Regional Project on Enterprise Development (RPED)

Ghana Manufacturing Enterprise Survey (GMES)

Rounds I – VII (12 years: 1991-2002)

Explanatory notes on dataset

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Availability

Abstract

This dataset contains comprehensive data from a panel survey of firms operating within the Ghanaian manufacturing sector. It covers 12 years of data, collected in seven rounds over the period 1992 to 2003. Rounds I–III are annual surveys collected under the Regional Program on Enterprise Development (RPED) organised by the World Bank. Rounds IV-VI cover two years each. Round VII covers three years.

The data was collected by a joint effort of the following organisations: the Centre for the Study of African Economies (CSAE), the University of Oxford, the University of Ghana, Legon and the Ghana Statistical Office.

The original sample of 200 firms, which were first surveyed in 1992, was drawn on a random basis from firms contained in the 1987 Census of Manufacturing Activities. The firms constituted a panel which was intended to be broadly representative of the size distribution of firms across the major sectors of Ghana's manufacturing industry. These sectors include food processing, textiles and garments, wood products and furniture, metal products and machinery.

Contents

The objective of this document is to provide potential users of this data with information which will help them to use this resource. Section 1 explains the origin of the data and gives a general overview of the type information which is covered. Section 2 describes the data files and do files used to construct the final data sets from primitive data. Section 3 explains in more detail how three specific types of information were obtained: physical capital stock, human capital stock and firm-specific price indices. Finally, Sections 4 and 5 estimate production and earnings functions respectively in order to provide an initial insight into some notable features of the data and illustrate some of the potential uses of the data.

For more information and analysis please also see the documentation to the first five rounds of the survey, which are also available on the CSAE website . Those earlier five rounds of data are in the SAS format while the data covering more rounds and described in these notes are in the STATA format.

1 Introduction to data

The data set contains a panel survey of firms operating within the Ghanaian manufacturing sector. It covers 12 years (waves) of data, collected in seven rounds over the period 1992 to 2003. Rounds I – III are annual surveys collected under the Regional Program on Enterprise Development (RPED) organised by the World Bank. Rounds IV-VI cover two years each. Round VII covers three years. The data was collected by a joint effort of the following organisations: the Centre for the Study of African Economies (CSAE), the University of Oxford, the University of Ghana, Legon and the Ghana Statistical Office.

The original sample of 200 firms, which were first surveyed in 1992, was drawn on a random basis from firms contained in the 1987 Census of Manufacturing Activities. The firms constituted a panel which was intended to be broadly representative of the size distribution of firms across the major sectors of Ghana's manufacturing industry. These sectors include food processing, textiles and garments, wood products and furniture, metal products and machinery. For approximately half of the original sample, the data was obtained in all waves. New firms entered the survey in later waves in order to make up for the firms which dropped out and keep the sample at a similar size thoughout the period covered.

The data contain two types of information:

- firm level information relating to years 1991 to 2002 -
- information on a sub-sample of workers & apprentices in each firm relating to years 1992 to 2003

This information for contained in the following two data files located in the **root folder**.

firms.dta	firm-level data
workers.dta	worker-level data

The difference in the time coverage is due to the fact that the questions for earnings (individual based surveys) refer to the earnings at the time of the survey while for the firm level information the information was collected for the previous calendar years. These differences are important for deflating the variables as inflation was substantial over the period.

Table 1.1 summarises the information above.

Table 1.1

Round	Date of survey	Period of worker-level data	Period of firm-level data	Number of firms	Firm attrition rate relative to next period
I	Aug/Sep 1992	1992	1991	200	0%
II	1993	1993	1992	212	0%
III	Sep 1994	1994	1993	215	30.2%
IV	Sep 1996	1995, 1996	1994, 1995	186	12.4%
V	Sep 1998	1997, 1998	1996, 1997	195	14.4%
VI	Oct 2000	1999, 2000	1998, 1999	182	27.5%
VII	Oct 2003	2001, 2002, 2003	2000, 2001, 2002	133	

Two steps were taken in order to enable an easy use of the data. First, all variables in both firm and worker datasets are ordered in a logical order and equiped with descriptive labels. Second, variables in the firm datasets are grouped together under several headings. These headings appear in the data as the only variables with names in capital letters. The headings are summarized in Table 1.2.

Table 1.2

Variable group	Content
Basic variables	firm id, wave number, year, firm age
Output and Costs	output, wage bills, material costs, other costs
Physical capital	plant & machinery, land & buildings
Number of workers	number of workers by gender, position and type of contract
Employee mobility	number of workers coming and leaving, reasons for leaving

Human capital	gender, age, education, experience, hours worker and earnings of workers, in total and by positions
Sector	sector
Location	location
Ownerhips and firm structure	public/private, domestic/foreign ownership, form of enterprise
Exports and imports	exported production, imported raw materials
Unionisation	unionisation
Wave dummies	wave dummies
Prices	CPI index, real and nominal exchange rate, firm-specific input and output price indices

2   Construction of final data files

Files **firms.dta** and **workers.dta** saved in the root folder are copies of files **prodfct_cl.dta** and **all112.dta** respectively, located in folder "3 Derived Data".

FIRMS.DTA = PRODFCT_CL.DTA =	all firm-level data; allows estimation of the production function
WORKERS.DTA = ALL112.DTA =	all worker-level data; allows estimation of the earnings function

These final datasets were constructed from raw data using a number of do files and intermediary datasets. All of these files are compatible with STATA 10 and are located in five folders as described in Table 2.1.

Table 2.1

Folder name	Content
(root directory)	folders 1-5 below, firms.dta, workers.dta
1 Primitive Data	primitive data in a separate subfoler for each wave
2 Derived Primitive Data	data derived from the primitive data, e.g. time-invariant characteristics of firms and workers; contains also price data and recall investment data collected during wave I
3 Derived data	files derived from the primitive data, e.g. files containing production data (firms) and files for earnings data (workers/apprentices).
4 Do Files	STATA do files which create the derived data from the primitive data
5 Questionnaires	questionnaires used for the survey

There are two main do files constructing the final data sets from raw data. Running these two do files will also run all other auxiliary do files and create or recreate all the final and intermediary datasets. These two do files are summarized below:

PRODFCT_CL.DO	• runs all auxiliary do files and creates all intermediate datasets related to firm-level information • creates (identical) datasets firms.dta and prodfct_cl.dta
ALL1-12.DO	• runs all auxiliary do files and creates all intermediate datasets related to worker-level information • creates (identical) datasets workers.dta and all112.dta

All do files make use of macros in order to identify the file location. The macro names are summarized in Table 2.2.

Table 2.2

Macro name	What it refers to
path (the only macro you should modify)	folder containing five principal folders
pw1, pw2, pw3, pw4, pw5, pw6, pw7	folders containing the primitive data for waves I to VII.
dp	folder for the derived primitive data.
d	folder for the derived data.
do	folder for the do files.

The only macro which needs to be modified in order to adjust the do files to one's computer is called "path", and it is defined in the beginning of do files prodfct_cl.do and all1-12.do. In BOTH these do files, you should set the macro equal to the full path to the root folder, i.e. the folder containing the five principal folders (1 Primitive Data, 2 Derived Primitive Data, ...). All the other macros are defined in terms of macro "path", so once the latter is modified in these two do files, all do files will run correctly.

Information on do files and datasets used to construct the final datasets is presented in Table 2.3 below. This full structure will be run and replicated by running dofiles prodfct_cl.do and all1-12.do.

Table 2.2

Data file (data file constructed by the do file is in parentheses)	Description	Source Data files
FIRM-LEVEL DATA		
prodfct_cl.do (**prodfct_cl.dta, firms.dta**)	Combines all firm-level data across all 12 years of the survey. **It runs the do files below:**	**d**\capn112; hc112; prod19r; scale112; **dp**\index; indexmacro; sizew6

scale112.do (scale112.dta)	Combines firm production data across all 12 years of the survey	**pw1**\rec01c; rec03c; rec04c; rec07c; rec08c; rec10c; rec11c; rec52; **pw2**\rec201c; rec208c; rec210c; rec211c; rec214c; rec249c; **pw3**\rec301c; rec304; rec311c; rec312; rec313c; rec314c; rec315c; rec316; rec321c; rec336; rec356; **pw4**\gmes1; gmes3; gmes6; **pw5**\gm5f3; gm5f4; gm5f5; **pw6**\gm6n3; gm6n4; gm6n5; **pw7**\gm7p3r; gm7p4; gm7p5r, **dp**\inv; sizew6,
labmar.do (labmar112.dta)	Combines data on number of employees across all 12 years of the survey	**pw1**\rec01c; rec11c; rec12c; **pw2**\rec201c; rec214c; rec215c; **pw3**\rec301c; rec321c; rec322c; **pw4**\gmes1; gmes3; gmes6; **pw5**\gm5f5; **pw6**\gm6n5; **pw7**\gm7p5r; **dp**\sizew6
scale112.do (scale112.dta)	Combines firm production data across all 12 years of the survey	**pw1**\rec01c; rec03c; rec04c; rec07c; rec08c; rec10c; rec11c; rec52; **pw2**\rec201c; rec208c; rec210c; rec211c; rec214c; rec249c; **pw3**\rec301c; rec304; rec311c; rec312; rec313c; rec314c; rec315c; rec316; rec321c; rec336; rec356; **pw4**\gmes1; gmes3; gmes6; **pw5**\gm5f3; gm5f4; gm5f5; **pw6**\gm6n3; gm6n4; gm6n5; **pw7**\gm7p3r; gm7p4; gm7p5r, **dp**\inv; sizew6,
humancap112.do (hc112.dta)	Combines human capital measures across all 12 years of the survey	**d**\all112; **do**\labmar; all1-12
labmar.do (labmar112.dta)		**pw1**\rec01c; rec11c; rec12c; **pw2**\rec201c; rec214c; rec215c; **pw3**\rec301c; rec321c; rec322c; **pw4**\gmes1; gmes3; gmes6; **pw5**\gm5f5; **pw6**\gm6n5; **pw7**\gm7p5r; **dp**\sizew6
all1-12.do (all112.dta)		**do**\worker13; appren13; all4; all5; all6; earn71_stata
capitalstock112.do (capn112.dta)	Combines capital stock levels across all 12 years	**d**\invlb; scale112; **dp**\sizew6
WORKER-LEVEL DATA		
all1-12.do (all112.dta, workers.dta)	Combines individual-level data for workers and apprentices across all 12 years of the survey. **It runs the do files below:**	
worker13.do (worker13.dta)	Combines worker data for years 1 to 3 (waves I to III).	**pw1**\rec07c; rec11c; rec12c; rec13c; rec19c; rec20c; rec60c, **pw2**\rec201c; rec208c; rec210c; rec214c; rec216c; rec220c; rec221c; rec222c; rec223c, **pw3**\rec326c,
appren13.do (appren13.dta)	Combines apprentice data for years 1 to 3 (waves I to III).	**pw1**\rec11c; rec12c ; rec22c; **pw2**\rec224c; **pw3**\rec330c; rec331c; rec332c
all4.do (all45c.dta)	Creates earnings and occupation variables for years 4 and 5 (wave IV).	
earn41.do (earn45.dta)	Combines worker and apprentice data for years 4 and 5 (wave IV).	
earncreate.do (earn4.dta)	Combines worker data for years 4 and 5 (wave IV) using primitive data.	**pw4**\gmes6a1a; gmes6a1b

apprencreate.do (appren4.dta)	Combines apprentice data for years 4 and 5 (wave IV) using primitive data.	**pw4**\gmes6a2
all5.do (all67.dta)	Creates earnings and occupation variables for years 6 and 7 (wave V).	
earn51.do (all5.dta)	Combines worker and apprentice data for years 6 and 7 (wave V).	
earn5create.do (earn5.dta)	Combines worker data for years 6 and 7 (wave V) using primitive data.	**pw5**\gm5f13a; gm5f13b; gm5f13c
appren5create.do (appren5.dta)	Combines apprentice data for years 6 and 7 (wave V) using primitive data.	**pw5**\gm5f14a; gm5f14b
all6.do (all89c.dta)	Creates earnings and occupation variables for years 8 and 9 (wave VI).	
earn61.do (all6.dta)	Combines worker and apprentice data for years 8 and 9 (wave VI).	
earn6create.do (earn6.dta)	Combines worker data for years 8 and 9 (wave VI) using primitive data.	**pw6**\gm6n13a; gm6n13b; gm6n13c
appren6create.do (appren6.dta)	Combines apprentice data for years 8 and 9 (wave VI) using primitive data.	**pw6**\gm6n14a; gm6n14b; gm6n14c
earn71_stata.do (all1012.dta)	Creates earnings and occupation variables for years 10 to 12 (wave VII).	**dp**\panwork05; **pw7**\gm7pwall_f_aug04_c1_public,
all6.do (all89c.dta)	Creates earnings and occupation variables for years 8 and 9 (wave VI). *NB: This is the same file as for the previous wave.*	**do**\earn61

3 Description of questionnaires

The dataset presented here has been extracted from a detailed questionnaire conducted with the owners or senior managers and, for relevant sections, workers of the sampled manufacturing firms. The original questionnaire was designed by a team from the World Bank. Over the waves of the survey, the structure of the questionnaire and the range of questions included have evolved in the light of field experience and in response to emerging research issues. Outlines of each of the questionnaires are included in folder "5 Questionnaires" in xlsx and pdf formats.

The overall questionnaire has been divided into a number of sections, grouping questions related to different aspects of firm-level structure and performance and also a section of supplementary labour market information gathered from interviews with a sample of workers within each firm. For instance, in round V the sections are organized as follows:

Survey Sections (Round V)

1. General Information Sheet

2. Entrepreneurship Questionnaire

3. General Firm Questionnaire

4. Investment Questionnaire

5. Labour Questionnaire

6. Government Regulation Questionnaire

7.	Financial Markets Questionnaire
8.	Infrastructure Questionnaire
9.	Adjustment Questionnaire
10.	Investor Confidence
11.	Network Questionnaire
12.	Conflict Resolution
13.	Worker Questionnaire
14.	Apprentice Questionnaire
15	Follow-up on labour, networks, insurance, property rights, miscellaneous

Questions within each of these sections have been further classified into a series of sequential records for ease of reference and data entry purposes. These individual record numbers provide the link between sections of the questionnaire and the data files in which the raw data is stored.

Also, each wave of the questionnaire has been assigned a unique code letter to assist in referencing/ data entry as follows:

- Round I - R
- Round II - Z
- Round III - L
- Round IV - S
- Round V - F
- Round VI - N
- Round VII - P

Variables in the data, eg output, employment and exports, can be identified and extracted by referring to the unique code for the data point which contains the relevant data entry for each of these variables. Some of these references are included in the tables of variables included below.

In each round, the initial record contains data which identify each firm's sector and location. However, the information that would identify the specific firm interviewed has been excluded. The subsequent records contain the raw data obtained from the relevant group of questions, ie. records in each questionnaire. Where these record numbers are suffixed with a "c" eg Rec03c this indicates that corrections have been made to the data in this file to account for errors identified in the data entry process.

There is one additional raw data file, which is not contained in the three folders described above. This data file titled inv.sd2 contains some additional observations on the firm's investment history collected.

4 Notes on construction of variables

This section provides some information on the derivation of three important groups of variables. These are

- physical capital stock (derived using investment flows)
- human capital stock (derived from worker information)
- price indices for output and material inputs

4.1 Capital Stock

The primary data contains information on the replacement value of the stock of plant and machinery, the sale value of land and buildings and investment in both these types of capital. These variables are processed in do file capitalstock112.do. It starts making some changes to the primary data. It then sets out the price deflators that are used both to deflate the nominal investment series the capital stock. The plant and machinery is deflated using a weighted average of the urban CPI and the nominal exchange rate, with the respective weights of 0.25 and 0.75, i.e. it is assumed that 75% of capital equipment is imported. The land and buildings obviously cannot be imported, so they are deflated simply by the urban CPI.

During the derivation of the capital stock, it is assumed that more recent data are more reliable, so the procedure is to work backwards from the more recent figures and impute a nominal value of the capital stock over the whole period for which we have information for the firm. We then work forward beginning with the nominal capital stock in wave 1 and calculating a constant price capital stock series based on a constant price investment series and a depreciation rate equal to 0.02.

While a similar approach is taken with regards to the land and buildings, it differs in two ways. First, the land-and-buildings (l&b) depreciation rate is assumed to be zero. Second, there is good l&b stock information but no l&b investment information for waves 2-7, while there is good investment information but only a limited amound of stock information for waves 8-12. There is not much of either information in wave 1. In order to get decent stock series for all 12 years, it is necessary to somehow connect the stock information in wave 7 with the investment information in wave 8. This is done on the assumption that in firms for which there is no stock information for wave 8 the l&b investment in wave 7 was equal to zero, and the real stock in wave 8 therefore equals the real stock in wave 7, while the nominal stocks differ only due to different prices. The l&b stock in wave 1 is based on the one in wave 2 in the same way.

4.2 The Human Capital Stock

To obtain a measure of the human capital stock available to the firm it was necessary to merge the worker with firm level information.. The human capital stock comprises of the following characteristics of workers: age, tenure in current job, potential experience, education, hours worked and earnings.

The approach taken towards calculation of human capital is motivated by the fact that the difference in human capital characteristics among workers at different occupations within the same firm tend to be larger than differences among workers at the same occupation in different firms. In other words, occupation is a strong predictor of a worker's characteristics. As only a small fraction of workers in each firm is interviewed each year, and this fraction may not be representative of the occupational composition

of the firm, the approach weights the characteristics by the number of a firm's employees at individual occupations. The approach is based on the following steps:

I.   Calculate firm-year-occupation-specific averages of the variables. (These averages will be based on very few observations, often just one, and in many cases there will not be many observations available at all.)

II. Substitute year-occupation-specific averages for firm-year-occupation-specific averages where the latter could not be calculated. (An alternative approach would be sector specific averages for each year and occupation rather than sample averages, as done here.)

III. Calculate a weighted average of the firm-year-occupation-specific averages, where the weights are the numbers of employees in each occupation for a given firm and year.

Note that the inter-firm variation in the human capital variables is composed of the variation in a firm's human capital at given occupation (where this is known) and the variation in the firm's occupational composition.

4.3   Prices Indices for Output and Raw Material Inputs

Two firm-specific price indices have been constructed, one a price index for outputs and the other a price index for raw material inputs. These are described below in Table 4.1 and Table 4.2 respectively. For Wave 4 to Wave 7 of the data, which collected information for the years 1994 to 2002, information was sought on the prices of output and material inputs of the most important goods that the firms produce. We were given access to World Bank data collected as part of a supplementary survey of the RPED project for prices covering the period 1991 to 1994 from some of the same firms as were covered in the main survey. We begin by describing how the data for the years 1994-2002 were first used to calculate the price indices for outputs and material inputs.

The information on the goods and their prices was extracted from the primary data and inputed into Excel. In Excel a spread sheet was created which was changed (by hand) so that the names and rankings of the goods was made comparable across the years. This Excel file was then manipulated to provide as comprehensive a data series as possible across the nine years of data. It should be noted that where information on the products of the firm was available, but no prices, we have used price information for similar goods across firms to create a price index for the firm with missing price information.

In the case of the supplementary RPED data available from the World Bank, we have not attempted to match products across the waves. An initial attempt to do this gave no useful information linking the years 1993 and 1994. So rather than linking products, we created overlapping firm prices where possible and then created a linked index.

Where data was missing for all the years we have used sectoral averages so that a complete set of firm deflators is available across all firms which have been covered over the course of the surveys. The sectoral averages were created from the firms for which we had observations. In Table 4.1 we show the price index for outputs. Table 4.2 shows the price index for raw material inputs. Table 4.3 presents some macro price indices to check that the results shown for the firms are, at least broadly, consistent with the macro data.

Table 4.1 shows an increase in output prices of 340% between the years 1991 and 1996 and then a further increase in output prices of 218% between 1997 and 2002. Over this period the urban CPI index shown in Table 4.3 rose by 331% between 1991 and 1996 and 135% between 1997 and 2002. The rise in the price

of raw materials shown in Table 4.2 is higher at 376% between 1991 and 1996 and then by 321% between 1997 and 2002. Thus input prices appear to be in line with output prices for the first 6 years of the data and then increase more rapidly for the second 6 years of the data. However, as Table 4.3 illustrates there was a fall in the crude measure of the real exchange rate of 6.8% for the period 1991 to 1996 and then a further fall of 31% between 1997 and 2002.

Table 4.1: Price Index for Outputs

Year	N	Mean	Std. Dev.	Min	Max
1991	278	100.00	0.00	100.00	100.00
1992	278	115.87	7.44	100.00	137.29
1993	278	142.85	12.96	105.51	180.51
1994	278	194.48	31.84	117.10	298.01
1995	278	278.94	49.01	135.19	498.33
1996	278	440.31	117.89	193.97	949.32
1997	278	548.73	144.91	229.18	1,426.46
1998	291	664.03	160.33	278.57	1,449.48
1999	291	843.38	210.18	337.32	1,996.36
2000	291	1,194.85	328.61	480.64	2,844.46
2001	291	1,431.22	391.78	576.20	3,409.99
2002	291	1,742.47	492.34	657.88	4,151.80

Table 4.2: Price Index for Raw Materials

Year	N	Mean	Std. Dev.	Min	Max
1991	278	100.00	0.00	100.00	100.00
1992	278	126.60	19.69	100.00	168.25
1993	278	164.05	25.27	115.79	271.16
1994	278	232.55	38.31	135.42	483.19
1995	278	333.06	52.50	148.51	613.04
1996	278	475.62	107.60	210.13	853.74
1997	278	588.09	140.59	256.58	1,040.82
1998	291	798.76	200.87	322.54	1,602.99
1999	291	1,094.23	283.54	328.37	2,044.16
2000	291	1,704.15	488.46	343.52	3,620.36
2001	291	2,028.06	573.69	394.43	3,798.77
2002	291	2,473.90	708.83	466.69	5,504.37

Table 4.3: Consumer Price Indices, Exchange Rates and Capital Stock Deflator

Year	CPI: 1991=100	Nominal Exchange (Rate Cedis/US$); 1991=100	Capital Stock Deflator: 1991=100	Real Exchange Rate:1991=100
1991	100.0	100.00	100.00	100.00
1992	109.3	118.83	116.45	91.94
1993	137.6	176.46	166.74	77.64
1994	173.2	260.10	238.37	79.71
1995	280.3	326.35	314.84	89.37
1996	431.3	445.11	441.65	93.22
1997	554.4	557.37	556.63	97.88
1998	665.8	623.06	633.74	97.17
1999	719.8	719.71	719.73	57.15
2000	879.0	1,483.04	1,332.03	60.77
2001	1218.5	1,949.54	1,766.78	59.32
2002	1303.1	2,156.43	1,943.10	67.69

5 List of variables

What follows is the list of all variables names and variables labels for data files firms.dta and workers.dta. The variables are listed in the same order as they appear in the datasets.

5.1 Firm dataset (firms.dta, prodfct_cl.dta)

Variable	Label	
BASIC VARIABLES		
firm	Firm Identification Number	
wave	Wave number	
year	Year	
fmage	Firm age	
OUTPUT AND COSTS		
output	Annual value of manufactured output	
routput	Real value of manufactured output (1991 Firm-Specific Output Prices)	
routputpc	Real value of manufactured output p.w. (1991 Firm-Specific Output Prices)	
lroutput	Log real value of manufactured output (1991 Firm-Specific Output Prices)	
lroutputpc	Log real value of manufactured output p.w. (1991 Firm-Specific Output Prices)	
routputva	Real manufactured value added (1991 Firm-Specific Output Prices)	
routputvapc	Real manufactured value added p.w. (1991 Firm-Specific Output Prices)	
lroutputva	Log real manufactured value added (1991 Firm-Specific Output Prices)	
lroutputvapc	Log real manufactured value added p.w. (1991 Firm-Specific Output Prices)	
wages	Annual wage bill including allowances	
wages_na	Annual wage bill excluding allowances	
mata	Annual total cost of raw materials	
rmata	Real total cost of raw materials (1991 Firm-Specific Raw Material Prices)	
rmatapc	Real cost of raw materials p.w. (1991 Firm-Specific Raw Material Prices)	
lrmata	Log real cost of raw materials (1991 Firm-Specific Raw Material Prices)	
lrmatapc	Log real cost of raw materials p.w. (1991 Firm-Specific Raw Material Prices)	
misc	Annual indirect costs	
rmisc	Real indirect costs (CPI 1991 Cedis, millions)	
rmiscpc	Real indirect costs p.w. (CPI 1991 Cedis, millions)	
lrmisc	Log real indirect costs (CPI 1991 Cedis, millions)	
lrmiscpc	Log real indirect costs p.w. (CPI 1991 Cedis, millions)	
misca	Annual building rental costs	
miscb	Annual electricity costs	
miscc	Annual water costs	
miscd	Annual phone costs	
misce	Annual fuel costs	
miscg	Annual transport costs	
PHYSICAL CAPITAL		

cap	Replacement value of plant and machinery (nominal Cedis, millions)
capn	Imputed replacement value of plant and machinery (nominal Cedis, millions)
lcap	Log replacement value of plant and machinery
rcapn	Real imputed replacement value of plant and machinery (deflator 1991 Cedis, mill
rcapnpc	Real replacement value of plant and machinery p.w. (deflator 1991 Cedis, million
lrcapn	Log real replacement value of plant and machinery (deflator 1991 Cedis, millions
lrcapnpc	Log real replacement value of plant and machinery p.w. (deflator 1991 Cedis, mil
klb	Sale value of all land and buildings (nominal Cedis, millions)
klbn	Imputed sale value of all land and buildings (nominal Cedis, millions)
rklbn	Real imputed sale value of all land and buildings (CPI 1991 Cedis, millions)
inv	Investment in plant and equipment (nominal Cedis, millions)
rinv	Real investment in plant and equipment (deflator 1991 Cedis, millions)
invr	Plant & machinery investment rate
rinvr	Real plant & machinery investment rate
invlb	Investment in land and buildings (nominal Cedis, millions)
rinvlb	Real investment in land and buildings (CPI 1991 Cedis, millions)
invlbr	Land & Buildings investment rate
rinvlbr	Real Land & Buildings investment rate
invd	Dummy if investment in plant or equipment
invlbd	Dummy if investment in land or buildings
invrci	Plant & machinery investment rate conditional on any investment
invlbrci	Land & buildings investment rate conditional on any investment
NUMBER OF WORKERS	
worker	Total Number of Workers
skill	Number of Skilled Workers
unsk	Number of Unskilled Workers
workerm	Number of Male Workers
skillm	Number of Male Skilled Workers
unskm	Number of Male Unskilled Workers
workersq	Total Workers Squared
skillsq	Skilled Workers Squared
unsksq	Unskilled Workers Squared
workermsq	Male Workers Squared
skillmsq	Male Skilled Workers Squared
unskmsq	Male Unskilled Workers Squared
lworker	Log Total Workers
lskill	Log Skilled Workers

lunsk	Log Unskilled Workers
lworkerm	Log Male Workers
lskillm	Log Male Skilled Workers
lunskm	Log Male Unskilled Workers
lworkersq	(Log Total Workers) Squared
lskillsq	(Log Skilled Workers) Squared
lunsksq	(Log Unskilled Workers) Squared
lworkermsq	(Log Male Workers) Squared
lskillmsq	(Log Male Skilled Workers) Squared
lunskmsq	(Log Male Unskilled Workers) Squared
man	Number of Management Workers
admin	Number of Administrtion Workers
comm	Number of Camerical Workers
prodw	Number of Production Workers
maint	Number of Maintenance Workers
mast	Number of Masters
appr	Number of Apprentices
superv	Number of Supervisor Workers
manm	Number of Male Management Workers
adminm	Number of Male Administrtion Workers
commm	Number of Male Camerical Workers
prodwm	Number of Male Production Workers
maintm	Number of Male Maintenance Workers
mastm	Number of Male Masters
apprm	Number of Male Apprentices
supervm	Number of Male Supervisor Workers
manpc	Management Workers as a Share of All Workers (%)
adminpc	Administrative Workers as a Share of All Workers (%)
commpc	Camerical Workers as a Share of All Workers (%)
prodwpc	Production Workers as a Share of All Workers (%)
maintpc	Maintenance Workers as a Share of All Workers (%)
mastpc	Masters as a Share of All Workers (%)
apprpc	Apprentices as a Share of All Workers (%)
supervpc	Supervisor Workers as a Share of All Workers (%)
emp	Total number of workers currently employed
lemp	Log total number of workers currently employed
emp_ftp	Total number of full-time (permanent) workers currently employed
emp_ftc	Total number of full-time (casual) workers currently employed
emp_pt	Total number of part-time workers currently employed
EMPLOYEE MOBILITY	

hire_pw	Annual number of permanent workers hired
left_pw	Annual number of permanent workers left firm
fire_pw	Annual number of permanent workers fired
quit_pw	Annual number of permanent workers quit or absconded
retired_pw	Annual number of permanent workers retired
retired_ill_pw	Annual number of permanent workers left because of illness
died_pw	Annual number of permanent workers who died
sever_pay	Total Annual Severance pay to fired workers
insure_ill_acc	Dummy if insured workforce against accident or illness
HUMAN CAPITAL	
eduwgt	Weighted firm average of education
edurwgt	Weighted firm average of years of educaton_revised
pexwgt	Weighted firm average of potential experience
yrswgt	Weighted firm average of imputed years of education
agewgt	Weighted firm average of worker age
tenwgt	Weighted firm average of tenure in job
ernwgt	Weighted firm average of real hourly earnings bt (1991 Cedis)
ernbtwgt	Weighted firm average of real monthly earnings bt (1991 Cedis)
ernomwgt	Weighted firm average of monthly earnings bt (nominal Cedis)
male	Firm proportion of workforce male
educ	Firm average formal education
educ_rev	Firm average revised education
pexp	Firm average potential experience
pexpsq	Firm average potential experience squared
age	Firm average age of workers
agesq	Firm average age of workers squared
tenure	Firm average tenure in job
earnm	Firm average monthly earnings bt
none	Firm proportion of workers with no education
primcom	Firm proportion of workers completed primary education
seccom	Firm proportion of workers completed secondary education
univ	Firm proportion of workers completed university education
yearsc	Firm average imputed years of schooling
hours	Firm average weekly hours worked
manedu	Firm average years of education of management
adminedu	Firm average years of education of administration
saledu	Firm average years of education of sales
supedu	Firm average years of education of supervisor
techedu	Firm average years of education of technician
prosedu	Firm average years of education of production or support

mastedu	Firm average years of education of master
appredu	Firm average years of education of apprentice
manedur	Firm average years of education_revised of management
adminedur	Firm average years of education_revised of administration
saledur	Firm average years of education_revised of sales
supedur	Firm average years of education_revised of supervisor
techedur	Firm average years of education_revised of technician
prosedur	Firm average years of education_revised of production or support
mastedur	Firm average years of education_revised of master
appredur	Firm average years of education_revised of apprentice
manyrs	Firm average years of imputed education of management
adminyrs	Firm average years of imputed education of administration
salyrs	Firm average years of imputed education of sales
supyrs	Firm average years of imputed education of supervisor
techyrs	Firm average years of imputed education of technician
prosyrs	Firm average years of imputed education of production or support
mastyrs	Firm average years of imputed education of master
appryrs	Firm average years of imputed education of apprentice
manage	Firm average age of management
adminage	Firm average age of administration
salage	Firm average age of sales
supage	Firm average age of supervisor
techage	Firm average age of technician
prosage	Firm average age of production or support
mastage	Firm average age of master
apprage	Firm average age of apprentice
manpex	Firm average potential experience of management
adminpex	Firm average potential experience of administration
salpex	Firm average potential experience of sales
suppex	Firm average potential experience of supervisor
techpex	Firm average potential experience of technician
prospex	Firm average potential experience of production or support
mastpex	Firm average potential experience of master
apprpex	Firm average potential experience of apprentice
manten	Firm average tenure in job of management
adminten	Firm average tenure in job of administration
salten	Firm average tenure in job of sales
supten	Firm average tenure in job of supervisor
techten	Firm average tenure in job of technician
prosten	Firm average tenure in job of production or support

mastten	Firm average tenure in job of master
apprten	Firm average tenure in job of apprentice
manern	Firm average real hourly earnings bt (1991 Cedis) of management
adminern	Firm average real hourly earnings bt (1991 Cedis) of administration
salern	Firm average real hourly earnings bt (1991 Cedis) of sales
supern	Firm average real hourly earnings bt (1991 Cedis) of supervisor
techern	Firm average real hourly earnings bt (1991 Cedis) of technician
prosern	Firm average real hourly earnings bt (1991 Cedis) of production or support
mastern	Firm average real hourly earnings bt (1991 Cedis) of master
apprern	Firm average real hourly earnings bt (1991 Cedis) apprentice
manebt	Firm average real monthly earnings bt(1991 Cedis) of management
adminebt	Firm average real monthly earnings bt (1991 Cedis) of administration
salebt	Firm average real monthly earnings bt (1991 Cedis) of sales
supebt	Firm average real monthly earnings bt(1991 Cedis) of supervisor
techebt	Firm average real monthly earnings bt (1991 Cedis) of technician
prosebt	Firm average real monthly earnings bt (1991 Cedis) of production or support
mastebt	Firm average real monthly earnings bt (1991 Cedis) of master
apprebt	Firm average real monthly earnings bt (1991 Cedis) of apprentice
manneb	Firm average monthly earnings bt (nominal Cedis) of management
adminneb	Firm average monthly earnings bt (nominal Cedis) of administration
salneb	Firm average monthly earnings bt (nominal Cedis) of sales
supneb	Firm average monthly earnings bt (nominal Cedis) of supervisor
techneb	Firm average monthly earnings bt (nominal Cedis) of technician
prosneb	Firm average monthly earnings bt (nominal Cedis) of production or support
mastneb	Firm average monthly earnings bt (nominal Cedis) of master
apprneb	Firm average monthly earnings bt (nominal Cedis) of apprentice
SECTOR	
sector	Sector Variable
secname	Sector name
sec	Sector ISIC code
bakery	Bakery Subsector Dummy
garment	Garments Subsector Dummy
textile	Textile Subsector Dummy
wood	Wood Subsector Dummy
furn	Furniture Subsector Dummy
metal	Metal Products Subsector Dummy
machines	Machinery Subsector Dummy
chemical	Chemical Subsector Dummy
ssrii	Small-Scale Resource Intensive Subsector Dummy
fooded	Food Subsector Dummy

drink	Beverage Subsector Dummy
LOCATION	
locdum	Location Variable
accra	Accra Dummy
cape	Cape Coast Dummy
kum	Kumasi Dummy
tak	Takoradi Dummy
OWNERSHIP AND FIRM STRUCTURE	
solo	Sole Trader Dummy
partner	Partnership Dummy
lle	Limited Liability Enterprise Dummy
owndum	Ownership Variable
privcorp	Private Corporation Dummy
statcorp	State-Owned Corporation Dummy
privdom	Private Firm with Full Ghanyan Ownership Dummy
privfor	Private Firm with Full Foreign Ownership Dummy
privdf	Private Firm with Mixed Ownership Dummy
sprivdom	Mixed State-Private Firm with Full Ghanyan Ownership Dummy
sprivfor	Mixed State-Private Firm with Full Foreign Ownership Dummy
sprivdf	Mixed State-Private Firm with Mixed Ownership Dummy
statgh	Partialy or Fully State-Owned Ghanyan Enterprise Dummy
sstate	Partially State-Owned Enterprise Dummy
state	100% State-Owned Enterprise Dummy
sfor	Private Firm with Partial or Full Foreign Ownership Dummy
anyfor	Any Firm with Partial or Full Foreign Ownership Dummy
perfor	Percentage of Foreign Ownership Dummy
EXPORTS AND IMPORTS	
tradum	Trade Variable
pexpaf	Percentage of output exported within Africa
pexpnaf	Percentage of output exported oustide Africa
exports	Dummy if firm exports products
pimpinp	Percentage of raw materials imported
UNIONISATION	
union	Some or All Employees Unionised Dummy
neg_national	Dummy if negotiations between firm and union at national level
neg_ind	Dummy if negotiations between firm and union at industry wide level
neg_firm	Dummy if negotiations between firm and union at establishment/plant level
neg_other	Dummy if negotiations between firm and union at other level
WAVE DUMMIES	
wave1	First Wave

wave2	Second Wave
wave3	Third Wave
wave4	Fourth Wave
wave5	Fifth Wave
wave6	Sixth Wave
wave7	Seventh Wave
wave8	Eighth Wave
wave9	Ninth Wave
wave10	Tenth Wave
wave11	Eleventh Wave
wave12	Twelfth Wave
PRICES	
inf	Consumer Price Inflation - Current vs Previous Year (%)
chinf	Proportional Change in Inflation - Current vs Previous Year (%)
cinf	Consumer Price Inflation - Following vs Current Year (%)
cchinf	Proportional Change in Inflation - Following vs Current Year (%)
cpi91	Consumer Price Index, 1991=100
rer	Real Exchange Rate (Cedis/US$)
erus	Nominal Exchange Rate (Cedis/US$)
pppi	Purchasing Power Parity Index
index	Price Index for Output
cindex	Price Index for Raw Materials

5.2 Worker dataset (workers.dta, all112.dta)

Variable	Label
wave	Round Dummy
wid	Worker Identification Number
male	Dummy if Worker is Male
age	Age of the worker
agesq	Age of the worker Squared
pexp	Potential experience (age-years in school-6)
pexpsq	Potential experience squared
tenure	Years Worked in Current Firm
tensq	Years Worked in Current Firm Squared
educ	Formal Years of Education
educsq	Formal Years of Education Squared
skill	Dummy if skilled worker
earnm	Monthly earnings before tax
rearn	Real monthly earnings before tax (1991 Cedis)

rearn77	Real monthly earnings before tax (1977 Cedis)
rearnh	Real hourly Earnings before Tax (1991 Cedis)
earnusd	Monthly earnings (nominal US$)
rearnusd	Real monthly earnings using US GDP deflator (1995 US$)
rearnyusd	Real annual earnings using 1995 US$, US GDP Deflator (1995 US$)
rearnppp	Real monthly earnings using PPP deflator (PPP US$)
rearnyppp	Real annual earnings using PPP deflator (PPP US$)
lrearn	Log of Real monthly earnings before tax (1991 Cedis)
lrearn77	Log of Real monthly earnings before tax (1977 Cedis)
lrearnh	Log of Real hourly earnings before tax (1991 Cedis)
hours	Weekly Hours Worked
cpi91	CPI Index (1991 as base year)
eddum	Educational Dummy: none; primary complete; secondary complete; university
none	No Education
somprim	Some Primary Education
primcom	Primary Education Completed
seccom	Secondary Education Completed
univ	University education Completed
ocdum	Occupational Dummy
mgmt	Dummy if Managment
adminp	Dummy if worker Administrator/Professional
sales	Dummy if Sales staff
super	Dummy if a Supervisor
tech	Dummy if a technician
pros	Dummy if a production or support
master	Dummy if a Master
appren	Dummy if an Apprentice
manyrs	Imputed education if worker=management
adminyrs	Imputed education if worker=administration
salyrs	Imputed education if worker=sales
supyrs	Imputed education if worker=supervisor
techyrs	Imputed education if worker=technciain
prosyrs	Imputed education if worker=production or support
mastyrs	Imputed education if worker=master
appryrs	Imputed education if worker=apprentice
manedu	Years of education if worker=management
adminedu	Years of education if worker=administration
saledu	Years of education if worker=sales
supedu	Years of education if worker=supervisor
techedu	Years of education if worker=technciain

prosedu	Years of education if worker=production or support
mastedu	Years of education if worker=master
appredu	Years of education if worker=apprentice
manedur	Years of education revised if worker=management
adminedur	Years of education revised if worker=administration
saledur	Years of education revised if worker=sales
supedur	Years of education revised if worker=supervisor
techedur	Years of education revised if worker=technician
prosedur	Years of education revised if worker=production or support
mastedur	Years of education revised if worker=master
appredur	Years of education revised if worker=apprentice
manage	Age if worker=management
adminage	Age if worker=administration
salage	Age if worker=sales
supage	Age if worker=supervisor
techage	Age if worker=technciain
prosage	Age if worker=production or support
mastage	Age if worker=master
apprage	Age if worker=apprentice
manten	Tenure in job if worker=management
adminten	Tenure in job if worker=administration
salten	Tenure in job if worker=sales
supten	Tenure in job if worker=supervisor
techten	Tenure in job if worker=technciain
prosten	Tenure in job if worker=production or support
mastten	Tenure in job if worker=master
apprten	Tenure in job if worker=apprentice
manpex	Potential experience if worker=management
adminpex	Potential experience if worker=administration
salpex	Potential experience if worker=sales
suppex	Potential experience if worker=supervisor
techpex	Potential experience if worker=technciain
prospex	Potential experience if worker=production or support
mastpex	Potential experience if worker=master
apprpex	Potential experience if worker=apprentice
manneb	Managers monthly earnings
adminneb	Administrators monthly earnings
salneb	Sales personnel monthly earnings
supneb	Supervisors monthly earnings
techneb	Technicians monthly earnings

prosneb	Production workers monthly earnings
mastneb	Masters monthly earnings
apprneb	Apprentices monthly earnings
manebt	Managers real monhtly Earnings
adminebt	Administrators real monthly Earnings
salebt	Sales personnel real monthly Earnings
supebt	Supervisors real monthly Earnings
techebt	Tehcnicians real monthly Earnings
prosebt	Production workers real monthly Earnings
mastebt	Masters real monthly earnings
apprebt	Apprentices real monthly earnings
manern	Managers real hourly Earnings
adminern	Administrators real hourly Earnings
salern	Sales personnel real hourly Earnings
supern	Supervisors real hourly Earnings
techern	Tehcnicians real hourly Earnings
prosern	Production workers real hourly Earnings
mastern	Masters real hourly earnings
apprern	Apprentices real hourly earnings
wave1	First Round
wave2	Second Round
wave3	Third Round
wave4	Fourth Round
wave5	Fifth Round
wave6	Sixth Round
wave7	Seventh Round
wave8	Eighth Round
wave9	Ninth Round
wave10	Tenth Round
wave11	Eleventh Round
wave12	Twelfth Round
educdad	Imputed years of education of Father
educmum	Imputed years of education of Mother
eddad	Highest level of education completed by father
edmum	Highest level of education completed by mother
d6prim	Distance from home to nearest Primary School at 6 years old
d12sec	Distance from home to nearest Secondary School at 12 years old
pubsch	Dummy if last school attended was public
farmdad	Dummy if father spent most of life farming
farmmum	Dummy if mother spent most of life farming

profdad	Dummy if father spent most of life as Professional/Management
profmum	Dummy if mother spent most of life as Professional/Management
regsch	Dummy for Region in which attended school
educ_rev	Revised educ: educ_rev=(educ-1) if highest level is A-level, Second., Univ.
yearsc	Imputed Years of Schooling
occdad	Occupation of Father
occmum	Occupation of Mother
jss	Dummy if completed primary and attended Junior Secondary or Senior Secondary Sch
yrsch	Last year of schooling