealing with this is to compress some of the measures. The results in Table 7 were constructed by replacing the two banking measures with a single dummy that takes the value 1 if the firm had any relationship (borrowing or deposits) with formal banking institutions, and replacing the two informal credit markets with a single dummy that takes the value 1 if the firm had any relationship (borrowing or using mobile bankers) with informal credit institutions.

\textsuperscript{10} Because there is no variation across contract types in the use of supplier credit, supplier credit indicators were not included in the probit.
Table 6  
Probit Estimates of the Firm Decision to Charge Apprentice Fees  
Dependent Variable=CHARGE=1 if the firm charges a fee  
absolute value of t-statistics in parentheses  
*indicates coefficient significant at 10%  
** indicates coefficient significant at 5%  

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>Mean effect on probability</th>
<th>Coefficient</th>
<th>Mean effect on probability</th>
</tr>
</thead>
<tbody>
<tr>
<td>Food sector dummy</td>
<td>0.156 (0.214)</td>
<td>.058</td>
<td>0.557 (0.697)</td>
<td>.115</td>
</tr>
<tr>
<td>Wood sector dummy</td>
<td>-0.587 (1.188)</td>
<td>-.181</td>
<td>-0.596 (1.107)</td>
<td>-.071</td>
</tr>
<tr>
<td>Metal sector dummy</td>
<td>-1.170** (2.309)</td>
<td>-.285</td>
<td>-1.058** (1.892)</td>
<td>-.100</td>
</tr>
<tr>
<td>Size</td>
<td>-0.0005 (0.262)</td>
<td>-.0001</td>
<td>-0.0017 (0.744)</td>
<td>-.0002</td>
</tr>
<tr>
<td>Firm received bank credit</td>
<td>-0.475 (0.931)</td>
<td>-.148</td>
<td>-0.193 (0.307)</td>
<td>-.034</td>
</tr>
<tr>
<td>Firm holds bank account</td>
<td>-0.641* (1.633)</td>
<td>-.194</td>
<td>-0.374 (0.906)</td>
<td>-.049</td>
</tr>
<tr>
<td>Firm received informal credit</td>
<td>0.462 (1.326)</td>
<td>.180</td>
<td>0.270 (0.697)</td>
<td>.049</td>
</tr>
<tr>
<td>Firm used mobile banker</td>
<td>1.275* (1.805)</td>
<td>.465</td>
<td>1.149 (1.509)</td>
<td>.289</td>
</tr>
<tr>
<td>Firm made sales on cash basis</td>
<td>1.011** (2.771)</td>
<td>.384</td>
<td>1.002** (2.595)</td>
<td>.242</td>
</tr>
<tr>
<td>Firm made sales on credit basis</td>
<td>-1.084** (2.863)</td>
<td>-.273</td>
<td>-1.002** (2.391)</td>
<td>-.297</td>
</tr>
<tr>
<td>Firm made sales with advance payment</td>
<td>0.927** (2.305)</td>
<td>.356</td>
<td>0.732* (1.639)</td>
<td>.161</td>
</tr>
<tr>
<td>Value added per worker</td>
<td>---</td>
<td>---</td>
<td>-1.44e-06** (2.865)</td>
<td>-3.20 e -07</td>
</tr>
<tr>
<td>Constant</td>
<td>0.542 (0.829)</td>
<td>---</td>
<td>1.022 (1.435)</td>
<td>---</td>
</tr>
<tr>
<td>Number of observations</td>
<td>97</td>
<td>91</td>
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<td></td>
</tr>
<tr>
<td>Chi-Squared</td>
<td>45.13</td>
<td>48.36</td>
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<td></td>
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<tr>
<td>Pseudo R²</td>
<td>.3432</td>
<td>.4020</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Log Likelihood</td>
<td>-43.175</td>
<td>-35.959</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Variable</td>
<td>Coefficient</td>
<td>Mean effect on probability</td>
<td>Coefficient</td>
<td>Mean effect on probability</td>
</tr>
<tr>
<td>---------------------------------------</td>
<td>--------------</td>
<td>-----------------------------</td>
<td>--------------</td>
<td>-----------------------------</td>
</tr>
<tr>
<td>Food sector dummy</td>
<td>0.125 (0.175)</td>
<td>.048</td>
<td>0.399 (0.510)</td>
<td>.136</td>
</tr>
<tr>
<td>Wood sector dummy</td>
<td>-0.531 (1.109)</td>
<td>-.208</td>
<td>-0.479 (0.927)</td>
<td>-.147</td>
</tr>
<tr>
<td>Metal sector dummy</td>
<td>-1.120** (2.280)</td>
<td>-.397</td>
<td>-0.948* (1.785)</td>
<td>-.256</td>
</tr>
<tr>
<td>Size</td>
<td>-0.0004 (0.211)</td>
<td>-.0001</td>
<td>-0.0010 (0.440)</td>
<td>-.0002</td>
</tr>
<tr>
<td>Firm had relationship with formal bank</td>
<td>-1.024** (2.366)</td>
<td>-.372</td>
<td>-0.646 (1.450)</td>
<td>-.190</td>
</tr>
<tr>
<td>Firm had relationship with informal financial sector</td>
<td>0.701** (2.011)</td>
<td>.323</td>
<td>0.488 (1.278)</td>
<td>.167</td>
</tr>
<tr>
<td>Firm made sales on cash basis</td>
<td>1.068** (3.094)</td>
<td>.323</td>
<td>0.968** (2.626)</td>
<td>.318</td>
</tr>
<tr>
<td>Firm made sales on credit basis</td>
<td>-0.962** (2.675)</td>
<td>-.354</td>
<td>-0.900** (2.252)</td>
<td>-.247</td>
</tr>
<tr>
<td>Firm made sales with advance payment</td>
<td>0.893** (2.309)</td>
<td>.287</td>
<td>0.701* (1.625)</td>
<td>.237</td>
</tr>
<tr>
<td>Value added per worker</td>
<td>---</td>
<td>---</td>
<td>-1.32e-06** (2.663)</td>
<td>-2.95 e -07</td>
</tr>
<tr>
<td>Constant</td>
<td>0.689 (1.030)</td>
<td>---</td>
<td>1.121 (1.589)</td>
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<tr>
<td>Number of observations</td>
<td>97</td>
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<td>Chi-Squared</td>
<td>44.74</td>
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<td>47.56</td>
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<td>Pseudo R²</td>
<td>.3403</td>
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<td>.3954</td>
<td></td>
</tr>
<tr>
<td>Log Likelihood</td>
<td>-43.368</td>
<td></td>
<td>-36.359</td>
<td></td>
</tr>
</tbody>
</table>
These results indicate that there is a relationship between credit market behavior and the use of apprenticeship fees, and that firms with more access to rents, as measured by value added, are indeed less likely to charge fees. The magnitudes of the credit market effects are smaller in the estimates where value added is included. This is not unreasonable, given that profitability, as proxied by value added, would be a determinant of firms' access to formal credit, generating some substantial correlation among the variables in these regressions.

The credit market results show that firms that do not provide financing to their customers are less likely to provide financing to apprentices. Use of the formal banking sector is negatively correlated, while use of informal credit markets is positively correlated, with charging apprentice fees. It must be emphasized, however, that this shows only correlation, not causation. Both credit market behavior and contract choice would be influenced by factors that control the firm's access to and cost of funds. The probit provides results consistent with the notion that worker financing of apprenticeship results from poor firm access to formal sources of working capital, but is not a test of that hypothesis, nor is it a direct test of the hypothesis that firms which do not charge apprenticeship fees are doing so as a form of rent sharing with their workers.

We would also expect characteristics of the apprentices to influence the type of contracts in which they are found. The evidence in Table 3 showed little difference in the educational characteristics or ages of apprentices, though it does indicate that women tend to be concentrated in contract types that do not involve wage payments and do involve fees. In addition to these personal characteristics, we would also expect the apprentices' ability to finance apprenticeship to influence contract choice. Most apprentice fees are paid by parents, and many apprentices have little knowledge of the specific arrangements that were made. If parents are the main source of funds for apprentices, then one would expect the apprentices for whom fees were paid to have been more able to draw on parental resources. The survey included questions to the apprentices about their receipt of funds from and remittance of funds to their parents. These variables, along with more standard human capital measures, are included in probit estimates of the probability an individual apprentice paid a fee. These estimates are presented in Table 8.
Table 8
Probit Estimates of Determinants of Apprentices' Contract Choice

absolute value of t-statistics in parentheses
N = 209
Log-Likelihood = -78.502864
chi-squared(8) = 49.93
Pseudo $R^2 = .2413$

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>Mean effect on probability</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age in years</td>
<td>0.0389</td>
<td>.0079</td>
</tr>
<tr>
<td>Age squared</td>
<td>-0.0006</td>
<td>-.0001</td>
</tr>
<tr>
<td>Highest schooling level is primary</td>
<td>-0.1014</td>
<td>-.0403</td>
</tr>
<tr>
<td>Highest schooling level is middle school</td>
<td>0.4422</td>
<td>.1703</td>
</tr>
<tr>
<td>Highest schooling level is secondary school</td>
<td>-0.6054</td>
<td>-.2278</td>
</tr>
<tr>
<td>Apprentice is male</td>
<td>-0.6909**</td>
<td>-.2556</td>
</tr>
<tr>
<td>Apprentice sends remittances to parents</td>
<td>-0.7003**</td>
<td>-.2586</td>
</tr>
<tr>
<td>Apprentice receives cash from parents</td>
<td>0.8768**</td>
<td>.3083</td>
</tr>
<tr>
<td>Constant</td>
<td>0.2086</td>
<td>---</td>
</tr>
</tbody>
</table>

As expected, male apprentices are less likely to have paid fees. Access to parental financial resources increases the likelihood of being in a paying apprenticeship by 31%, while apprentices who send cash home are 26% less likely to have paid fees. Other human capital variables, including education and age (a proxy for experience) do not exert statistically significant influence on contract choice, although it seems that the most educated individuals, those who have completed secondary school, are less likely to be in apprenticeships.

Given the differences between men and women in this sample, an attempt was made to analyze their behavior separately. Small sample size for the women (64) and lack of variation across them in personal characteristics such as education and age made estimation of the same probit impossible, but the available results do indicate the same positive relationship between receiving cash from parents and paying fees as is seen for the sample as a whole.
where fees are charged. If the qualifications and abilities of the two groups of apprentices do differ, the differences are not captured in standard measures of human capital.

Overall, the evidence indicates that contract choice in apprenticeship, insofar as it is based in decisions about the financing of training, is influenced by the relative access to funds of firms and apprentices. In contexts such as manufacturing in Ghana, where firms are small and informal and not necessarily clearly distinguishable from households, it seems reasonable that some firms would be unable to finance training as easily as their apprentices can.

V. Summary and Directions for Future Research

The first section of this paper indicates that there is a great deal of training taking place on the job in the manufacturing sector in Ghana, particularly in small firms. While this paper does not explore the content of this training, and therefore cannot assess its quality, it seems clear that the training of a new generation of craftsmen is an important part of economic activity in the small-scale manufacturing sector. Equally important, the evidence indicates that these firms provide relatively general training, generating skills which are useful in other firms and which seem to provide apprentices with preparation for entrepreneurship. Both King and Berry note that apprenticeship in a trade is a route to self-employment, and the importance of apprenticeship training in the backgrounds of the entrepreneurs in this sample supports this idea. The important implication of this fact is that apprenticeship should not be excluded from general analyses of vocational training in Ghana, and that the human capital being generated in small scale manufacturing should be considered when policy in this area is made.

The human capital approach taken here provides insights into the quotations from King and Berry presented in Section III. While King’s contention that apprentices pay for their training is correct, since all apprentices ultimately bear the cost of the general portion of their training, what is truly interesting about fee-paid apprenticeships is that they involve apprentice financing as well. Berry’s contention that the usefulness of apprentices to firms is that they do not have to be paid is insightful in its focus on the importance of working
capital constraints in motivating the structure of apprenticeship contracts. This paper has expanded their ideas by looking more closely at the financing arrangements involved in apprenticeship contracts.

Finally, the discussion suggests one more avenue through which the functioning of credit markets may influence economic behavior. The correlation between apprenticeship contract choice and other credit market behavior, while it neither shows causation nor identifies the root cause of differences in these behaviors across firms, does indicate that the practice of firm financing of training is related to the way in which firms finance other activities. This implies that changes in the functioning of urban capital markets could influence patterns of human capital formation in addition to their more well known effects on technological change, employment, and growth.

This analysis has provided a first step in understanding the role of apprenticeship in manufacturing in Ghana. It does, however, neglect some important questions including the determinants of the firm's decision to train apprentices and to offer general or specific training, and the influence of apprenticeship training on the employment opportunities, career paths, and wages of apprentices. Future work must address these issues. In an era of budgetary crisis and structural adjustment forcing many African countries to reduce their education budgets, the role of alternative training institutions such as apprenticeship must be explored.

While these contract forms do alleviate working capital constraints, it is unlikely that the fact that apprentices do not receive wages actually increases firm profits. The small payments received by apprentices would be exactly offset by their low productivity. Only if apprentices received less than their productivity minus training costs would this practice actually enhance firm profits. This would only be possible if the firm charged the apprentices more than their training cost, which they could only do if they had some market power. Given the large number of small firms engaged in the training of apprentices in any trade, this kind of market power seems unlikely.
References


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