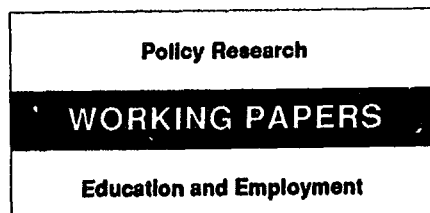


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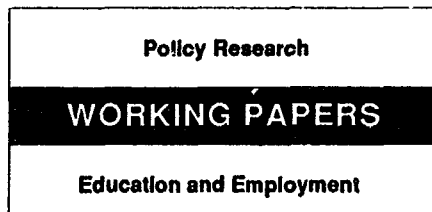
Many Paths to Skilled Employment

A Reverse Tracer Study of Eight Occupations in Colombia

Adrian Ziderman
and
Robin Horn

The manpower requirements forecasting approach to national planning for vocational education and training reduces choices available to individuals and creates a less diverse and efficient training system.

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This paper — a product of the Education and Employment Division, Population and Human Resources Department — is part of a larger effort in the department to study the operation of the labor market and its impact on human resources development. Copies of the paper are available free from the World Bank, 1818 H Street NW, Washington, DC 20433. Please contact PHREE, room S6-214, extension 33680 (January 1993, 35 pages).

Ziderman and Horn use the reverse tracer study technique to identify alternative training paths for selected skilled and semi-skilled occupations in Colombia.

The study, confirming earlier research for the United States, shows that workers pursue many different training paths to acquire the skills they need in a given occupation. Ziderman and Horn provide an occupational training map format to analyze these training paths.

They conclude that strong public intervention that narrows the effective range of available

training should be discouraged; such intervention will not only reduce choices but will also lead to a less flexible and efficient training system.

A reduction in training alternatives is the result of the manpower requirements forecasting approach to planning for the provision of national vocational education and training — yet that approach is still popular in the planning ministries in developing countries.

The more training options available to workers, the better they can arrange their own training packages.

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**MANY PATHS TO SKILLED EMPLOYMENT:
A REVERSE TRACER STUDY OF EIGHT OCCUPATIONS IN COLOMBIA**

by

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and

Robin Horn

Education and Employment Division

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**MANY PATHS TO SKILLED EMPLOYMENT:
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I. INTRODUCTION

Throughout much of the developing world, publicly subsidized, pre-employment training institutions play a dominant role in government training policy. These institutions encompass both vocational secondary schools and government training centers. Yet evidence from industrialized countries, particularly the United States,¹ suggests that these public vocational and non-formal training systems constitute but two among many alternative training options. Alone or in combination they account for a small proportion of the job-skills training received by workers across many skilled occupations. Indeed, even in a given occupation, this research demonstrates that workers pursue a large variety of training paths to acquire the skills they employ on their jobs.

There are two additional findings of this U.S. research that are surprising. Informal training, or "picking up the trade on the job," is found to be among the most important sources of job-related skill development. Moreover, combining different types of training programs is found to be a common practice among workers in many of the occupations analyzed in this research.

In the present study we attempt to verify whether these important findings from the U.S. hold in Colombia's less-developed economy. To explore this question, we employ the reverse tracer study technique to analyze data from surveys of workers in

¹ See Foster (1970), Hills (1982), Horowitz and Herrnsstadt (1968), Marshall & Glover (1975), and U.S. Department of Labor (1964 and 1970), for an analysis of training sources associated with traditional occupations in the United States.

selected skilled and semi-skilled occupations. Our analysis confirms that for Colombia, too, there is a tremendous variety of ways in which workers acquire their job skills. This is all the more striking given the central role assigned to the country's national, publicly financed training program, SENA (Servicio Nacional de Aprendizaje). An important implication for policy is that there is considerably more flexibility on the supply side of the training market than national planners may suppose: This, in turn, casts further doubt on the efficiency of the use of fixed-coefficient manpower requirements forecasting models, for educational planning.

II. FOLLOW-UP STUDIES VERSES REVERSE TRACER STUDIES.

Follow-up studies, also called tracer studies, are the traditional, and still dominant, method of evaluating vocational and technical training programs.² These types of studies chronologically trace the labor market outcomes for training program participants. They are designed to provide information, *inter alia*, on whether participants in particular programs obtain employment after training, how quickly they find employment, whether this employment is in training-related occupations, and whether participants benefit from enhanced earnings. The follow-up methodology provides a useful tool for evaluating whether training programs and institutions are successful.

For example, where pre- and post-training earnings information is available, or data relating to the post-training earnings of a suitable control group, economists have utilized the follow-up approach to appraise the economic efficacy of major training programs. These studies may compare the social or private rate-of-return from investment in a particular training program with the rate of return available from competing investments, or they may compare major alternative training programs in cost-benefit terms.

² For a recent follow-up evaluation of SENA training, see Jimenez, Kugler and Horn (1989), and Horn (1987).

Such studies provide policymakers with supposedly objective criteria for expanding (or contracting) major training programs, and thus should lead to more efficient national training policies. On the other hand, in selecting to evaluate the external efficiency of one particular institution--usually the government funded institution, these studies have the disadvantage of tending to exaggerate the centrality of such programs in overall training provision. Several distortions may result from policies designed in response to these types of studies. First, governments and their public agencies may be inclined to devote too many resources to publicly financed national training programs, or to secondary, postsecondary, or vocational institutions, and too few resources to alternative, non-mainstream modes of training. Second, targeted individuals may be receiving too much, too little, or inappropriate kinds of training. Third, highly structured, publicly subsidized, training programs may be edging out relatively less costly traditional or informal training arrangements. Finally, at the very least, it is possible that significant opportunities for efficiently and flexibly meeting training needs in developing countries for a variety of skilled and semiskilled occupations are being overlooked by policymakers.

Reverse tracer studies differ from the typical follow-up study both in technique and in aim. Instead of following completers of a particular pre-employment training program into the job market, reverse tracing works backwards, so to speak, by focusing the analysis on samples of workers currently employed in particular occupations and tracing back the educational histories and training paths pursued by these workers. Specifically, reverse tracer studies permit the analyst to identify each major alternative training route pursued by workers in the same occupation.³

Metaphorically, the reverse tracer study begins with the intended destination and seeks to identify all the paths that individuals may take to arrive at that destination, and the frequency with which each of these paths are pursued. The follow-up study begins with

³ For a lively advocacy of the reverse tracer study approach, see Dougherty (1988).

one path, follows individuals in that path to their destinations, and estimates how frequently individuals end up in each of these destinations. Which approach to use depends on what one is seeking to learn.

For those interested in the success of particular training programs, or the outcomes and labor market destinations of graduates of these programs, then the follow-up is the most appropriate methodology. Not all of these course completers will be employed in a training-related job; some will be working in occupations not utilizing skills acquired in the program, while others will be unemployed or currently outside the labor force. The typical policy questions examined are, "Does this training program prepare individuals for the jobs they obtain?" or "Is this training program economically worthwhile?"

For those curious about how individuals working in particular occupations of interest obtain their training, the reverse tracer study is the most appropriate methodology. Without making assumptions about the importance of one particular training institution, the reverse tracer study probes all the alternative training paths followed by workers employed in these occupations. Identifying the range of training paths utilized by workers in a given set of occupations serves to widen the effective range of policy options for training provision, particularly with regard to the occupations under study. The kinds of policy questions the reverse tracer study examines are, "Where do skilled and semi-skilled workers obtain their training?" or "What is the most cost-effective means of preparing workers for skilled or semi-skilled occupations?"

III. DATA

Data on the occupational and training histories of workers in selected occupations in Colombia were derived from a series of five surveys conducted between 1979 and 1981 in seven regions of Colombia.⁴ These surveys were conducted to evaluate SENA, the country's national, publicly financed training system.⁵ Two of these surveys were used for our sample. The primary survey focuses exclusively on a comprehensive sample of SENA trained workers. In addition to items collecting information on workers' background characteristics, occupational sequences, training and education histories, and current job activities and earnings, the survey also identifies the workers' places of employment and their supervisors. These last two items of data permitted the development of the second survey that we used. This consists of workers not trained by SENA who perform the same type of work in the same (public or private) enterprise under the same supervisors as the SENA-trained workers. Since the sample of non SENA-trained workers is located via the workplace of SENA-trained workers, the proportion of non SENA-trained workers identified in the sample cannot reflect their prevalence in the labor force as a whole.

Our initial sample, which was constructed from these two surveys, contains 4,895 workers, comprising about equal numbers of SENA-trained and non SENA-trained workers in Colombia.

Female workers in these surveys were mostly, but not exclusively employed as secretaries, bookkeepers, and seamstresses, and the male workers as bookkeepers, metal workers, fitters, electricians, and plumbers (Table 2). To focus on each of the occupations by gender, the small number of workers employed in non-traditional occupations (from the

⁴ A complete description of the five surveys is contained in SENA-Holanda (1982); see also Horn (1987).

⁵ SENA's budget is about equal to 10 percent of the entire public education budget; its programs training nearly 500,000 workers each year (Jimenez, Kugler, and Horn, 1989); almost 9 percent of the workforce in Colombia, as surveyed in 1981, received some SENA training (Horn, 1987).

point of view of gender) were dropped from the analysis; there were 159 such individuals. Only in bookkeeping were there sufficient workers of both sexes to justify analysis of male and female workers.

Table 3 gives the sample breakdown by the final occupation-gender groups we use throughout the paper; we analyze training patterns of male and female bookkeepers separately.

Information on attendance of various training institutions was identified from responses to the survey questionnaire. For workers who has attended SENA training programs--both short SENA training (typically less than 1 year in length) and long SENA training (typically a two year program particularly oriented to youths)--five major training categories were identified:

- job-related secondary vocational education,
- institutional training prior to SENA course,
- SENA training (short and long),
- institutional training following SENA course,
- practical training (mainly employer-based on-the-job training).

Three main training categories were applicable to workers who had not received SENA training:

- relevant vocational education,
- institutional training (non-SENA),
- practical training.

We exercised some judgement in deciding whether any vocational schooling received was "relevant" to the occupation in question. For secretaries and bookkeepers, only "commercial" vocational education programs were considered related; for metal workers, fitters, and plumbers, "industrial" vocational education programs were taken as related; and

for electricians, both "technical" and "industrial" vocational education training programs were considered to be related. Other types of training programs were determined directly from responses to the questionnaire. Respondents answered survey items which asked whether they had received training from a training institute (and if so, if they had paid for it); they were also asked whether they had received any practical (enterprise or on-the-job) training.

IV. RESULTS: TRAINING PATTERNS

In Table 4 we summarize the major training patterns identified for each of the eight groups. The table reports, separately for SENA and non-SENA workers, the percentages of workers in each occupational group that have received any of the major types of training listed in the previous section. The major feature of the table is the sheer variety of training experiences registered by workers in a given occupation. Not only are workers trained through one of the three broad alternatives of non-SENA, short-course and long-course SENA; also, many workers chose a package of training courses from the available, additional training modes. The concept of a single training experience appropriate to a given occupation, appears dubious.

SENA-Course Completers:

The surprising result from the table is that SENA completers obtain a great deal of additional training, particularly following completion of their SENA course. Women particularly choose to obtain multiple types of training. From one-fifth of seamstresses, to 45 percent of bookkeepers and 56 percent of secretaries who had taken short SENA courses took additional training from training institutions. Smaller proportions of men obtained training in addition to their short-course SENA training, ranging from 9.5 percent (plumbers) to 36.2 percent (electricians).

Short SENA courses are designed essentially to provide only a limited range of specific occupational skills; this could explain why so many workers found it useful to secure other types of training. The training experiences of long-course SENA completers does show that, compared to short-course SENA-trainees, slightly fewer secretaries and bookkeepers received other training in addition to their long SENA program (45.2 and 42.0 percent of the long-course SENA- trainees took additional training, compared to 55.9 and 44.4 percent, respectively, of the short-course trainees). However, slightly higher proportions of male workers in bookkeeping, filters, and the electrical and plumbing trades, and female seamstresses complemented their long-course SENA training with other types of training. For most occupations, some 40 percent of workers who completed long SENA courses also received training in at least one other training program.

A sizeable proportion of workers in several occupations received training from three or even more institutions (including SENA) prior to their current job (Table 5). For example, 10.4 percent of female bookkeepers who completed a short SENA course (and 6.0 percent for long SENA training) received training from two additional types of training programs; parallel figures for electricians are 4.3 and 8.2 percent.

The timing of additional training, too, is relevant. For short SENA course completers, non-SENA institutional training is about as likely to be acquired before the SENA program as after it. Thus about half obtained their institutional-based training after SENA, no doubt to complement or to supplement short-course SENA training. Surprisingly, the proportion of long-course SENA completers receiving additional training from structured training institutions is no less than for short-SENA courses. Moreover, they tend to acquire institutional training after their long-SENA program rather than before, a pattern that is consistent across all the occupational groups. In most occupations, structured practical training is important, often more so for long-SENA courses.

Non SENA-Trained Workers:

While the SENA program is an important source of training in Colombia, the overwhelming majority of workers have never participated in its programs.⁶ Our data suggest that of the workers sampled who received their job preparation without SENA, many obtained training from more than one source. Yet, surprisingly, the large majority of workers (about two thirds) received no structured training of any kind. Moreover, over three-fourths of (female) seamstresses were working in the trade without structured training. From this we infer that a considerable proportion of these workers, especially male workers, manage to acquire their skills informally, perhaps picking them up from co-workers while on the job.⁷ One implication of this finding is that the major source of job preparation, and the primary alternative to SENA training, is not structured or institutionalized training outside the SENA framework, but informal on-the-job skills acquisition. Again we find that many of those that do benefit from structured training programs do so from multiple sources of training (Table 5); 2.3 to over 13 percent of the non SENA-trained workers received training from more than one source, be it secondary vocational training, practical training, or institutional training.

Gender Differences in Training Patterns. Table 4 reveals clear differences in the training patterns of women and men who are not SENA-trained. First, with the exception of seamstresses, most women receive some type of training (66.4 percent of secretaries and 60.1 percent of bookkeepers): approximately twice the proportion of men who receive "any type of training." Second, and again excepting seamstresses, women are much more likely to receive related secondary vocational training (about three times more so) than men; they are two to three times as likely to receive multiple types of training than

⁶ Household surveys suggest that less than 10 percent of (male) workers in the country's largest urban centers have ever participated in SENA (Horn, 1987).

⁷ This finding is in conformity with the results from research for the US, listed earlier.

men. The only type of training that women are less likely to receive is employer provided practical training.

Arguably, these differences are not gender related but a consequence of the occupations themselves. However, even for the same occupation, bookkeeper, nearly twice as many women receive "any kind of training" as men; they are about three times more likely to receive multiple types of training, forty percent more likely to receive institutional training, but only half as likely to receive practical training as men. The larger amount of training received by non SENA-trained women than men may be accounted for by a process by which women are substituting structured training for labor-market experience. Since, for any age cohort, women tend to have fewer total years of full-time work experience than men (or a more intermittent pattern of labor-market participation), they possess fewer skills acquired during their occupational experiences or the skills they did acquire are more depreciated relative to those of male workers.⁸

Worker-financed Institutional Training:

The survey provided information on which institutional training courses were paid for by the workers themselves: this is presented in Table 6. For all three major training groups (with the exception of plumbers), trainees are more likely to pay for courses provided in training institutions than to obtain it free.

The generally higher proportion of trainee-financed institution training by women is partially occupationally related, but also no doubt reflects a greater willingness to purchase structured training as a substitute for on-the-job experience and learning by doing.

⁸ One way to test for this hypothesis would be to look for fewer years of total work experience for women than men in the same age groups. Unfortunately, the survey does not identify actual years in the labor-market.

General Findings:

We may draw some general conclusions from the results reported in Tables 4 - 6.

1. Workers employed in the seven occupations analyzed here obtain training from a wide variety of sources. While, formally, short- and long-course SENA programs are the major providers of training in Colombia, other types of institutions, both free and fee-charging, offer skill training to large numbers of Colombian workers. Secondary vocational education programs also provide occupational skills. In addition, employers provide practical training to workers on-the-job or through employer-based training programs.

2. Although there are some similarities in the training patterns across occupations, there are also some striking differences. In general, men are more likely recipients of practical training from their employers than are women, women are more likely than men to be in jobs that use their secondary vocational education training, and white collar workers are more likely to obtain institutional training (not including SENA courses) than industry workers.

3. A substantial proportion of workers in the sample received their training from multiple sources. In particular, for some occupations, notably bookkeepers, secretaries, fitters, and electricians, two-fifths to one-half of the SENA-trained workers obtained additional training from other sources--most notably from fee-charging institutions and from employer-based practical training programs. Surprisingly, long-course SENA trainees, who participated in about two years of SENA training, were more likely than short-course SENA trainees to have taken this additional training after their SENA program was completed rather than before. Although non SENA-trained workers also took more than one type of training program, they were far less likely to do so than SENA trained workers.

4. Workers themselves paid for much of the training they received. Of the non SENA-trained individuals working as bookkeepers, secretaries, seamstresses, and electricians, from one-sixth to one-third paid for training in a training institute. Except for SENA-trained metal workers and plumbers, about 20 percent of both short-course and long-course SENA trained workers paid for additional (non-SENA) institution-based training.

V. OCCUPATIONAL TRAINING MAPS

Mapping Training Patterns:

One limitation in presenting results in tabular form, as in Tables 4 - 6, is that much relevant information is lost for those workers that have pursued multiple forms of training. It omits details on the particular combinations of training programs, and their sequences. The results of reverse tracer studies may be presented more comprehensively in the form of "occupational training maps." These are charts that identify, and illustrate diagrammatically, the main sequences (i.e., alternative training paths) workers in particular occupations pursued to reach a given job.

In the following section we present occupational training maps relating to, and extending, our findings for two of the occupation groups considered in Table 4 and 5. In preparation, we outline briefly the salient features of the particular form of training map that is employed in this study. One potential problem associated with training maps is that they can be made very rich in detail; on the other hand, too much information will inhibit clarity. A training map can be constructed in many different ways; in the training maps that follow, we have attempted to strike a balance between detail and clarity. But this balance has been achieved at a cost: much available information that was available (such as whether the worker paid for institutional training) is absent from the maps presented here.

Chart 1, relating to a hypothetical occupation, offers a simplified version of the training map we utilized in this study. Based on simulated data, it characterizes the training histories of a group of individuals identified as working in this occupation at a given point in time, and indicates their progress (upwards, in the chart) through successive incidents of training until they work in their current jobs. The oblong blocks represent various training programs (for simplicity, only three are illustrated in the chart--occupationally-related vocational education, institutional training, and formal on-the-job training), while the lines trace the major training paths pursued by these hypothetical workers to reach their current occupation.

Starting at the left hand side of the chart, we may see that institutional training represents the dominant mode of skills preparation for the occupation. Of all workers in the sample, 65 percent attended courses at training institutions. These 65 percent are divided into two groups. One group, representing 50 percent of the workers, received only institutional training. The remaining 15 percent of these workers also received related vocational training prior to institutional training. The chart indicates three paths moving through related vocational education training. The first line, marked 15 percent, we just discussed. The second line, marked 18 percent, represents the path of individuals who topped up their vocational training with formal on-the-job training. The third line, marked 10 percent, represents those who managed to work in their occupation without any additional institutional or on-the-job training. Consequently, all three of these lines add up to 43 percent ($15 + 18 + 10$) of the workers in the selected occupation who received related vocational education. The two remaining lines in the chart depict workers who only received formal on-the-job training (4 percent), and workers who received no structured training at all (3 percent). In all likelihood, these workers would have benefitted from informal learning on the job and from job experience.

The chart also indicates, with fictitious data, that many workers attended more than one training program. In this example, 33 percent experienced such multiple forms of

training (15 percent received secondary vocational education followed by institutional training; and 18 percent received secondary vocational education followed by formal on-the-job training). In principle, workers could have attended all three types of training program, though this possibility is not illustrated in the chart.

Occupational Training Maps: Some Empirical Results:

In Charts 2 and 3, we present occupational training maps for women bookkeepers and male fitters, respectively.⁹ Each map contains three sections, relating to (i) non SENA-trained workers; (ii) short SENA-trained workers; and (iii) long SENA-trained workers. Given the sampling procedure adopted for the sample of non-SENA trained workers (see Section III), we may not compare the three major training alternatives in terms of absolute numbers. Rather, we consider workers in each of the three training categories separately, each in terms of the percentage distribution of workers across the various identified training paths.

In each map, the shaded section on the left relating to non-SENA training depicts three major types of training program: (a) occupationally-related vocational training; (b) institutional training; and (c) formal on-the-job training). This non-SENA section parallels the illustrative map in Chart 1. The middle section (shaded) and rightmost section (unshaded), representing short and long SENA-trained categories of workers, respectively, report on five types of training: (a) occupationally-related vocational education; (b) institutional training that preceded the SENA course, (c) the SENA training itself, and (d) institutional training acquired after the SENA program; and (e) formal on-the-job training.

Female Bookkeepers. Chart 2 summarizes the training histories of the 752 women bookkeepers for which sufficiently detailed information was available. We will first

⁹ Because of limitations of space, we present only two maps in the body of the paper. The other six occupational training maps appear, without discussion, in the Annex.

discuss non-SENA trained female bookkeepers (the leftmost non-shaded section of the chart). The simplest path in this section is the single line on the right side of this section indicating that 40 percent of non SENA-trained bookkeepers were employed in this occupation with no formal training (having most likely acquired their bookkeeping skills on the job). Thirty-one ($2 + 1 + 7 + 21$) percent of all non-SENA bookkeepers received occupationally-related vocational education. Most of these, 21 percent of all non-SENA bookkeepers, received no additional training (the next to last line in this non-SENA category) beyond this occupationally-related secondary vocational education. While maintaining our focus on the non-SENA trained workers, if we turn our attention to all paths passing through the institutional training rectangle, we should note that 36 percent of these workers ($1 + 1 + 27 + 7$) received institutional training. Three quarters of these (27 percent of the total) received only institutional training. The others received secondary vocational education prior to institutional training (7 percent of the total), or other combinations of training.

The middle (shaded) section represents female bookkeepers who took short SENA courses. By definition, all the training paths of these workers pass through the SENA rectangle. The overwhelming majority (77 percent) received no formal training after SENA. Considering these 77 percent of the short SENA-trained bookkeepers, one seventh (11 percent of the total) had vocational education prior to SENA training, and one-sevenths participated in some other type of formal training prior to SENA. Twelve percent of all short SENA-trained workers ($4 + 2 + 5 + 1$) received at least two additional types of formal training experiences in addition to SENA.

The map for long SENA-trained workers is similar to that of short SENA-trained workers. Most (80 percent) took no additional training after their SENA program. In this case, however, only a few percent ($2 + 1 + 1$) have pursued two or more training programs in addition to SENA.

Male Fitters. The training map shown in Chart 3 relates to 752 male fitters. Turning our attention now to non SENA-trained male fitters (the leftmost, unshaded section of Chart 2), we note that 68 percent received no formal training. Very few obtained training in a secondary school vocational program (5 percent). Fourteen percent received only formal on-the-job training. Finally, very few of these non SENA-trained fitters pursued two or more forms of structured training (4 + 1 percent of the total).

The overwhelming majority of short-SENA trained fitters (85 percent) took no post-SENA formal training. Of the 15 percent of those who did pursue training after short SENA training, most participated in formal on-the-job training (11 percent of all short course SENA-trained fitters). Prior to SENA training, only 7 percent (1 + 6) of all short course SENA-trained workers participated in an occupationally-related vocational education program while in secondary school.

Long-course SENA-trainees were twice as likely to have "topped up" their SENA training (31 percent (6 + 25) of the long-course trainees), than the short-course SENA-trainees (15 percent (4 + 11) shown in the shaded short-SENA section of Chart 3). Most of this topping up is in formal on-the-job training courses.

Summary of Occupational Training Maps.¹⁰

1. The most striking feature of the maps is the sheer variety of training paths that workers are choosing for themselves. For these occupations, the notion that there is any unique training mode is clearly false. Yet this is precisely the assumption -- that there is an appropriate education/training level required for any given occupation -- that underlies manpower requirements forecasting models, so popular with educational planners in developing countries.

¹⁰ This section summarizes the findings in all eight training maps, including those that appear in the Annex.

2. A considerable number of workers were trained in more than one training mode; many had attended three such training activities (including SENA). The large numbers of SENA trained workers that topped-up SENA training, especially long-course SENA training, with subsequent additional training, is surprising.

3. While no direct information on informal skills acquisition is available from the surveys, its importance can be inferred from the fact that the large numbers of non SENA-trained workers reported having received no structured training at all. For men, the proportion of workers without any structured training represented the majority of non SENA trained workers, exceeding 60 percent for all occupations. For women, the proportion of non SENA-trained workers without formal training was large, but for commercial occupations (bookkeepers--pictured here, and secretaries--not pictured here), 40 percent or less were employed in their occupations without structured or formal training. Nearly 80 percent of non SENA-trained female seamstresses were working in this occupation without formal or structured training.

VI. TRAINING PATHS: POLICY USES

Occupational training maps, and the training paths they describe, have been seen, essentially, as tools for guiding public policy. They have a number of uses in this context, which we discuss in this concluding section.

The first is purely informational, in identifying for policy makers the major alternative training paths for given occupations. This information on training paths can provide signals for guiding choices in national training strategies. Main alternative training paths may be costed and this societal cost information compared with any earnings advantages associated with alternative paths. This simple form of cost-benefit analysis (or cost-effectiveness comparisons, if the earnings associated with different training paths are similar) will serve to guide the allocation of resources for training investment. By viewing

training from this wider vantage point, policy makers will be in a position to make more soundly based policy decisions, leading to a more efficient training system. For example, where one form of training, usually public sector-provided, is dominant in a training system (as is the case of SENA in Colombia), such alternatives as those shown on the left-hand third of the maps tend otherwise to be ignored by policy makers, mainly because of lack of information

For some occupations it is possible to identify a few major alternative paths in this way; for example, some 80 percent of metal workers learned their skills in one of three non-multiple training paths - solely in short or long SENA courses or informally on-the-job. Others however display a wider range of training paths, consisting of skill acquisition through a variety of training modes. In some of these occupations, it is not easy to identify a few dominant training paths; however, more important is the difficulty in understanding why individuals chose many of the training-mode combinations revealed in the maps. We may take as an example the case of fitters trained in long SENA courses; while 63 percent trained solely in the SENA program, a further 30 percent subsequently "topped up" this course with additional training, at another training institution (24 percent), or with practical on-the-job training (6 percent). Given that all these long SENA program graduates are employed as fitters, it is unclear why some would undertake additional training, yet others do not.

While the human capital approach might offer an explanation in terms of this additional training resulting in enhanced earnings, the results of a multiple regression analysis did not yield supportive results. The objective was to test for differences in earnings across the different training patterns, for each occupation. We estimated Mincer-type earnings functions for each of the eight occupation groups, in which the log of hourly wage is regressed on different training patterns; these included dummy variables relating to the main training categories listed in Table 4 (and identified in the maps), as well as interaction terms combining training modes (eg., SENA topped up by practical training or SENA

preceded by related vocational education).¹¹ However, very few of the coefficients on the training variables were significant, indicating, perhaps, that within an occupation alternative training packages do not lead to enhanced earnings. This is not to argue that training as such does not raise earnings. Rather it indicates that alternative training strategies chosen by workers now employed in a given occupation (and some entailing higher private costs than others), result in broadly similar earnings outcomes.

While these results are open to various interpretations, one suggestive explanation relates to the heterogeneity of workers employed in a given occupation. A worker's choice of a particular training pattern, from among the many potential paths available, in preparation for a given occupation, is no doubt related to his or her own characteristics in terms of ability, aptitudes, opportunities and social and educational background. A standardized training package may not allow all workers to reach the level and breadth of skill required in the job market. Workers will arrange a training path for themselves that is individually appropriate in complementing existing skills and abilities and filling in where they are lacking. Thus, while the training maps may identify a number of training paths, not all of these should be seen as realistic alternatives for all workers. Individuals, as good judges of their particular training requirements, may be left to arrange their training paths for themselves. However there may be a supplementary informational role that governments can perform to enhance the efficiency of this process of training choice.

This approach suggests that the plethora of training paths and alternatives may be a sign that training markets are functioning flexibly and well; workers are arranging their own training packages. Strong public intervention to narrow down the effective choice of available training paths - the outcome of the manpower requirements forecasting approach to planning national training provision - will not only lead to a reduction in choice but also to a less diverse and efficient training system.

¹¹ The category of workers who had both not attended SENA nor participated in any formal training was in the constant term. Details of the regression results are available on request from the authors.

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**Table 1: Sample Distribution by Occupation
and SENA- versus Non SENA-Training**

	non SENA- trained	SENA- trained	Total
	<hr/>	<hr/>	<hr/>
Secretaries	669	561	1,230
Bookkeepers	736	846	1,582
Seamstresses	11	161	272
Metal Wrkrs	150	170	320
Fitters	362	503	865
Electricians	118	305	423
Plumbers	85	118	203
Sample total	2,231	2,664	4,895

**Table 2: Sample Distribution by
Occupation and Gender**

	Women	Men
	<hr/>	<hr/>
Secretaries	1,150	80
Bookkeepers	782	800
Seamstresses	219	53
Metal Wrkrs	8	312
Fitters	6	859
Electricians	11	412
Plumbers	1	202
Total	2,177	2,718

Table 3: Sample Distribution by Occupation-Gender Categories

	No-SENA	Short SENA	Long SENA
	_____	_____	_____
Women			
Secretaries	617	170	363
Bookkeepers	358	105	319
Seamstresses	86	113	20
Men			
Bookkeepers	378	85	337
Metal Wrkrs	144	50	118
Fitters	358	120	381
Electricians	112	69	231
Plumbers	84	42	76
Total	2,137	754	1,845
Unclassified	94	26	39
Grand Total	2,231	780	1,884

Table 4: Summary of Training Received
(Percent of Occupation)

	Women			Men				
	Secretaries	Seamstresses	Bookkeepers	Bookkeepers	Metal Workers	Fitters	Electricians	Plumbers
<u>SHORT-COURSE SENA TRAINING</u>								
With Related Secondary Vocational Ed.	21.9	0.0	21.6	2.4	4.0	6.7	5.8	2.4
With Institutional Training	28.8	16.8	25.7	17.6	6.0	13.3	24.4	9.5
-- Before the SENA Program	14.1	8.8	11.5	11.8	4.0	7.9	14.3	2.4
-- After the SENA Program	14.7	8.0	14.2	5.9	2.0	5.4	10.1	7.1
With Practical Training	11.9	3.5	11.4	18.8	10.0	10.8	10.1	4.8
Total: With Additional Type of Training	55.9	19.5	44.4	34.1	18.0	26.7	36.2	9.5
Sample Size	170	113	105	85	50	120	69	42
<u>LONG-COURSE SENA TRAINING</u>								
With Related Secondary Vocational Ed.	15.6	0.0	17.6	3.6	5.1	4.6	3.4	3.9
With Institutional Training	27.5	30.0	23.8	26.1	8.5	11.8	27.7	7.9
-- Before the SENA Program	6.6	10.0	9.1	6.0	1.7	5.0	6.1	0.0
-- After the SENA Program	19.9	20.0	14.7	20.1	6.8	6.8	21.6	7.9
With Practical Training	7.3	15.0	5.6	14.8	4.2	25.2	16.4	17.1
Total: With Additional Type of Training	45.2	40.0	42.0	38.9	16.9	37.0	39.4	26.3
Sample Size	363	20 ^{a)}	319	337	118	381	231	76
<u>NO SENA TRAINING</u>								
Related Secondary Vocational Training	32.6	0.0	31.1	6.3	11.4	4.7	9.8	6.0
Institutional Training	41.2	16.3	36.3	26.4	10.4	13.6	20.5	10.7
Practical Training	6.4	8.1	5.0	9.4	6.3	17.9	14.3	10.7
Total: Any Type of Training	66.4	22.1	60.1	37.3	24.3	31.8	36.6	23.8
Sample Size	617	86	358	378	144	358	112	84

a) The sample size of this group is too small for meaningful analysis.

Note: Columns sum to a number greater than the total because many individuals receive more than one type of training.

**Table 5: Multiple Types of Training
(percent of occupation)**

	Women			Men				
	Secretaries	Seamstresses	Bookkeepers	Bookkeepers	Metal Workers	Fitters	Electricians	Plumbers
<u>SENA TRAINED WORKERS</u>								
Multiple Types of Training								
– in addition to short SENA course	7.2	0.9	10.4	4.7	2.0	4.2	4.3	7.1
– in addition to long SENA course	5.1	4.7	6.0	5.0	0.8	4.2	8.2	2.6
<u>NON SENA TRAINED WORKERS</u>								
Multiple Types of Training	13.5	2.3	11.0	4.0	2.8	4.9	8.0	3.6
Sample Size	1150	219	782	800	312	859	412	202

**Table 6: Sources of Finance of Institutional Training
(Percent of Institutional Training)**

	Women			Men				
	Secretaries	Seamstresses	Bookkeepers	Bookkeepers	Metal Workers	Fitters	Electricians	Plumbers
<u>SHORT-COURSE SENA TRAINING</u>								
– Free	32	20	11	20	66	25	29	50
– Paid For	68	80	89	80	34	75	71	50
<u>LONG-COURSE SENA TRAINING</u>								
– Free	33	17	25	33	29	42	28	67
– Paid For	67	83	75	67	71	58	72	33
<u>NO SENA TRAINING</u>								
– Free	16	7	16	21	47	45	35	68
– Paid For	84	93	84	79	53	55	65	32
Sample Size	1150	219	782	800	312	859	412	202

Chart 1

Training Map: Schematic Outline

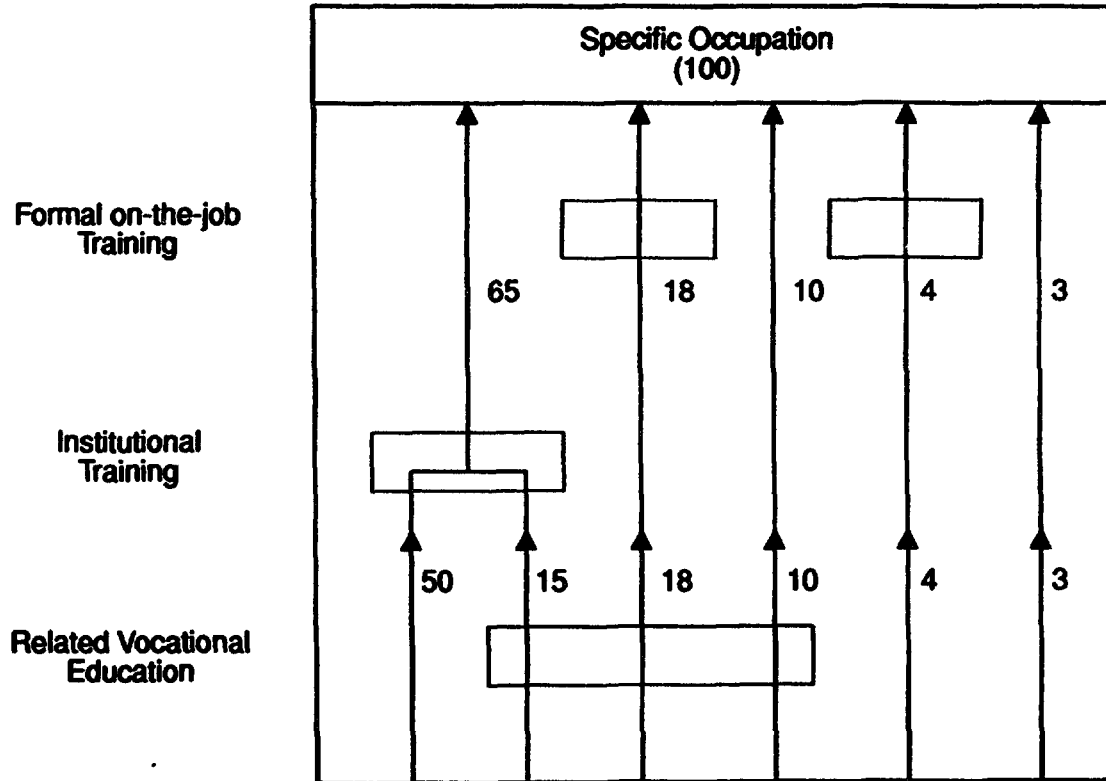


Chart 2
Training Map: Female Bookkeepers

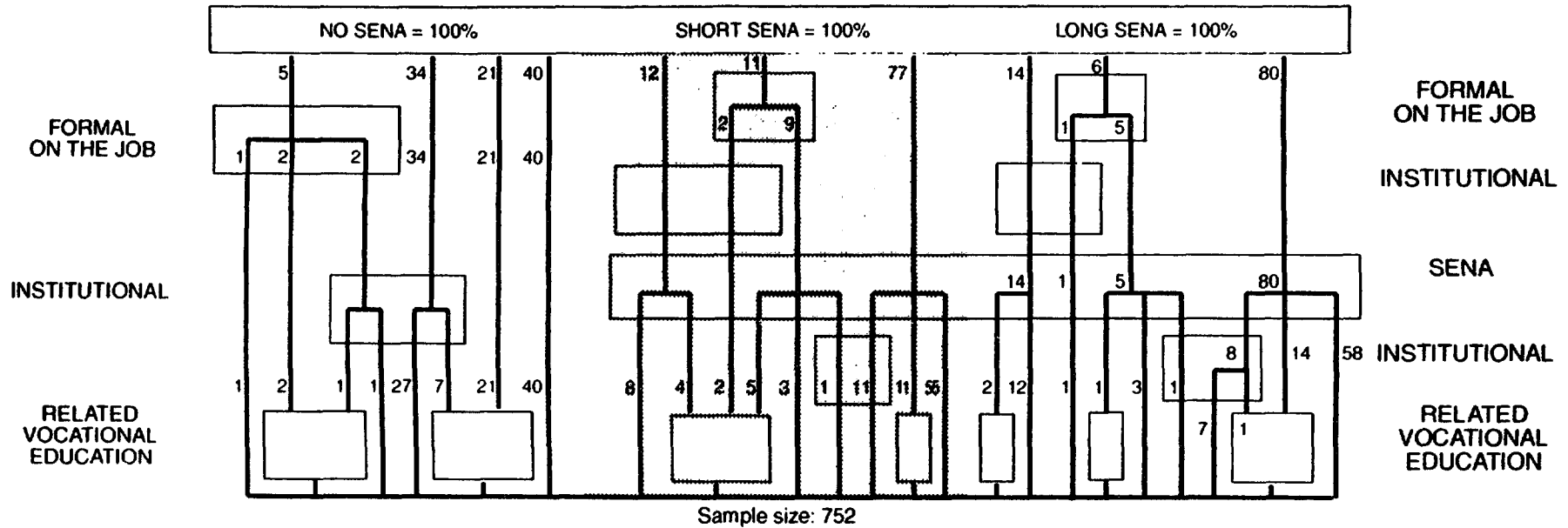
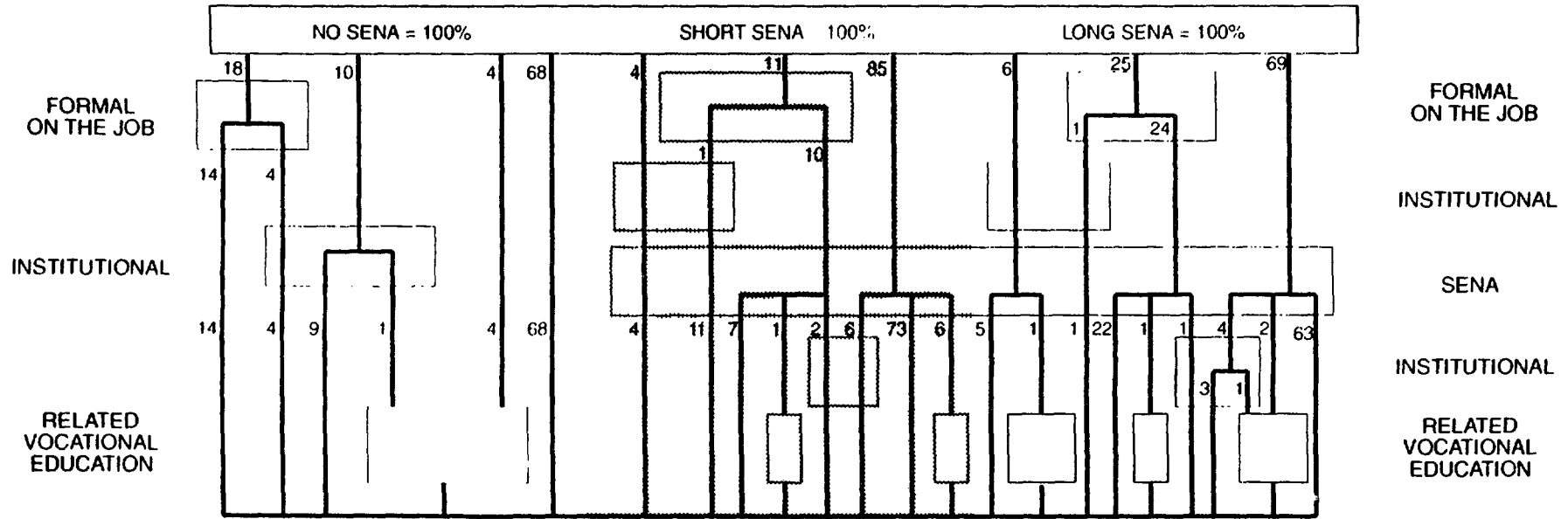


Chart 3

Training Map: Male Fitters

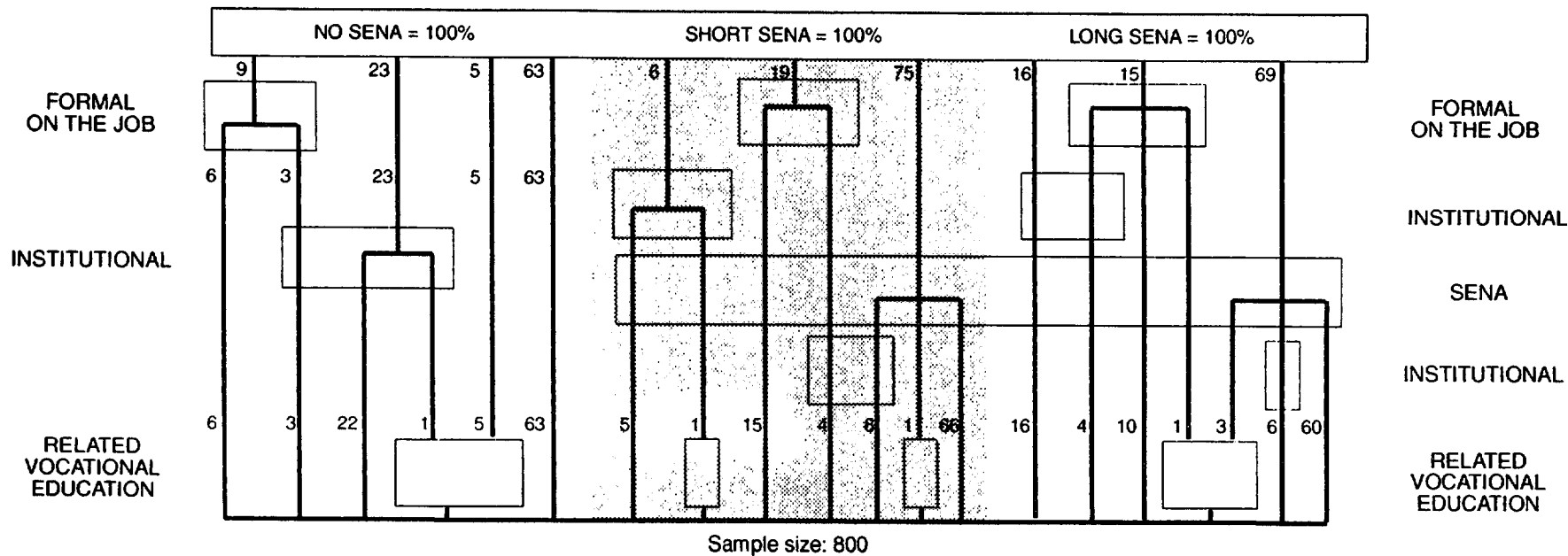


Sample size: 859

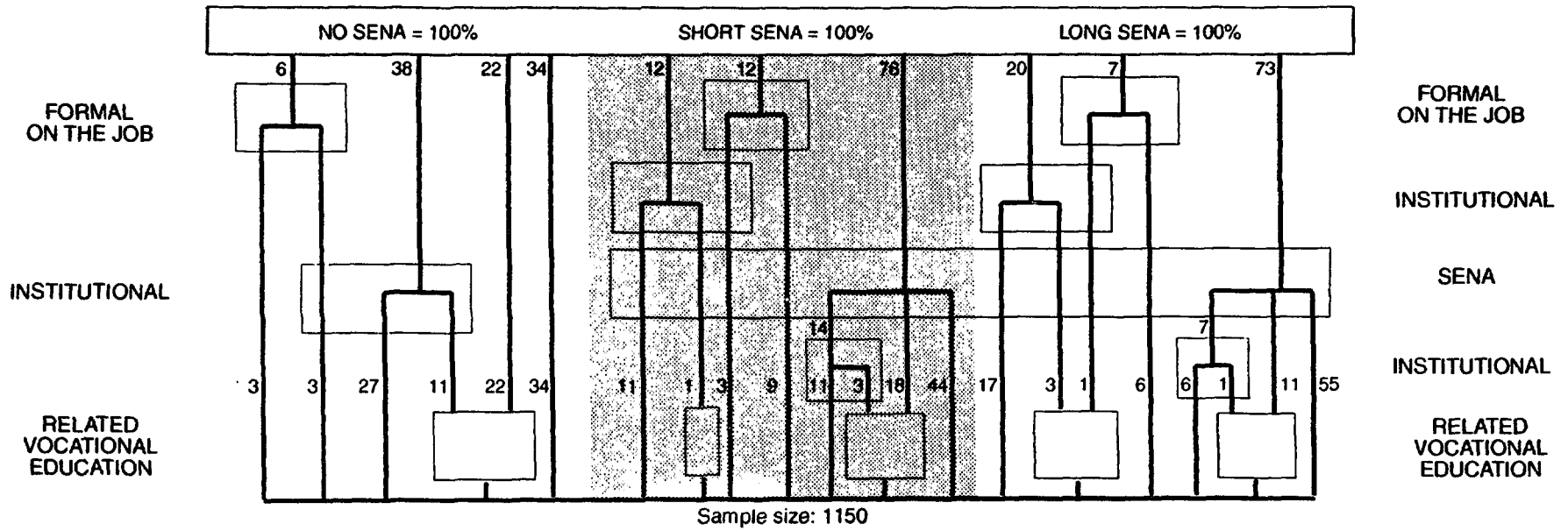
ANNEX

Additional Occupational Training Maps.

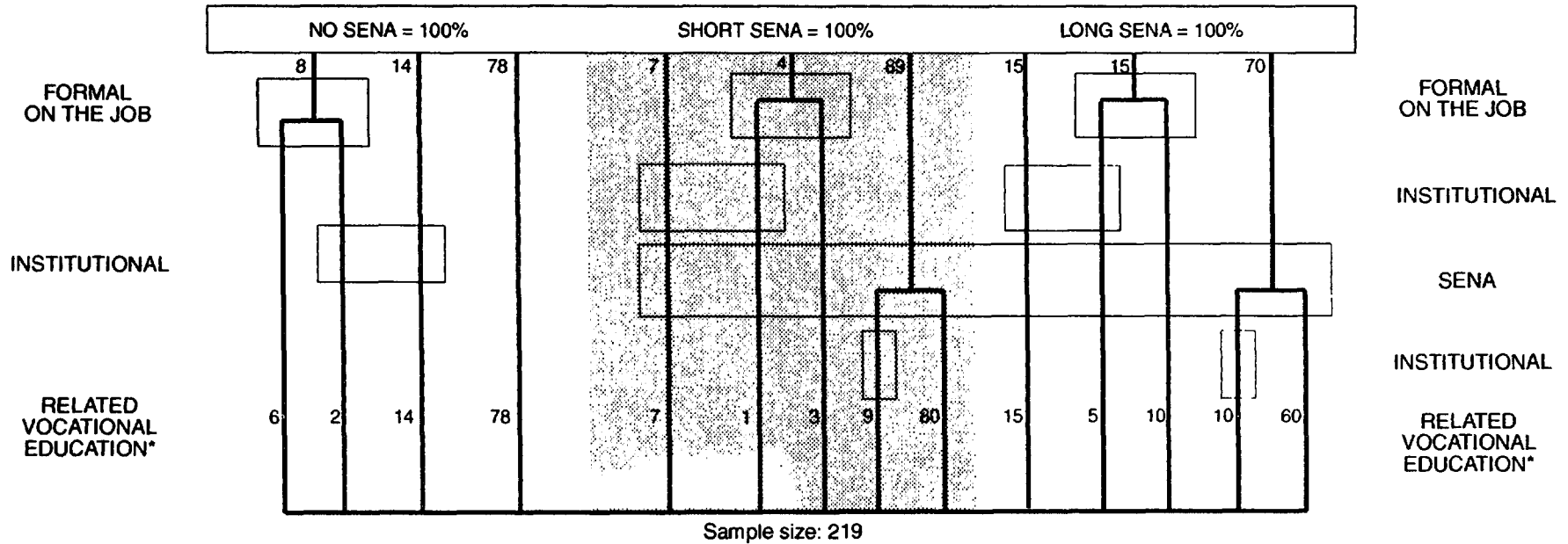
Annex Chart 1
Male Bookkeepers



Annex Chart 2
Female Secretaries

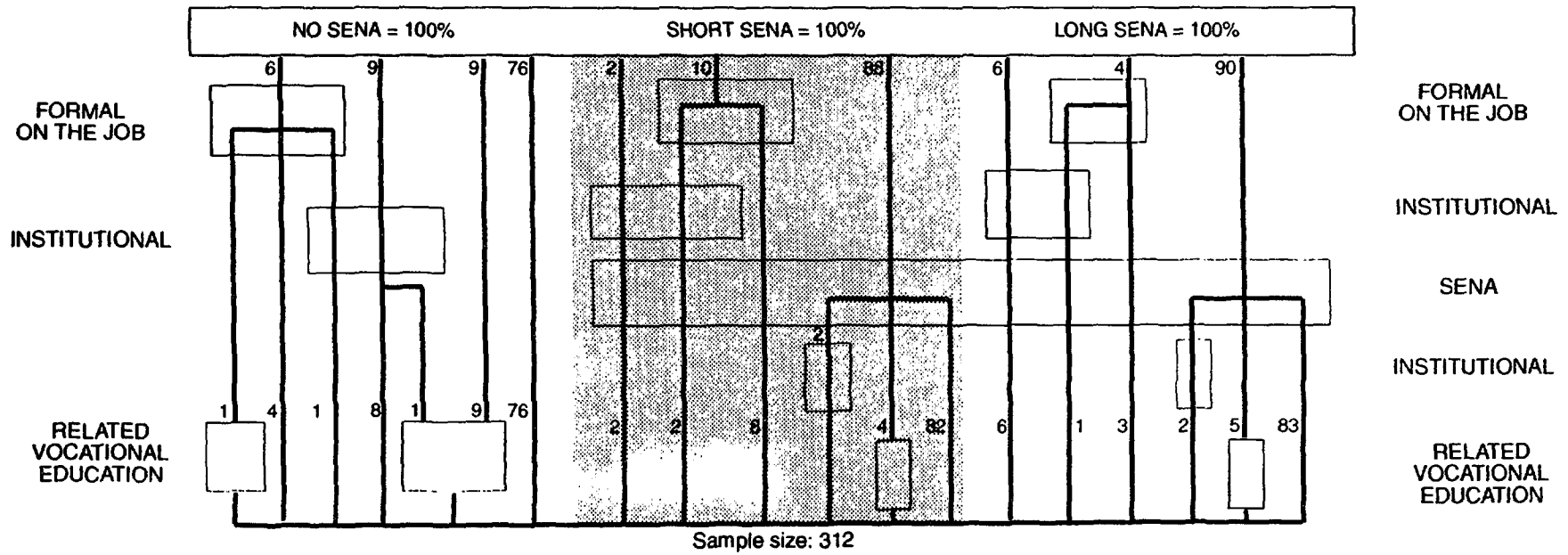


Annex Chart 3
Female Seamstresses

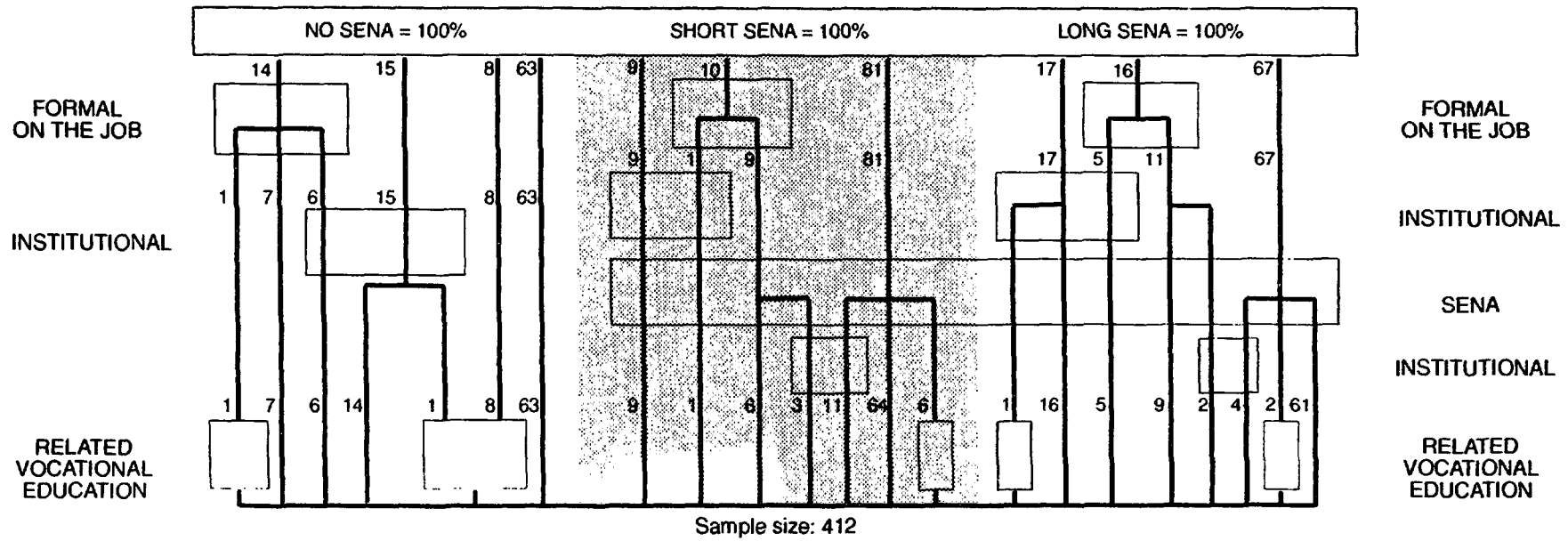


* No secondary level vocational education program was considered related to the occupation seamstress.

Annex Chart 4
Male Metal Workers

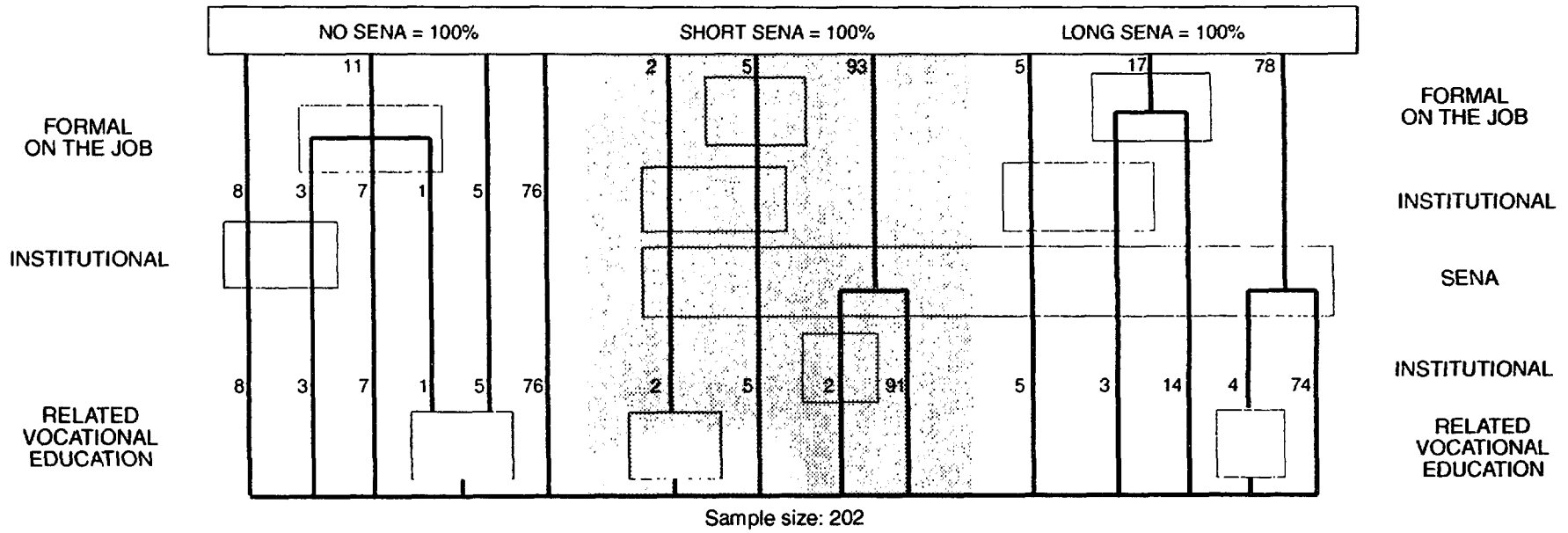


Annex Chart 5
Male Electricians



Annex Chart 6

Male Plumbers



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