Recent Trends in Labor Productivity and Size and Features of the Urban Informal Micro-Enterprise Sector in Peru, 1997-2007

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ABSTRACT

This paper takes a macro and micro levels of analysis with the purpose to understand the dynamic of labor productivity in Peru throughout period 1997-2007 wherein two sub-periods are identified: a deceleration or 'recession' period, 1997-2001 of slow GDP economic growth and decreasing terms of trade and an acceleration or 'booming' period, 2002-2007 with relative high GDP and terms of trade rates of growth. At the sectoral-macro level of analysis, the objectives of this paper are to describe the changes in employment, value added, and labor productivity throughout period 1997-2007 and to perform a sectoral decomposition analysis of such variables. At the firm level of analysis, this paper focus on the estimation of the size of urban informal microenterprises from all the sectors of the economy in the booming period 2002-2007. It estimates the size of the urban informal micro-enterprise sector of Peruvian economy in term of employment, real output value and labor productivity as well as to identify a set of demographic, educational and productive characteristics (e.g., size and age) of these micro-entrepreneurs and microenterprises.

RESUMEN

El presente trabajo analiza a nivel macro y micro la dinámica de la productividad laboral en el Perú en el período 1997-2007 el cual se identifica un sub-periodo de recesión, 1997-2001 y un sub-período de expansión, 2002-2007. A nivel macro, los objetivos del trabajo son el de describir los cambios en el empleo, valor agregado real y la productividad laboral en dicho período para luego realizar una descomposición sectorial de dichos cambios. A nivel mico, el trabajo estima el tamaño del sector informal de microempresas en el sub-período de expansión y describe una serie de características demográficas y productivas de estas microempresas.

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INTRODUCTION

In the last 4 years Peruvian economic growth performance has been outstanding compared to other Latin American countries with an average real GDP and urban employment growth rates of 8.3% and 8.7% respectively in period 2005-2008 (BCRP, 2009). Despite of this impressive record, labor productivity growth during the post liberal reforms period (1991-2005) has been lower than East Asian countries and United States. Thus, according to World Bank Development Indicators (WDI, 2009), the annual average GDP per capita rate of growth in such a period were 0.9%; 0.3%; 2.7%, 1.8% for Peru, Latin America and Caribbean (LACs), East Asia and the United States[3]. This low per capita GDP rate of growth has been implied that by 2007, labor productivity[4] (or GDP per worker) of Peru were lower than other middle income (large, medium and small size) Latin American and Caribbean countries such as Brazil, Argentina, Mexico, Colombia, Chile, and Costa Rica[5]. Furthermore, productive and trade structure has not changed in the last 40 years despite of economic crisis (internal or international) or development economic policy regimes (inward and outward oriented) experienced in period 1970-2008. On the one hand, Peruvian GDP is concentrated in primary activities (e.g., agriculture, fishing and minerals), light manufacturing industries with lower degree of processing and services (Table No 1 and Tello, 2009b). On the other hand, exports are still concentrated in primary products. In 2007, primary exports represented 84% of the total export value and mining products represented 62% (BCRP, 2009).

Understanding the low dynamism of output per worker or labor productivity and its implications on productive and trade structure in Peru demands on the one hand and at the macro level, an analysis of the sectoral dynamic of labor productivity and on the other hand at micro or firm level, an analysis of productive features shared by firms throughout this dynamic. In the case of Peru, unavailability of data series at the sectoral and micro (i.e, firm or worker) levels has limited research on this area. Fortunately, since beginning of 1990s, data availability in some developing countries (including Peru) has originated an extensive literature on new theoretical models and methodologies on the micro analysis of labor productivity and structural productive changes.

Taking advantage of these new data for Peru, this paper takes these two levels of analysis with the purpose to understand the dynamic of labor productivity in Peru throughout period 1997-2007 wherein two sub-periods are identified: a deceleration or 'recession' period, 1997-2001 of slow GDP economic growth and decreasing terms of trade[6] and an acceleration or 'booming' period, 2002-2007 with relative high GDP and terms of trade rates of growth[7]. At the sectoral-macro level of analysis, the objectives of this paper are

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[3] Similarly total factor productivity rate of growth during the post liberal reforms has been lower than Asian countries and United States (Blyde and Fernandez-Arias, 2005). It should be also added that by 2005 GDP (in 2000 US$) per capita for Peru was 4863 and the average for Latin America and Caribbean Countries and East Asia economies and United States were 8780, 2406, 71400.

[4] Labor productivity is measured by the ratio of real GDP or value added over employed labor force. Note that GDP per worker is a fraction of the output value per worker. Physical output per worker, by economic theory depends upon the capital labor ratio, other tangible factors per worker, and total factor productivity. Consequently, changes of labor productivity may be associated to changes in total factor productivity, capital labor ratios and changes of the others tangibles factors per worker.

[5] See Table No A10 from the Appendix Table.

[6] The average annual rate of change of the GDP (in $1994) was close to 1% and for the terms of trade -4.4%.

[7] These rates were 6% and 9.1% respectively.

to describe the changes in employment, value added, and labor productivity throughout period 1997-2007 and to perform a sectoral decomposition analysis of such variables. At this level and in contrast to previous results (e.g., Timmer and de Vries, 2007 and 2007), it is found that in both booming and recession periods, labor productivity changes in Peruvian economy are primarily explained by reallocation of employment between sectors rather than changes in labor productivity within sectors. On the other hand, labor productivity improvement in the manufacturing sector in the booming period 2002-2007 has been more important than labor productivity growth in some low labor-productivity services sectors (e.g., household and education services and hotels and restaurants) and the agriculture sector. Conversely, in the recession period 1997-2001, the decline of labor productivity in some low-productivity services sectors and the agriculture sector (when differences between average and marginal labor productivity is taken into account) have been more important to explain the decrease of the labor productivity of the economy than the decrease of labor-productivity in the manufacturing sector.

At the firm level of analysis, this paper focus on the estimation of the size of urban informal microenterprises from all the sectors of the economy in the booming period 2002-2007. It estimates the size of the urban informal micro-enterprise sector of Peruvian economy in term of employment, real output value and labor productivity as well as to identify a set of demographic, educational and productive characteristics (e.g., size and age) of these micro-entrepreneurs and microenterprises.

The evidence shows that the informal micro-enterprises (IME) in urban areas accounts for a significant proportion of the workforce in the booming period 2002-2007. Employment of the whole IMEs sector has grown at annual rates higher than the overall economy but the value added grown at a lower rate. As a consequence, the average product of labor (i.e. value added per worker) declined during this period. Consequently, productivity growth in the economy in this period, in contrast with the behavior of the IMEs, is a result of productivity growth in the formal sector (modern establishments with relatively larger size). As it is shown in the paper, this has been the case for the manufacturing sector. This evidence is based on the National Households Survey (Encuesta Nacional de Hogares, ENAHO) available since 1997.

The paper is divided in three sections. Section I deals with the sectoral level of the analysis. Sections II with the firm level of the analysis. Section III provides a summary of the main findings of the paper.

I. LABOR PRODUCTIVITY AND EMPLOYMENT DYNAMIC BY SECTORS IN PERU, 1997-2007

Recurrent acceleration and decelerations periods of growth in relative short periods of time (e.g., 10 years) rather than a sustainable and positive economic growth trend in long periods of time are more common in developing than in developed countries In this regard, understanding features of the accelerations and decelerations growth episodes may provide more information on the economic development and growth process in less developing economies than focusing on the average economic growth of longer periods in these economies (Prichett, 2000). Parallel to this change in the focus of the economic growth process, economic developers and growth researchers today have resumed to the old and long tradition represented in the contributions of Chenery and associates (Chenery *et al*, 1986) to single out, as in 1980s, the importance of sectoral development

patterns and changes in their composition on the impact of labor and total factor productivity which (and eventually) may led to economic growth. Thus, Timmer and de Vries (2008) and Jones and Olken (2008) have argued that sectoral labor reallocation caused by differences in labor productivities may be associated to the ups and downs periods of per capita GDP growth of an economy. In addition, Temple and Woessmann (2006) have shown the significance of structural change in generating growth (through changes in total factor productivity) by the reallocation of labor towards sectors with higher marginal productivity[8].

Based on these developments of the economic growth literature and using the household survey data from Peru (ENAHO, National Household Survey) for period 1997-2007, the objective of this section is to estimate the sectoral changes in employment, valued added and labor productivity originated by the reallocation of labor among sectors in the economy during the recession and expansions sub-periods of the GDP occurred in those 10 years period.

I.1 Literature Review

In general, literature on Peruvian labor productivity and its estimations in relative long periods of time have been scanty as suggested by Iguiñiz y Barrantes (2004); Garavito (2008) and Yamada (2004). Among the most relevant studies are on the first place the work Timmer and de Vries (2008). Using different data sources, they estimate the sectoral contribution on the average annual GDP per worker rate of growth in period 1960-2005, wherein GDP is composed in 4 sectors: agriculture, manufacturing, market services (which include wholesale and retail trade, transport and communication and financial services) and non-market services (which include community, social and personal services and government services). The change of GDP per worker is decomposed in two effects. The within or intra-sectors effects which measures the contribution to the overall labor productivity growth of the economy due to the changes of labor productivity within each sector. A positive within sector effect means that labor productivity has increased during the period and a negative number that it has decreased. The shift or between effects which measures the contribution to the overall labor productivity growth of the economy due to the changes of labor shares of each sector. A negative shift effect means that labor from a low labor productivity sector has been reallocated to other sectors of higher labor productivity and a positive value means that labor from other sectors of low labor productivity sectors has been reallocated to a sector of higher labor productivity.

Timmer and de Vries (2008) results indicate on the one hand, that in recession periods of relative high decreasing rates of GDP per worker growth, all Peruvian sectors decreases their respective GDP per worker level. In recessions periods of low decreasing rates of GDP per worker growth, the sectors which contribute the most to the reduction of GDP per worker are manufacturing, market and non-market services. In both cases, most of the variation of GDP per worker is explained by the within industry effect. On the other hand, in booming periods all the sectors grow, however the manufacturing and the market services are the sectors which contribute the most.

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[8] Linked to this is a renewed interest in the development patterns of particular sectors such as agriculture (e.g., Gollin *et al.,* 2002; World Bank 2007) and manufacturing (Imbs and Wacziarg, 2003; Jones and Olken, 2008).

A second study is provided by the last World Development Report (World Bank, 2008). In this study is suggested that in urbanized countries such as Peru[9], for period 1993-2005, the agriculture sector (which includes hunting and forestry) contributes in a higher proportion to the increase of labor productivity than the non-agricultural sector, whereas agriculture employment growth rate is lower than the respective rate from the non-agricultural sector. Consistent with this result, Martin and Mitra (2001) reports a higher TFP rate of growth for the agriculture than the manufacturing sector for period 1967-1992 for the Peruvian economy.

A third group of studies are those of Chacaltana (2008), Chang (2007), and Villarán (2007). They report that output value per worker is positively related to firm's size. Thus, large firms have higher level of output per worker than small firms. On the other hand, in the boom period of 2002-2007, the rate of employment growth also has varied positively with firms' size (i.e, larger firms has created higher rate of employment than small firms).

I.2 Methodology and Sources of Data

This section estimates labor productivity throughout the recession and booming periods during the 1997-2007 for 11 sectors of Peruvian economy[10]. The estimations are based upon on the employment figures from National Households Survey (i.e., ENAHO) carried out by the National Institute of Statistics and Information (INEI) during period 1997-2007. In this survey, employment is defined as the number of people from 14 years old or more who were working at least one hour during the last week compared to the day wherein the survey interview was implemented. The employed labor force includes employers, wage-earners, self-employees, unpaid family workers and housekeepers (or maids). Two employment figures are used. One are the expanded figures from ENAHO, which represents the estimated number of workers employed (denoted by L1) and the other the 'standardized employment' level of people working 40 hours per week (denoted as L2) which represents the estimated number of people working 40 hours per weeks. In general the estimated number of workers has been greater than the number of standardized workers. Labor productivity using the number of workers is denoted by LP1 and the estimated labor productivity using the number of standardized workers is denoted by LP2. Since in most of the sectors and years of period 1997-2007, the number of workers has been higher than the number of standardized workers then labor productivity per worker has been lower than the labor productivity per standardized worker[11]. Differences in the changes of those numbers of workers will mean that the people are also changing the number of hours of work per week. Value added[12] data is obtained from INEI (2009).

In the traditional methodology (summarized in the Appendix of Formulas) labor productivity growth for an economy (or a group of sectors) is decomposed into the within or intra-sectors effects and the between or shifts effects among sectors. This

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[9] Urbanized countries (e.g., Latin American and Caribbean, and European and Central Asian countries) are countries with an average share of the agriculture sector value added out of total GDP of around 5% and with around 18% of labor share out of total employment.

[10] A more disaggregated level of sectors is shown in the Appendix Tables. In this case, 39 sectors are included in these tables.

[11] In some sectors (e.g., Electricity and Water) people may have worked overtime and more than the 40 hours an week, consequently in these cases L2 has been higher than L1 and LP1<LP2.

[12] Value added does not include direct or indirect taxes.

decomposition is expressed as an accounting identity. However, Timmer and de Vries (2008) postulate an alternative interpretation of this 'traditional or standard decomposition'. They argue that the split between within and between effects in the standard decomposition is based on the assumption that marginal and average labor productivity in a sector are equal, or put otherwise, that labor productivity growth is independent of the changes in employment. Whereas this assumption may hold for short periods of time and for most of sectors of a developing economy, this might be not the case for the agriculture sector wherein most of people are living in poverty conditions[13].

In consequence and according to Timmer and de Vries (2008), the existence of surplus labor or disguised employment in the agricultural sector is a typical phenomenon in many countries in early stages of development. Thus, as long as marginal productivity is below average productivity, a decline in the number of agricultural workers will by definition raise the average labor productivity level in agriculture and the difference between average and marginal productivity in agriculture will end up in the within-effect, whereas its effect actually arises from the shift of labor in response to the opening up of new employment opportunities elsewhere in the economy. This suggests that (part of) the within-contribution of agriculture should be allocated to the between-contribution of other sectors. To accommodate this important shortcoming, the traditional decomposition is modified following the steps shown in Box No 1. A detailed list of formulas is described in the Appendix of Formulas.

As it shown below, and in contrast to the role played by the agriculture sector found in previous studies, when differences between average and marginal labor productivity are taken into account, the agriculture contribution on labor productivity is lower than the respective contribution of non-agriculture sector. Moreover, its contribution is negative. Contrarily, employment contribution of the agriculture sector is positive and higher in the recession period 1997-2001 than in the booming period 2002-2007.

Box No 1

> Assuming that people who leave the agriculture sector are marginal workers with a lower productivity than those who stay behind. Then the adjusted decomposition includes the following steps: i) an adjusted labor productivity of those workers who stay in the agriculture sector is estimated; ii) a new within effect of the agriculture is estimated using that adjusted labor productivity; iii) the between effect for the agriculture when workers leave this sector is imputed to be zero. No adjustment is made otherwise; iv) the remainder of the original within-contribution of the agriculture sector is distributed across those sectors that expand their labor shares in proportion to their share in total expansion. Here it is assumed that agriculture workers who leave this sector will move to those expanding sectors; v) for those sectors who shrinks their labor share the between effects are also imputed to be zero; vi) finally, the adjusted sectoral labor productivity growth decomposition assumes a ratio of marginal to average labor productivity of ($\varepsilon=$) 0.410 for Peru which was estimated by Timmer and de Vries (2008).

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[13] In the case of Peru, in 2007 the Agriculture (including Forestry and Hunting) sector contributed close to 9% of the total value added of the economy and provided employment to 34% of the labor force (i.e, the highest labor share among the sectors analyzed in this paper). Most of the activities in this sector are carried out by small productive units wherein it is estimated that around 23% of the total land cultivated in the sector are used to produce export products. Moreover, most of the families in the agriculture sector and rural areas belong to the segment of the population living in poor conditions (Tello, 2008).

I.3 Results

Figures in Tables No I.1 (A and B) and I.2 (A and B) summarize in numbers the behavior of total valued added, employment and value added per employed worker for period 1997-2007 shown in Graphs No 1 and 2. Tables No I.2A and No I.2B indicates that the average annual rates of growth for value added and both measures of employment (i.e. L1 and L2) were respectively 0.99%, 2.3% in the recession period of 1998-2001 and 6.1%, 3.6% and 2.8% in the booming period of 2002-2007. The estimated average rates of growth of labor productivity using workers and standard workers were -1.349% and -1.383 respectively in period 1998-2001 and 2.4% and 3.1% in period 2002-2007. One important distinction between the number of workers and the standardized workers observed in Graph No 1 is that whereas the former always has increased during the 1997-2007, the latter has decreased in certain periods of time, specifically in periods 1997-1999 and 2003-2005. This indicates that in those periods the number people who worked less than 40 hours increased.

Tables No I.1A and No I.1B show the sectoral share in value added and employment for 11 sectors of Peru in period 1997-2007 and the labor productivity of each sector relative to the labor productivity for the whole economy. The figures in this table show that in both periods, the agricultural sector together with the wholesale and retail trade, and services sectors (which includes real state activities, hotels and restaurants, household services, human health, private education and government services) employed close to 80% of total occupied labor force. Manufacturing sector is the fourth most important sector in terms of employment generation: its share is around 9%. Close to 45% of the manufacturing labor force is employed in the textiles, wearing apparels, woods and furniture sectors. Those 4 sectors with the highest employment share also explain around 80% of total real value added in both periods.

GRAPH No 1
Real Value Added and Employment of Peru, 1997-2007
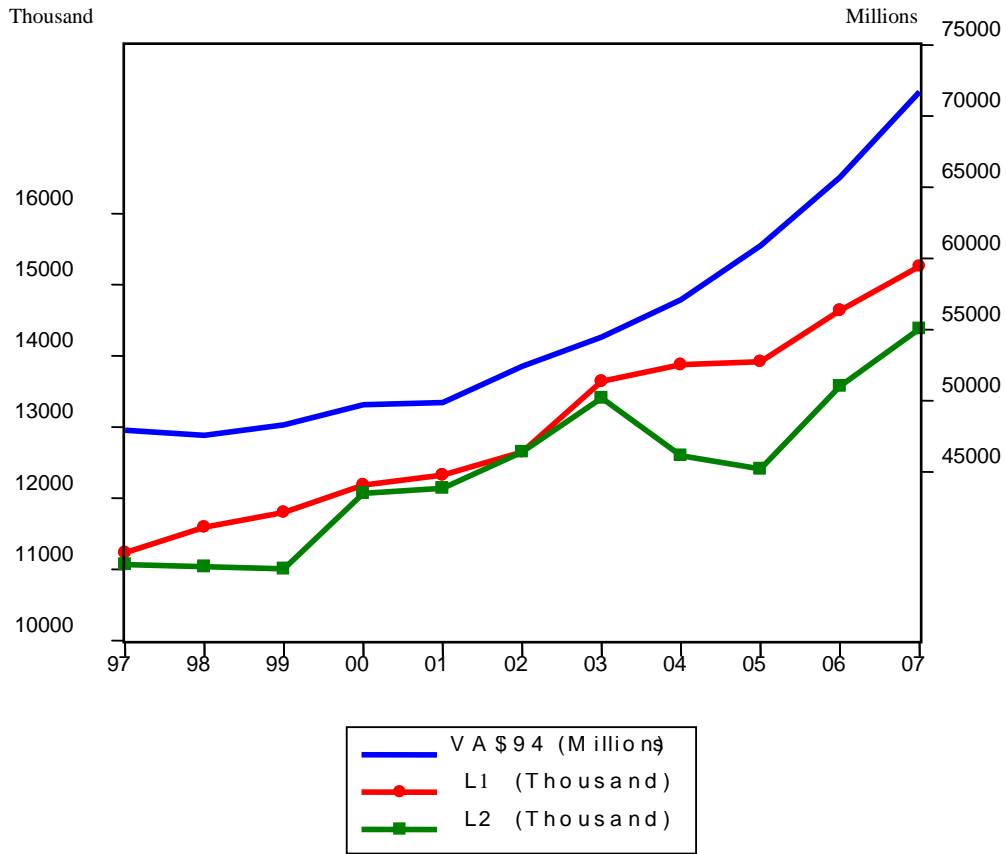
GRAPH No 2 Real Value Added Per Employed Worker, Peru 1997-2007
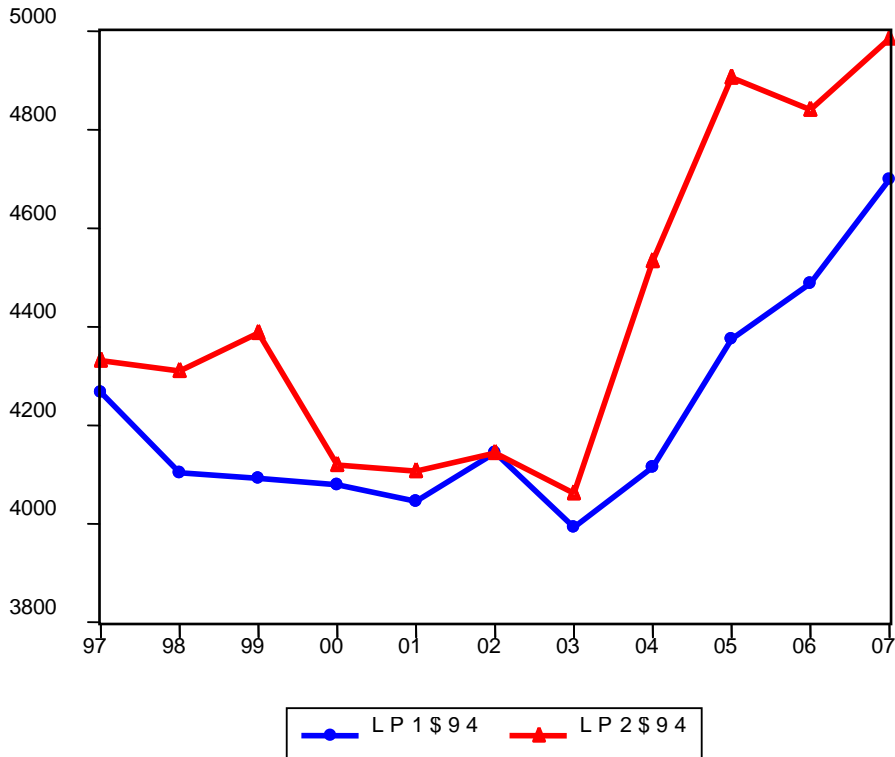
TABLE No I.1A

**Average Annual Value Added (VA) and Number of Workers Shares (L1) and
Relative Value Added per Worker (LP1) by Sectors, Peru, 1997-2007 (%)**

Sector/Period	1997-2001			2002-2007		
	VA	L1	LP1	VA	L1	LP1
Agriculture, Hunting and Forestry	9.3	34.0	27.3	9.3	36.7	25.5
Fishing	0.6	0.6	96.8	0.6	0.6	104.6
Mining and Quarrying	5.9	0.5	1170.0	7.0	0.8	885.7
Manufacturing	16.4	9.2	179.8	16.9	9.5	179.4
Electricity and Water	2.3	0.3	906.4	2.3	0.2	1152.1
Construction	6.1	3.9	158.2	5.6	3.4	162.8
Wholesale and Retail Trade	16.0	19.4	82.4	15.8	17.1	92.2
Transport and Communications	8.7	5.3	165.8	9.0	5.5	163.2
Financial Services	2.8	0.3	1058.8	2.4	0.3	837.8
Insurance Services	0.3	0.1	616.6	0.5	0.1	783.7
Rest of Services	31.6	26.5	119.5	30.6	25.9	118.2
Total (%)	100	100	100	100	100	100
TOTAL (in million of dollars, thousand of workers, and dollar per worker respectively)	48752.9	11,827.4	4122.1	60477.5	13997.3	4320.7

Source: Authors estimations. INEI (2009), INEI (1997-2007). Shares computed using: i) Valued added (VA) in constant soles of 1994; ii) L1 number of employed workers; iii) L2 number of workers standardized by a journal work of 40 hours a week and iv) Value added per employed worker (LP) in constant soles of 1994 per worker.

TABLE No I.1B

Average Annual Value Added (VA) and Number of Standardized Workers Shares (L2) and Relative Value Added per Standardized Worker (LP2) by Sectors, Peru, 1997-2007 (%)

Sector/Period	1997-2001			2002-2007		
	VA	L2	LP2	VA	L2	LP2
Agriculture, Hunting and Forestry	9.3	28.1	33.2	9.3	30.7	30.4
Fishing	0.6	0.7	88.7	0.6	0.6	96.5
Mining and Quarrying	5.9	0.7	865.4	7.0	1.0	702.8
Manufacturing	16.4	9.4	176.4	16.9	9.9	170.9
Electricity and Water	2.3	0.3	732.4	2.3	0.2	948.1
Construction	6.1	4.2	145.9	5.6	3.7	149.9
Wholesale and Retail Trade	16.0	21.6	74.3	15.8	19.5	80.8
Transport and Communications	8.7	7.6	115.6	9.0	7.6	117.9
Financial Services	2.8	0.4	874.5	2.4	0.3	758.7
Insurance Services	0.3	0.2	426.2	0.5	0.1	820.9
Rest of Services	31.6	27.0	117.1	30.6	26.2	117.1
Total (%)	100	100	100	100	100	100
TOTAL (in million of dollars, thousand of workers, and dollar per worker respectively)	48752.9	11464.1	4252.7	60477.5	13170.8	4,591.8

Source: Authors estimations. INEI (2009), INEI (1997-2007). Shares computed using: i) Valued added (VA) in constant soles of 1994; ii) L1 number of employed workers; iii) L2 number of workers standardized by a journal work of 40 hours a week and iv) Value added per employed worker (LP) in constant soles of 1994 per worker.

TABLE No I.2A

Sectoral Average Annual Rate of Growth and Contribution in Value Added (VA), Number of Workers (L1) and Labor Productivity (LP1): Peru 1997-2007 (%)

Sector/Period	Average Annual Rate of Growth						Annual Growth Contribution			
	1997-2001			2002-2007			1998-2001		2002-2007	
	VA	L1	LP1	VA	L1	LP1	VA	L1	VA	L1
Agriculture, Hunting and Forestry	4.447	4.815	-0.227	4.124	2.518	1.735	0.398	1.591	0.375	0.903
Fishing	3.545	0.744	3.923	6.498	5.152	3.426	0.013	-0.007	0.033	0.023
Mining and Quarrying	7.283	-9.089	18.415	5.873	21.987	-10.91	0.411	-0.050	0.397	0.124
Manufacturing	0.560	1.376	-0.576	7.071	5.456	1.764	0.079	0.097	1.152	0.492
Electricity and Water	3.503	-11.39	19.541	5.754	4.604	6.986	0.077	-0.032	0.129	0.004
Construction	-5.737	-2.557	-2.556	9.435	5.505	4.183	-0.361	-0.119	0.498	0.176
Wholesale and Retail Trade	0.165	0.557	-0.093	6.579	2.418	4.253	0.017	0.090	0.998	0.389
Transport and Communications	0.819	2.769	-1.368	8.606	7.256	1.372	0.070	0.129	0.735	0.381
Financial Services	-6.179	-12.54	33.692	9.116	16.055	-1.875	-0.178	-0.070	0.209	0.032
Insurance Services	11.836	31.673	338.746	12.483	23.342	10.364	0.019	-0.014	0.047	0.008
Rest of Services	1.406	2.722	-1.181	4.930	4.109	0.905	0.441	0.700	1.479	1.028
Total (%)	0.987	2.315	-1.349	6.051	3.559	2.417	0.987	2.315	6.051	3.559

Source: Table No 1, Authors estimations. INEI (2009), INEI(1997-2007).

TABLE No I.2B
Sectoral Average Annual Rate of Growth and Contribution in Value Added (VA), Number of Standardized Workers (L2) and Labor Productivity (LP2): Peru 1997-2007 (%)

Sector/Period	Average Annual Rate of Growth						Annual Growth Contribution			
	1997-2001			2002-2007			1998-2001		2002-2007	
	VA	L2	LP2	VA	L2	LP2	VA	L2	VA	L2
Agriculture, Hunting and Forestry	4.447	5.474	-0.754	4.124	1.003	3.252	0.398	1.481	0.375	0.295
Fishing	3.545	5.840	12.861	6.498	8.124	5.337	0.013	-0.026	0.033	0.024
Mining and Quarrying	7.283	-9.008	19.037	5.873	19.157	-8.909	0.411	-0.072	0.397	0.141
Manufacturing	0.560	2.395	-0.986	7.071	5.243	2.193	0.079	0.151	1.152	0.499
Electricity and Water	3.503	-8.205	18.465	5.754	2.111	7.600	0.077	-0.031	0.129	0.002
Construction	-5.737	-2.820	-2.347	9.435	5.826	4.556	-0.361	-0.149	0.498	0.191
Wholesale and Retail Trade	0.165	2.132	-0.717	6.579	1.762	5.031	0.017	0.316	0.998	0.307
Transport and Communications	0.819	1.711	-0.175	8.606	6.781	2.524	0.070	0.116	0.735	0.472
Financial Services	-6.179	-12.22	42.865	9.116	15.289	0.918	-0.178	-0.105	0.209	0.033
Insurance Services	11.836	29.641	292.717	12.483	24.895	19.735	0.019	-0.015	0.047	0.007
Rest of Services	1.406	2.435	-0.967	4.930	3.563	1.834	0.441	0.649	1.479	0.854
Total (%)	0.987	2.314	-1.383	6.051	2.824	3.068	0.987	2.314	6.051	2.824

Source: Table No 1, Authors estimations. INEI (2009), INEI(1997-2007).

In regard to labor productivity, the sectors with the highest level of labor productivity in order of importance are: mining and quarrying, financial services, electricity and insurance services. The first two sectors decrease their relative labor productivities with respect to the average labor productivity of the economy in the booming period 2002-2007 and the other two sectors increase their respective relative labor productivities. The differences in this pattern in part can be attributed to the fact that employment shares of electricity and water, and insurance services have been decreasing throughout the period 1997-2007, whereas the respective employment shares of mining and quarrying and financial services have responded to the changes of the aggregate demand (external and internal respectively), increasing in the period of expansion 2002-2007 and decreasing in the recessive period 1997-2007

On the other end, the agriculture is the sector with the lowest level of labor productivity and its relative labor productivity with respect to the average of the economy has decreased in the booming period of 2002-2007. The next two sectors with the lowest labor productivity are fishing and wholesale and retail trade sectors. In contrast to the agriculture sector, relative labor productivity with respect to the average labor productivity of the economy in these two sectors has increased in the booming period of 2002-2007. Within the services sector, the hotel and restaurants, household and private education services are the ones with the lowest labor productivity, and their labor

productivity have been lower than the average labor productivity of the economy. Except for the private education services, relative labor productivity in the other two services sectors with respect to the average labor productivity of the economy has decreased in period 2002-2007[14].

In the last three sectors the relative level of the labor productivity ratio also differs. This ratio in the manufacturing and construction sectors seems to increase in the booming period and in the transport and communications sector is not clear its changes. These depend upon the measure of the labor productivity indicator. In terms of the number of workers, relative labor productivity decreased in the booming period and in terms of the number of standardized workers it increased.

Tables No I.2A and No I.2B show the sectoral growth contribution in value added and employment for the same 11 sectors of Peru in period 1997-2007. The behavior of these sectors in terms of output, employment and labor productivity also differs through the growth dynamic of period 1997-2007. Thus, in the booming period 2002-2007, the contribution in employment and real output (or value added) of the manufacturing sector has been higher than the respective contribution in the recession period 1997-2001. This suggests that this sector (as many others) is very sensitive to changes to internal demand: the growth rates in output and employment in this sector were higher than the respective rates for the economy in the booming period and the reverse in the recession period. Except for the agriculture and mining and quarrying sectors, the same pattern of the sectoral contribution of manufactures follows the rest of sectors (i.e., fishing, transport and communication, construction, electricity, and financial and insurance services) although at different degrees of response to the changes of (internal and external) demand.

In the case of the agriculture sector, the output and employment contribution have been higher in the recession than the booming period. This has implied that the growth rates of output and employment in this sector in the recession period have been higher than the respective rates for the economy in the booming period. This suggests that agriculture workers in the booming period might have moved to other sectors with higher wages and labor productivities and/or due to the fact there were new jobs opportunities in those other sectors originated by the increased (internal and external) demand.

On the other hand, the output contribution in the recession period was higher than in the booming period for the mining and quarrying sector whereas this pattern is reversed in terms of its employment contribution. This result comes from the fact that in the recession period the output rate of growth has been higher than the respective average for the economy whereas the employment rate of growth has been negative and lower than respective average of the economy. The reverse occurred in the booming period. The difference in output and employment behavior of the mining and quarrying sector suggests that employment is more sensitive to changes of (external or internal) demand than output. Since most of the output from this sector is exported then output level in the mining and quarrying sector seems to be less sensitive to changes in its prices[15].

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[14] See Table No A1 from the Appendix Tables.
[15] Prices in this sector increased only 1.6% in period 1998-2001 and its output 7.3% whereas this rate was 20.7% in period 2002-2007 and its output 5.9%.

Tables from No I.3 to I.6[16] and their respective Graphs from No 3 to 6 show the sectoral contribution of labor productivity and its growth decomposition. Tables No I.3, I.5 and Graphs No 3 and 4 describe the labor productivity growth decomposition by sectors without taking any adjustment due to differences in average and marginal labor productivity in the agriculture and Tables No I.4, I.6 and Graph No 5 and 6 show the figures for the adjusted decomposition.

The overall figures for most of the sectors in Peruvian economy show that in contrast to Timmer and de Vries (2008) results, the between sector effects rather than the within sector effects explain in a greater proportion the labor productivity growth in the economy in period 1997-2007 regardless of the methods or employment figures (workers and standardized workers) used. This is mainly explained by the fact that Timmer and de Vries (2008) employment estimations includes only the formal sector whereas the employment figures reported in this paper includes both formal and informal sectors. This means that the reallocation of resources between the formal and informal sectors may explain the importance of the between sector effects in the economy[17].

On the other hand, there are three major differences between the standard decomposition and the adjusted one. First, a negative between sector effects for the agriculture sector may occur even when this sector expand in employment (e.g. period 2002-2007). Thus and in any period, when labor moves from shrinking sectors towards the agriculture sector (i.e., when employment in the agriculture sector increases), if the average labor productivity in this sector is lower than the labor productivity of the shrinking sector would imply that labor productivity for the economy would decrease despite of the fact that employment in the agriculture sector is increasing. In the traditional method, an expansion of employment in the agriculture sector contributes positively to labor productivity of the economy since the labor productivity in the agriculture is assumed constant when labor reallocates from other sectors to the agriculture sector.

Second, the within effect of the agriculture would be reduced compared with the traditional method only if for a period (or year) employment in the agriculture decreases (e.g., period 2001-2002 where employment in this sector decreased). This has not been the case for the number of workers for period 1998-2001. Third, the between sector effects for the non-agriculture sectors in the adjusted method will be higher (e.g., in manufactures and electricity and water in period 2002-2007) or lower (e.g., in mining and quarrying in period 2002-2007) than the respective effects of the traditional method depending upon the changes in employment of the agriculture sector and the differences between the labor productivity of a particular non-agriculture sector and the average labor productivity of the shrinking sectors.

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[16] Tables from No A3 to A6 in the Appendix Tables show the same figures for the sectoral decomposition of 39 sectors. Tables A3 and A5 presents the figures of the traditional labor productivity decomposition and Tables No A4 and A6 for the adjusted decomposition. The Mining and Quarrying sector in the tables of the text includes the Extraction of Petroleum branch. On the other hand, the Manufacturing sector in the text tables includes Refineries of Petroleum. Although the total labor productivity growth contribution of each sector does not change whenever a sector is disaggregated in several branches, the sum of the within and between effects of these disaggregated branches are not necessarily the same as the respective effects in the more aggregated sector.

[17] Saavedra et al (2001) show that the employment growth in the informal sector is fundamentally due to the growth of labor allocation in these traditionally informal sectors and is to a lesser extent due to the growth of informality within these sectors.

TABLE No I.3

Average Annual Growth Rate Contribution in Value Added Per Worker- L1 by Sector, Peru 1998-2007 (%)

Sector/Period	1998-2001			2002-2007		
	Within Sectors	Between Sectors	Total	Within Sectors	Between Sectors	Total
Agriculture, Hunting and Forestry	-0.042	0.226	0.184	0.130	-0.096	0.033
Fishing	0.022	-0.023	-0.001	0.009	0.003	0.012
Mining and Quarrying	0.987	-0.708	0.278	-0.885	1.029	0.144
Manufacturing	-0.106	-0.200	-0.306	0.275	0.262	0.537
Electricity and Water	0.391	-0.366	0.025	0.092	-0.047	0.045
Construction	-0.167	-0.342	-0.508	0.203	0.092	0.295
Wholesale and Retail Trade	-0.052	-0.306	-0.358	0.619	-0.195	0.424
Transport and Communications	-0.144	0.011	-0.134	0.111	0.298	0.409
Financial Services	0.571	-0.815	-0.245	-0.089	0.210	0.121
Insurance Services	0.443	-0.431	0.012	-0.010	0.040	0.030
Rest of Services	-0.401	0.105	-0.296	0.256	0.110	0.366
TOTAL	**1.501**	**-2.850**	**-1.349**	**0.711**	**1.705**	**2.417**

Source: Table No 1, Authors estimations.

TABLE No I.4

Average Annual Growth Rate Contribution in Value Added Per Worker- L1 Adjusted by Difference in Agriculture Labor Productivity by Sector, Peru 1998-2007 (%)

Sector/Period	1998-2001			2002-2007		
	Within Sectors	Between Sectors	Total	Within Sectors	Between Sectors	Total
Agriculture, Hunting and Forestry	-0.042	-1.333	-1.375	0.086	-0.412	-0.326
Fishing	0.022	-0.090	-0.068	0.009	0.008	0.017
Mining and Quarrying	0.987	0	0.987	-0.885	0.966	0.081
Manufacturing	-0.106	-0.173	-0.280	0.275	0.279	0.555
Electricity and Water	0.391	0	0.391	0.092	0.216	0.308
Construction	-0.167	-0.233	-0.399	0.203	0.105	0.308
Wholesale and Retail Trade	-0.052	-0.793	-0.845	0.619	-0.116	0.503
Transport and Communications	-0.144	-0.091	-0.236	0.111	0.140	0.252
Financial Services	0.571	0.165	0.736	-0.089	0.299	0.210
Insurance Services	0.443	0.057	0.499	-0.010	0.103	0.093
Rest of Services	-0.401	-0.357	-0.759	0.256	0.160	0.416
TOTAL	**1.501**	**-2.850**	**-1.349**	**0.667**	**1.749**	**2.417**

Source: Table No 1, Authors estimations.

TABLE No I.5

Average Annual Growth Rate Contribution in Value Added Per Worker- L2 by Sector, Peru 1998-2007 (%)

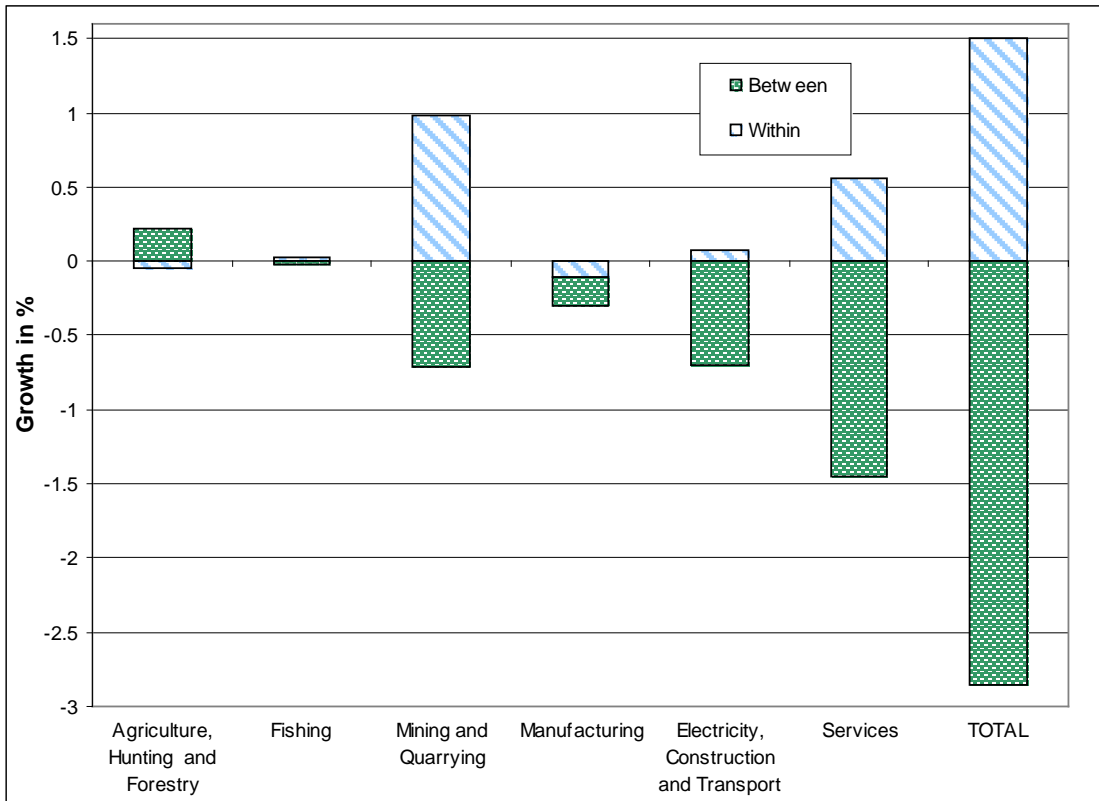| Sector/Period	1998-2001			2002-2007		
	Within Sectors	Between Sectors	Total	Within Sectors	Between Sectors	Total
Agriculture, Hunting and Forestry	-0.113	0.282	0.170	0.272	-0.170	0.102
Fishing	0.036	-0.038	-0.002	0.006	0.009	0.015
Mining and Quarrying	0.979	-0.714	0.265	-0.726	0.918	0.192
Manufacturing	-0.223	-0.079	-0.302	0.307	0.335	0.642
Electricity and Water	0.358	-0.335	0.023	0.125	-0.065	0.061
Construction	-0.145	-0.356	-0.500	0.195	0.133	0.329
Wholesale and Retail Trade	-0.223	-0.132	-0.354	0.713	-0.191	0.522
Transport and Communications	-0.040	-0.098	-0.137	0.163	0.299	0.462
Financial Services	0.740	-0.980	-0.240	-0.058	0.193	0.135
Insurance Services	0.415	-0.403	0.011	0.002	0.033	0.034
Rest of Services	-0.324	0.008	-0.316	0.453	0.123	0.576
TOTAL	**1.462**	**-2.845**	**-1.383**	**1.451**	**1.617**	**3.068**

Source: Table No 1, Authors estimations.

TABLE No I.6

Average Annual Growth Rate Contribution in Value Added Per Worker- L2 Adjusted by Difference in Agriculture Labor Productivity by Sector, Peru 1998-2007 (%)
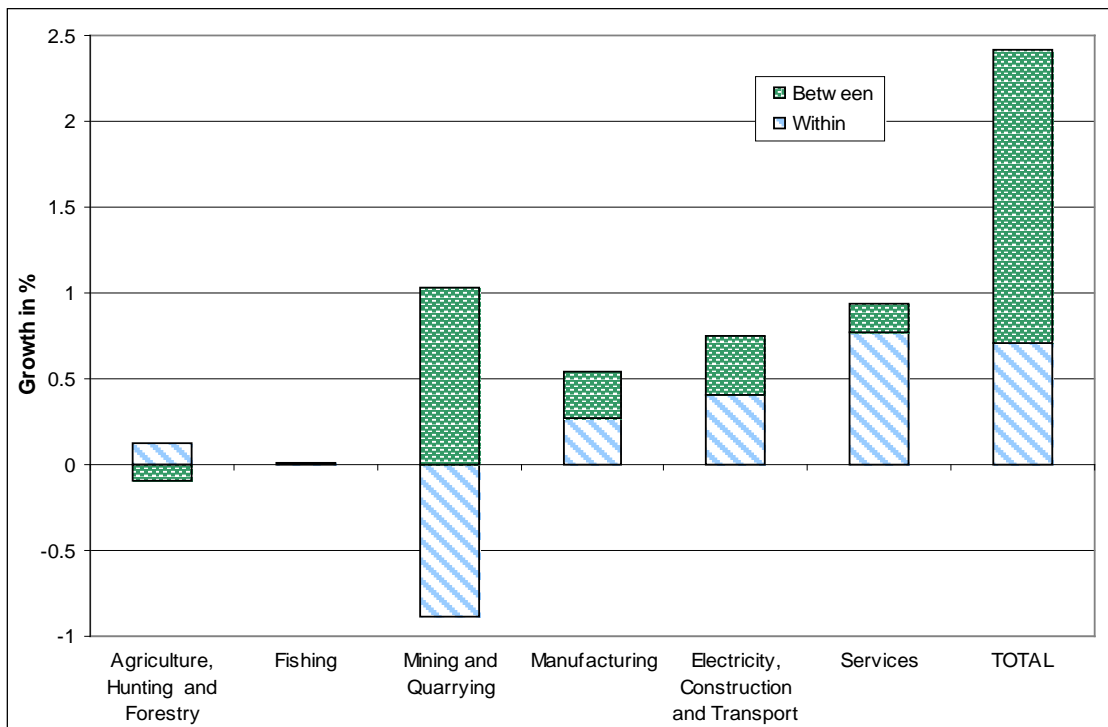
Sector/Period	1998-2001			2002-2007		
	Within Sectors	Between Sectors	Total	Within Sectors	Between Sectors	Total
Agriculture, Hunting and Forestry	-0.115	-0.757	-0.872	0.196	-0.426	-0.230
Fishing	0.036	-0.208	-0.172	0.006	0.010	0.016
Mining and Quarrying	0.979	0.000	0.979	-0.726	0.922	0.196
Manufacturing	-0.223	0.023	-0.200	0.307	0.327	0.634
Electricity and Water	0.358	0.051	0.408	0.125	0.173	0.298
Construction	-0.145	-0.037	-0.182	0.195	0.147	0.342
Wholesale and Retail Trade	-0.223	-1.660	-1.882	0.713	-0.021	0.692
Transport and Communications	-0.040	-0.161	-0.201	0.163	0.065	0.228
Financial Services	0.740	0.219	0.959	-0.058	0.313	0.255
Insurance Services	0.415	0.016	0.430	0.002	0.116	0.118
Rest of Services	-0.324	-0.327	-0.651	0.453	0.066	0.519
TOTAL	**1.459**	**-2.842**	**-1.383**	**1.375**	**1.693**	**3.068**

Source: Table No 1, Authors estimations.

Graph No 3
Average Annual Growth Rate Contribution in Value Added Per Worker (LP1)
1998-2001

2002-2007

Graph No 4
Average Annual Growth Rate Contribution in Value Added Per Worker (LP1)
Adjusted Method, 1998-2001
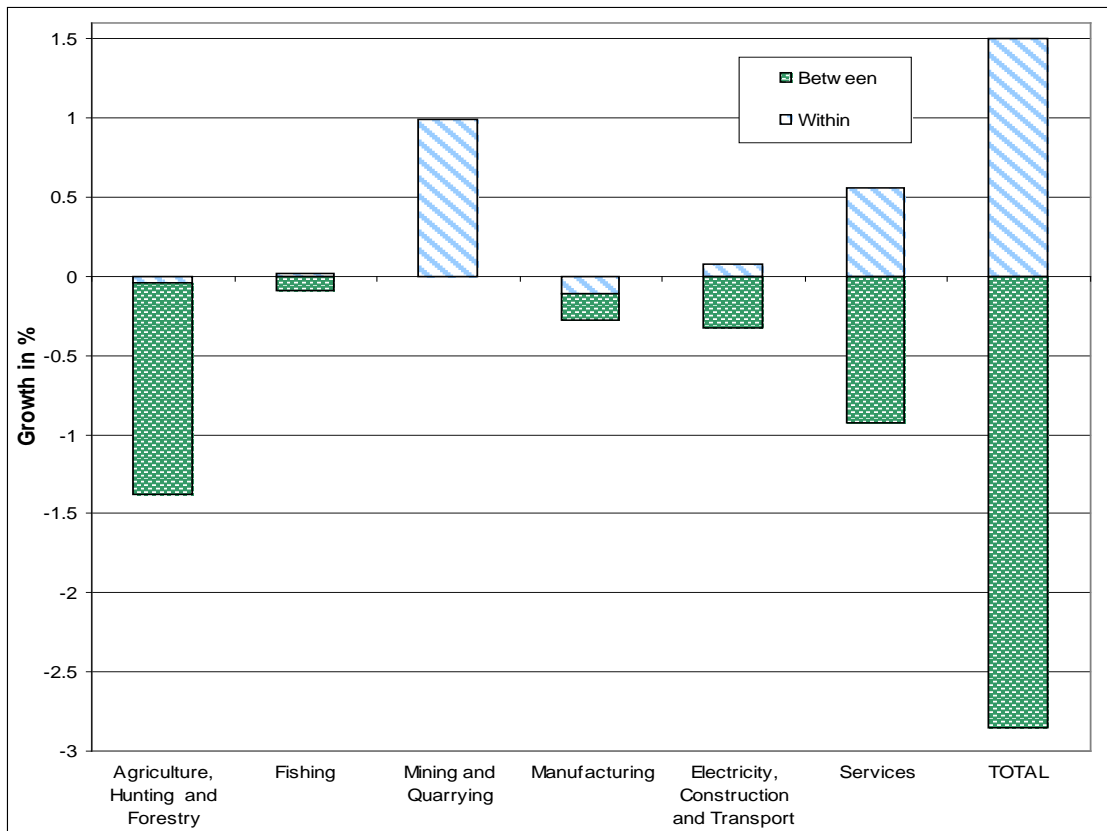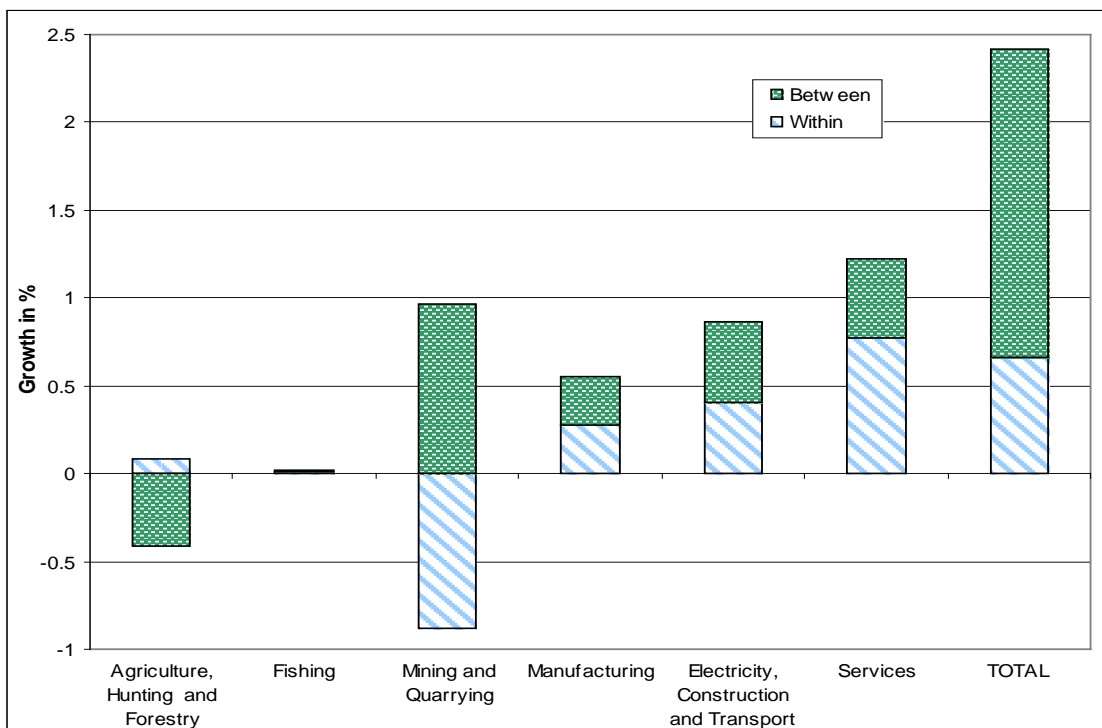
2002-2007

Graph No 5
Average Annual Growth Rate Contribution in Value Added Per Standardized Worker (LP2), 1998-2001
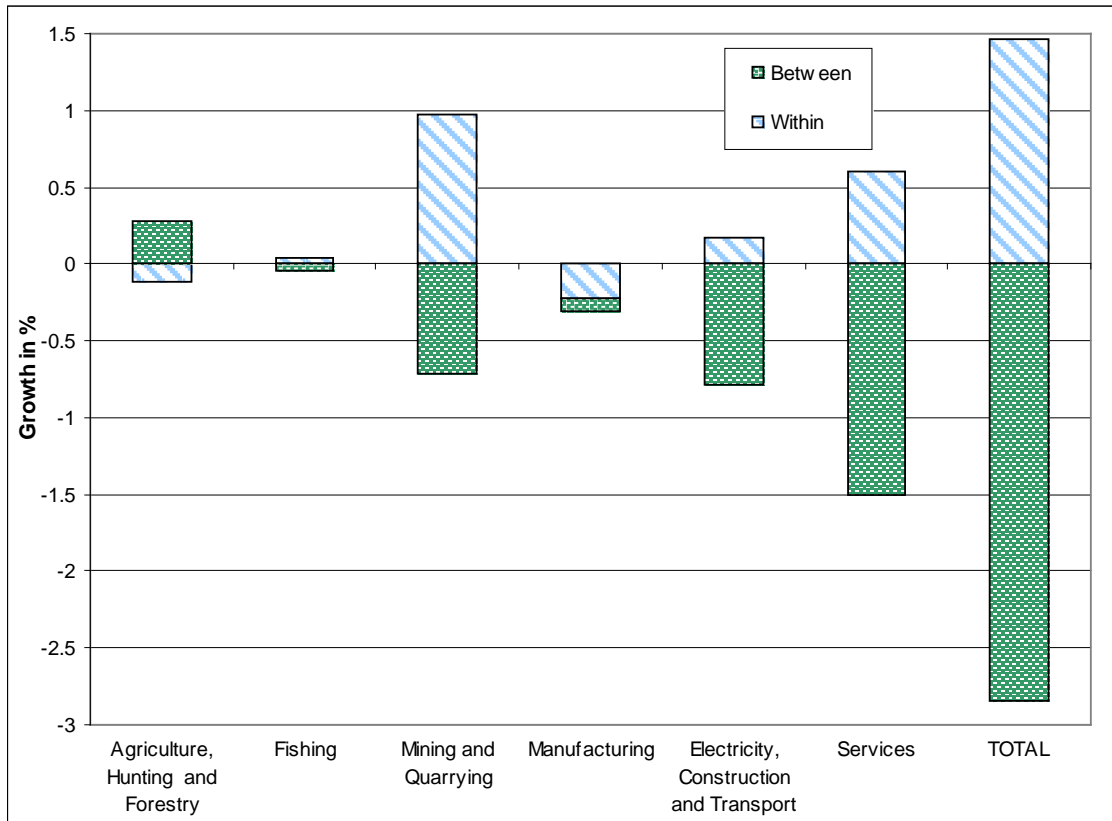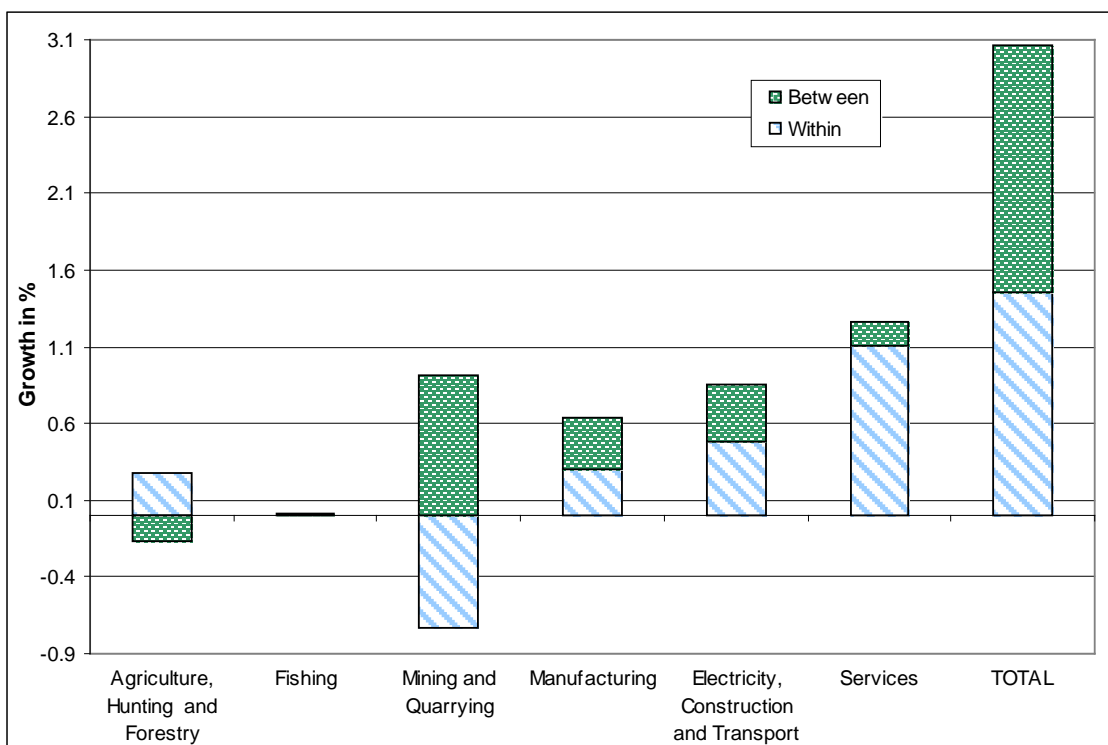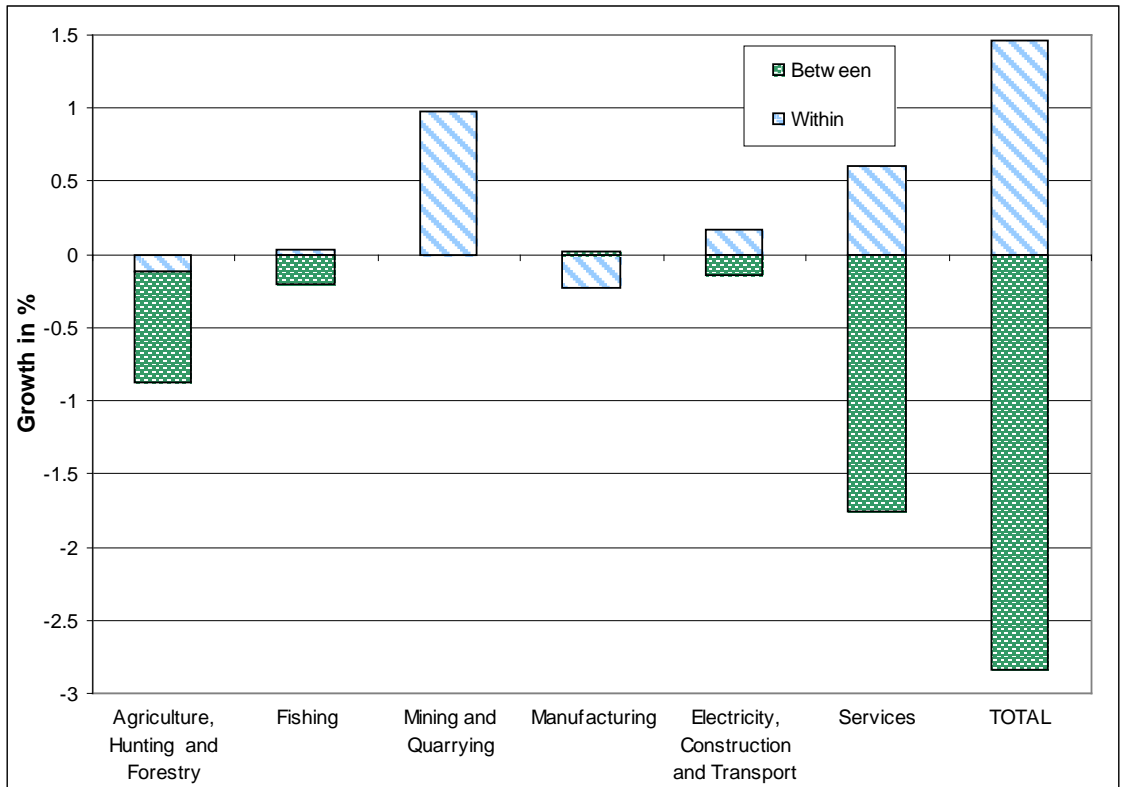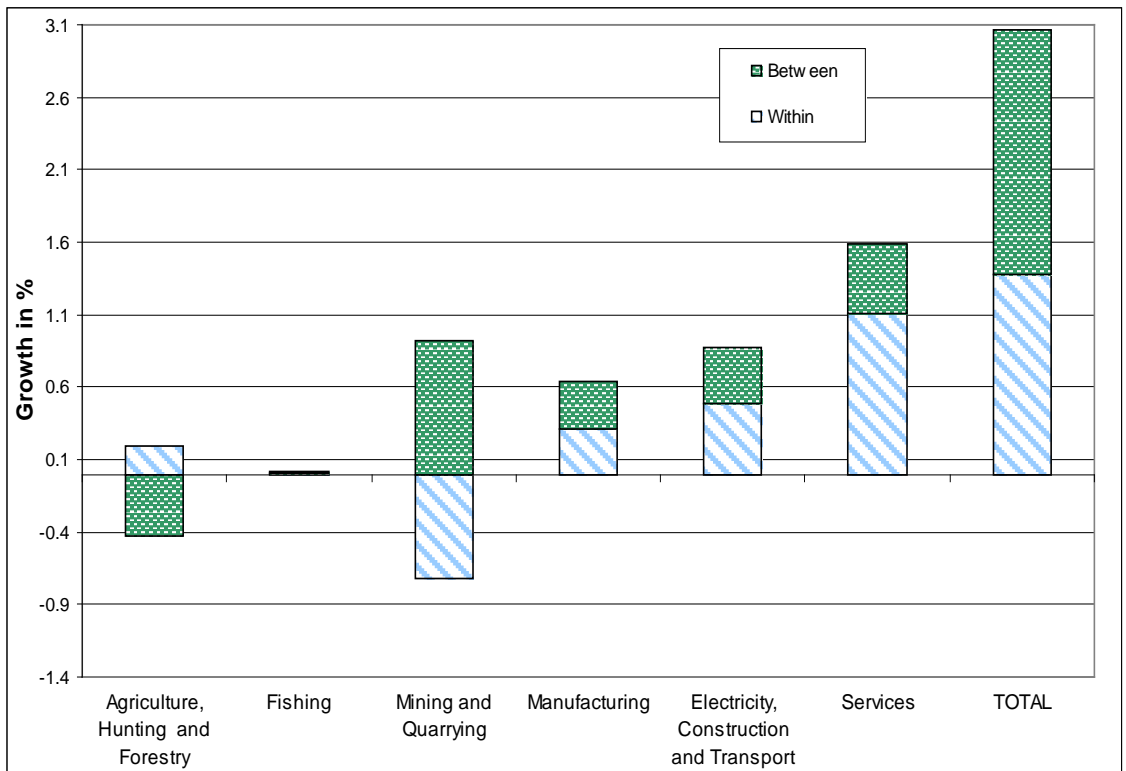

2002-2007

Graph No 6
Average Annual Growth Rate Contribution in Value Added Per Standardized Worker (LP2) Adjusted Method, 1998-2001

2002-2007

Taking these differences into account, the figures by sectors in the tables indicate that in the booming period 2002-2007, the between sectors effect for the agriculture and the wholesale and retail trade sectors were negative, regardless the employment indicator and methods (standard and adjusted) used. This effect may indicate that in such a period workers from these sectors either have moved to the other sectors because they found new job opportunities or jobs with higher wages and labor productivities, or both. In the case of the adjusted decomposition, as indicated above the higher level of the negative between sector effects of the agriculture sector is due to the lower level of labor productivity of workers of this sector compared with the rest of the sectors. The within effect for these sectors was positive suggesting that labor productivities may have increased in these two sectors during this period[18]. These increases, however, may well be at lower rate than the increase of the labor productivity of the economy implicated by the lower relative level of the labor productivity in this period.

Contrarily, in the recession period both within effects (traditional and adjusted) were negative in these sectors which indicates that the annual average level of labor productivity decreased in this period. On the other hand, whereas the traditional between effect was positive, the adjusted between effect was negative. The within effect suggest that the agriculture and wholesale and retail trade sectors act as a buffer in hard times and absorb labor which is put out of employment in other sectors of the economy. But this effect is short term rather than long term, given that in the booming period the (traditional) within and between effects are reverted. The between effects indicate that despite of the higher employment rates of growth in the recession period than in the booming period, labor productivity levels in the agriculture and the wholesale and retail trade sectors and were still lower than in the average labor productivity of the rest of sectors, in particular in those which labor shares decreased in the recession period.

The hotel and restaurants, household and private education services sectors have similar decomposition patterns than the agriculture and wholesale and retail trade sectors in both periods as it is shown in Tables from No A3 to A6 in the Appendix Tables.

The behavior of the rest of sectors can be divided in two types of behavioral relationship between labor productivity and employment. In the first type of sectors, labor productivity is inversely related to the employment levels in recession and booming periods. In the second type, labor productivity and employment are positive related in both periods. Mining and quarrying, financial, human health and government services[19] are sectors of the first type. The within effect in these sectors was negative in the booming period of 2002-2007 and positive in the recession period 1997-2001. This means that labor productivity decreased in the former period and increased in the recession period. Contrarily, the employment level of both sectors increased in the last period compared to that of the first period.

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[18] The average labor productivity level of the whole trade and retail sector increased in period 2002-2007. However, this average decreased in the agriculture sector. It should be noted during this period, labor productivity decreased in period 2002-2004 and increased from 2004 to 2005. The higher productivity in this period overcompensated the lower productivity in period 2002-2004 so that the within effect in the agriculture sector in period 2002-2007 was positive, which is consistent with the positive rate of growth of this in the booming period (see Table No I.2A and Graph No 3).

[19] The figures for these last two sectors are shown in the Appendix Tables.

Except for electricity and water, the rest of sectors (such as manufacturing, construction, transport and communications) have had a positive relationship. That is, labor productivity and employment levels have increased in the booming period 2002-2007 compared to the recession 1998-2007. In these sectors both the within and between effects were positive in the former period and negative or negligible in the latter period.

Although the employment and real value added shares of the compound electricity and water sector out of GDP is low, its dynamic of employment and labor productivity throughout the period 1997-2007 provides a special case of the negative relationship between labor productivity and employment level. Along this period, labor productivity level has been growing whereas employment level has decreased constantly (Graph No 7i). It should be also noted that the positive average rate of growth of employment in the booming period has not compensated the higher and negatives rates in the recession period. Standard labor productivity growth decomposition indicates that the within effect has been positive in both periods (1998-2001 and 2002-2007) and the shift effect has been negative in both periods regardless of the type of the level of employment (L1 and L2). In the adjusted decomposition case, all these effects have been non negative in both periods, suggesting either that workers with low labor productivity are leaving the sector or workers with a high labor productivity has been recruited into the sector.

I.4 Sectoral Differences in the Behavior of Labor Productivity and the Cyclical Behavior of the Peruvian GDP Per Capita, 1997-2007: Some Hypothesis and Final Remarks

As a methodological note, it should be mentioned that for each of the 11 sectors used in this section, real value added and employment include the formal and the informal sectors. In Section III, Table No III.2 presents the estimation of the size of urban informal sector of Peru in the booming period, 2002-2007 in terms of value added and employment. This sector is decomposed in 5 sectors: primary sector, manufactures construction, services and trade. Value added and employments of the formal sector are estimated using the total values of these variables minus the respective values from the estimated informal sector. Thereafter, the valued added per employed are computed. These calculations are done for three sectors: manufactures (Graph No 7 c and d); the aggregated services and trade sector (Graph No 7 f and g) and the construction sector (Graph No 7 i and j). The formal and informal decomposition for the rest of sector were not feasible due to data limitations. Taking this into account, there might be some plausible hypotheses that may cause the sectoral differences in the dynamic behavior of labor productivity and employment in Peruvian economy in period 1997-2007.

The firs type of behavior refers to the low- productivity agriculture sector (or traditional agriculture and micro-farmers oriented primarily to the production of non-tradable goods, Tello, 2009a) and the informal sector[20]. As it shown in Graph No 7(a), (e) and (g) and figures in Table I.2A, employment trend in these sectors has been positive regardless of the cyclical behavior of the GDP per worker of the economy. However, their labor productivity trend has been negative also regardless of the cyclical behavior of the GDP per worker of the economy.

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[20] Broadly speaking, the small-scale, semi-legal, often low productivity frequently family-based, perhaps pre-capitalistic enterprise which continues to employ between 30% and 70% of the urban work force in Latin America (Maloney, 2003, Maloney *et al*, 2007).

The dynamic of the agriculture sector shown in Graph No 7(a) includes the dynamic of the informal, traditional micro-farm sector and the modern large sized firms (and mainly agro-exporters) sector. Whereas the average rate growth of the export value of the agro-exporter (traditional and not traditional) sector in period 1998-2003 was 0.5%, the respective rate for period 2004-2007 was 24.9%. This higher rate of growth in this period may explain the higher rate of growth of the real valued added per worker of the agriculture sector in that period. In the recession period up to 2003, the decreasing rate of labor productivity in this sector can be explained by the low growth of the export value of the agriculture sector and the probable negative rate of growth of labor productivity of the informal and micro-farm sectors.

In the booming period 2002-2007, the compound services-trade informal and formal sectors show clearly the differences in the behavior of labor productivity between the formal and informal sectors of Peruvian economy. The formal services-trade sector with a procyclical labor productivity behavior as a response to internal (and/or external) demand shocks and the informal sector with limited capacity (in terms of small size, low level of human capital, absence of innovation processes, and lower probabilities of capital accumulation[21]) which labor force constantly increases producing a negative trend of its labor productivity.

As pointed out above, the informal and the traditional agriculture sectors act as a buffer in both recession and expansion times and absorb labor which is put out of employment in other sectors of the economy. Partly this is shown in next section, wherein manufacturing formal firms not only generate new jobs in booming periods but also reduce jobs in this period. Thus, fired workers may move either to other manufacturing sub-sectors or to the informal sector. This higher and continuous employment growth in these low-productivity sectors, under limited productive capacity generate a decreasing trend in labor productivity as observed in Graph No 7(a) and (g). Due to large size of these two sectors in terms of employment, their negative labor productivity growth limits to a certain extent the labor productivity growth of the economy even in periods of expansion.

The second type of sectoral behavior is due to sectors highly sensitive to changes in aggregate internal demand, such as the manufacturing sector. In this type of sectors labor productivity is positively associated to employment because of: the procyclical behavior of installed capacity utilization rate[22], the absence of substantial change in total factor productivity, and firms' changes in (technical, economic and/or organizational) efficiency.

According to PRODUCE (2009) and INEI(2009), installed capacity utilization rate decreased from 65.3% in 1997 to 53.8% in 2001 and then increased up to 58.7% in 2007[23]. Thus, when installed capacity utilization rate is less than 100% (i.e, the current level of output is lower than the potential output that can be produced by a firm plant) then as demand increases firms may have the propensity to hire more workers in order to

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[21] See more details in Section III.
[22] The installed capacity utilization rate measure the percentage of output produced from the potential output when all their production factors all fully employed.
[23] If Y/L=LP=TFP. F(θv); Y, is the output level, v=V/L; wherein, θ is the installed capacity rate (wherein, θ is between zero and one), V is the vector of primary factors and v, the vector primary factors per-worker. Maintaining constant total factor productivity (TFP), LP will increase (or decrease) even if L increases (or decreases) if θ increase (or decrease).

take advantage the idle plant capacity. In consequence as the utilization of this capacity increases then labor productivity may well increase. However, as it is shown in Section II, although employment in the manufacturing sector has increased (due to the employment increases in both microenterprises from the informal sector and medium and large size firms from the formal sector) the increase in labor productivity in the manufacturing formal sector was in part due to a higher level of the utilization rate of installed capacity and another due to a more efficient use of the plant capacity of firms that reduced their level of employment. The fact the installed capacity utilization rate is lower than 100% for both for the total manufacturing sector and for a sample of medium and large firms from the manufacturing formal sector (as it is shown in Table No A7) may indicate the absence of the substantial change of the total factor productivity in this sector.

Graph No 7 (b), (c) and (d) show the positive relationship between labor productivity and employment in the manufacturing sector. Given the large differences in labor productivities and employment shares between the formal and informal sector, the behavior of the former is dominated by the formal sector and that of employment by the respective behavior of the informal sector. Graph 7(b) show the procyclical dynamic behavior of labor productivity of the total manufacturing sector and the estimated employment of the formal sector using data from De vries and Hofman (2007). Graph 7(c) and (d) show the differences in labor productivity behavior between the formal and informal manufacturing sector. These graphs suggest that the cyclical behavior of the GDP per worker of Peruvian economy partly can be attributed to the procyclical behavior of the labor productivity in the manufacturing formal sector. A similar behavior as the manufactures has the construction sector as shown in Graph No 7 (h), (i) and (j).

The third type of sectoral labor productivity behavior comes from sectors that works at full capacity and that increase in its output is originated by higher level of investment or an intensive use of its fixed factors. In this type of sectors, such as mining, there is a negative relationship between labor productivity and employment. Some stylized facts may support this hypothesis: i) investment in the mining sector dropped from an average of 1252 millions of dollars in period 1998-2001 to 880.7 in period 2002-2006 (MINEN, 2004, 2006); ii) similarly the rate of growth of real value added from the mining sector decreased from 7.3% in period 1998-2001 to 5.9% in period 2002-2007 (Table I.2A) despite of the increasing rate of growth of mining prices from 1.6% in period 1998-2001 to 20.7% in period 2002-2007; iii) employment growth rate have increased from the negative rate in period 1998-2007 of -9.0% to 22% (or 19.% in terms of standardized workers) in period 2002-2007. Thus, in the presence of fixed factors, labor productivity would be inversely related to employment level[24]. In this type of sector employment is pro-cyclical and labor productivity respond to the cycle of investment. Labor productivity increased in the recession period due to higher level of investment and lower level of employment and decreased in the expansion period, due to lower level of investment and higher level of employment. This dynamic is shown is Graph No 7 (k).

The fourth type of behavior may be originated by positive changes in total factor productivity of a sector. The modern electricity sector may have followed this behavior. Thus, whereas investment in this sector[25] dropped from an average of 596 millions of

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[24] In this case, changes in labor productivity ('Y/L') is positively related to changes in the size of the fixed factors per worker (v=V/L) and negatively related to changes in L for fixed factors (V). Higher level of investment means higher level of physical capital (or mining resources) and higher level of v.

[25] Firms' activities in this sector include: distribution, generation and transmission of electricity.

dollars in period 1997-2001 to 387 millions of dollar in period 2002-2007[26], the installed power per worker (in mega watts per worker) rose from 2.8 in 1998 to 2.93 in 2006 (at annual average rate of growth of 0.6% in period 1998-2006) with an annual average employment rate of growth of 0.4% in period 1998-2007. The rate of growth[27] of physical output of the (formal and informal) electricity sector were 5.4% and 6.1% in the recession and booming period respectively and for employment -18.4% and -4.7%. The respective rates for the water sector were 0.6% and 0.2% for output and -10.7% and -1.6% for employment. The physical output rate of growth for the compound (formal and informal) electricity and water sector were 3.3% and 5.4% and -14.5% and -2.6% for employment. That is, whereas output growth of this compound sector is dominated by the rate of growth of electrical sector output, employment changes have been affected for both the electricity and waters sectors.

Consequently, the sustainable labor productivity growth shown in Graph No 7(l) in this sector throughout the period 1997-2007, despite the decreasing rate of investment in the modern electrical sector and employment in both the electrical and water formal and informal sectors may be explained by an increased total factor productivity associated to the structural reforms implemented in the electrical sector since beginning of 1990s (MINEM, 1998, 2008).

Summing up, the evidence of the sectoral differences on the dynamic behavior of output, employment and labor productivity and their contribution on the rate of growth of labor productivity in Peru in period 1997-2007 may explain the cyclical and low performance of the GDP per worker in such a period. In recessive periods (such as that of 1997-2001), the decreasing trend of GDP per worker is explained by: i) the decreasing trend and low labor productivity sectors such as traditional agriculture, wholesale trade and retail, household services and the informal sector as a whole; and ii) the decreasing trend of the labor productivity of the formal and informal sectors highly demand sensitive such as manufacturing; construction, and transport and communications. Out of total decreasing rate of growth of -1.349% of the GDP per worker, these sectors[28] contributed in -1.325%.

In expansion periods, the increasing trend of GDP is explained by the formal firms of the same sectors. The labor productivity of the relative small size sectors such as mining and the low levels of labor productivity of the informal sector and micro-farms of the agriculture sector (whose labor productivity behavior have been opposed to those highly sensitive to internal demand) did not compensated the increasing rate of the labor productivity of the demand sensitive sectors, although they reduced the rate of change of the labor productivity of the economy.

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[26] In the formal water sector also investment decreased from average of US $ 250 millions between 1998 and 2001 to 130 millions in period 2002-2007 (SUNASS, 2009).

[27] These rates are exponential rates of growth.

[28] Excluding the traditional agriculture sector since the contribution of the agriculture as whole (i.e., the modern and traditional sector) was positive in the recession period of 1997-2001. When differences between average and marginal labor productivity is taken into account the contribution of the agriculture sector is negative and of the same size of the negative rate of growth of labor productivity for Peruvian economy.

GRAPH No 7

(a)

r= -0.275

Legend: LP1$94_AGR, L1_AGR

(b)

r=0.304

Legend: LP1$94_MANU, L1_MANUFe

GRAPH No 7

(c)

r=0.137

— LP1$94_MANUF   — L1_MANUF

(d)

r=-0.774

— LP1$94_MANUIF   — L1_MANUIF

GRAPH No 7

(e)

r=0.687

LP1$94_SERTRADE   L1_SERTRADE

(f)

r =0.185

LP1$94_SERTRADEF   L1_SERTRADEF

GRAPH No 7

(g)

r= -0.368

LP1$94_SERTRADEIF   L1_SERTRADEIF

(h)

r= 0.779***

LP1$94_CONST   L1_CONSTFE

30

GRAPH No 7

(i)

r= - 0.059

(j)

r= - 0.574

GRAPH No 7

(k)

r=-0.753

LP1$94_MIN — L1_MIN

(l)

r= -0.881

LP1$94_ELEC — L1_ELEC
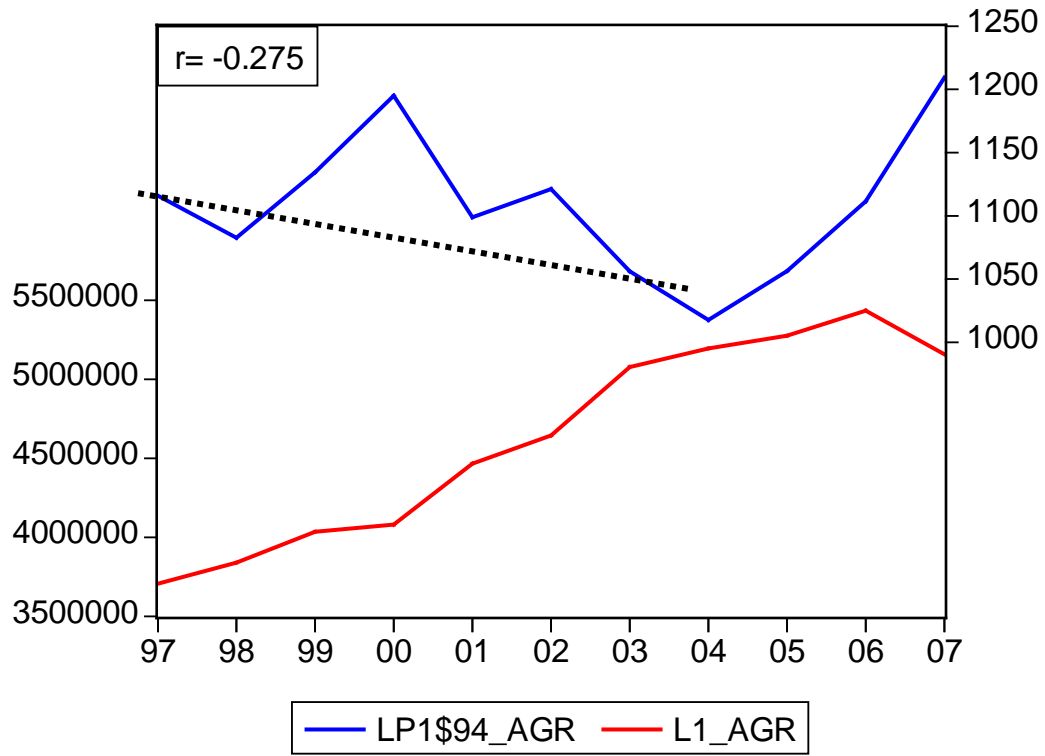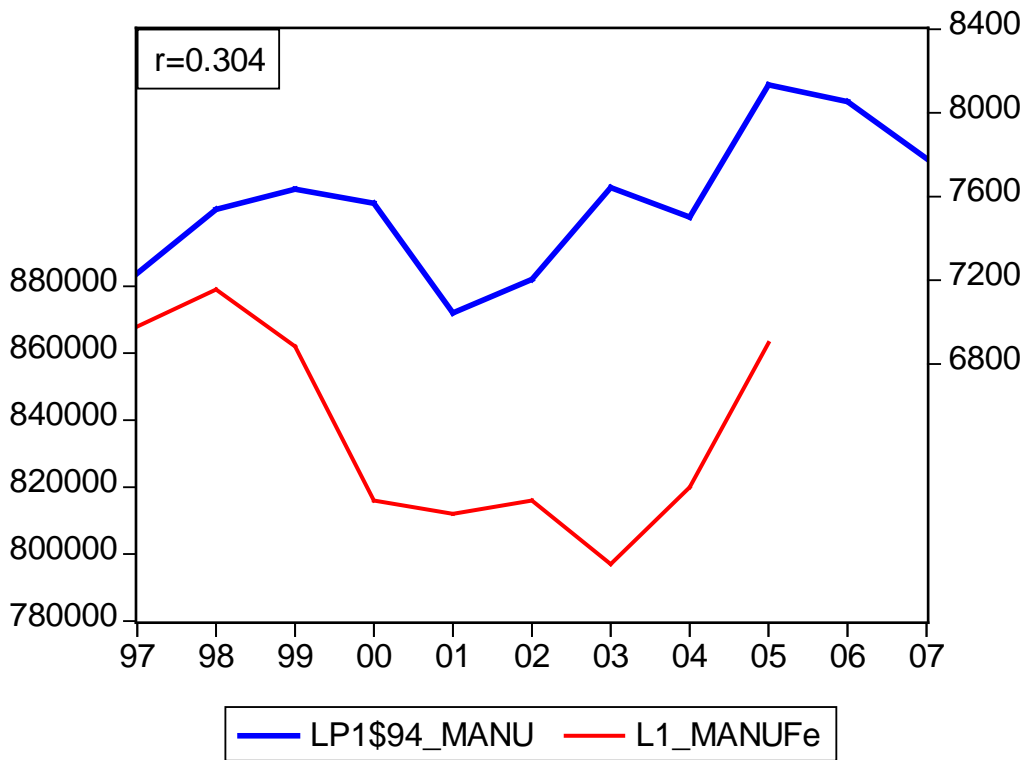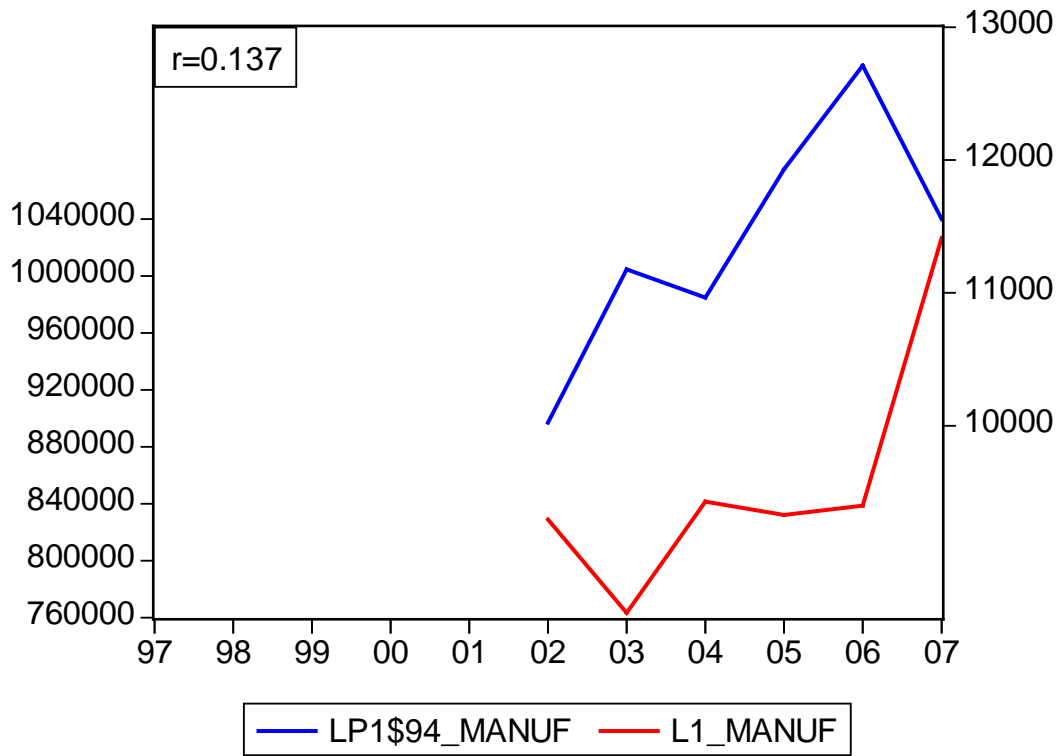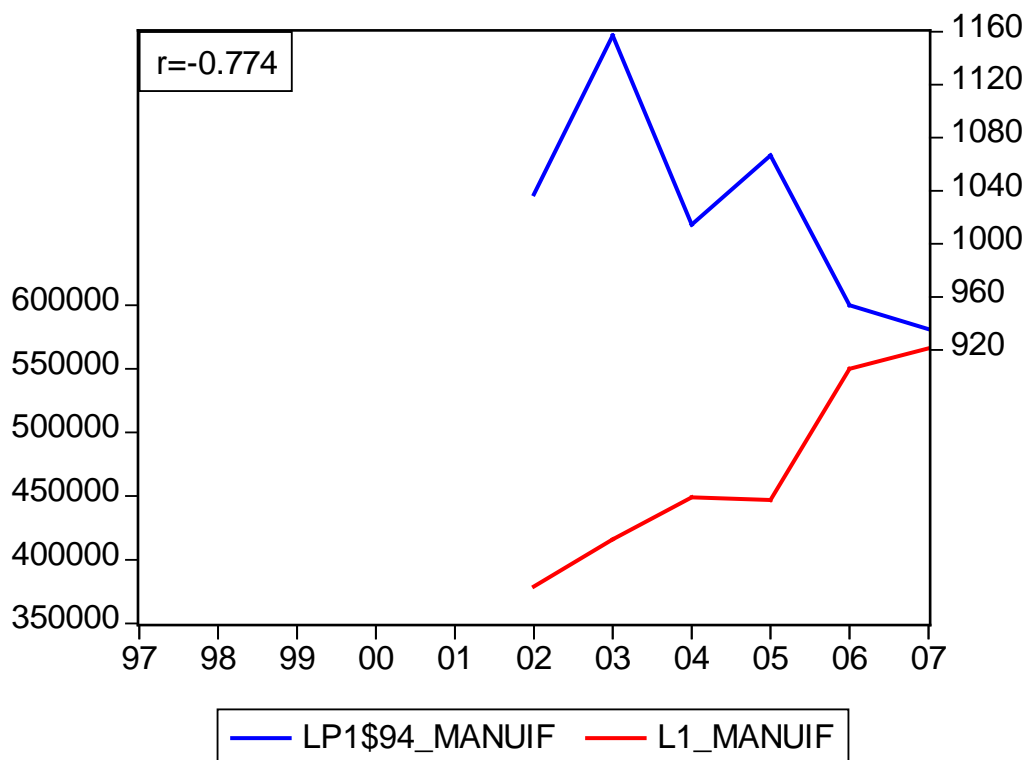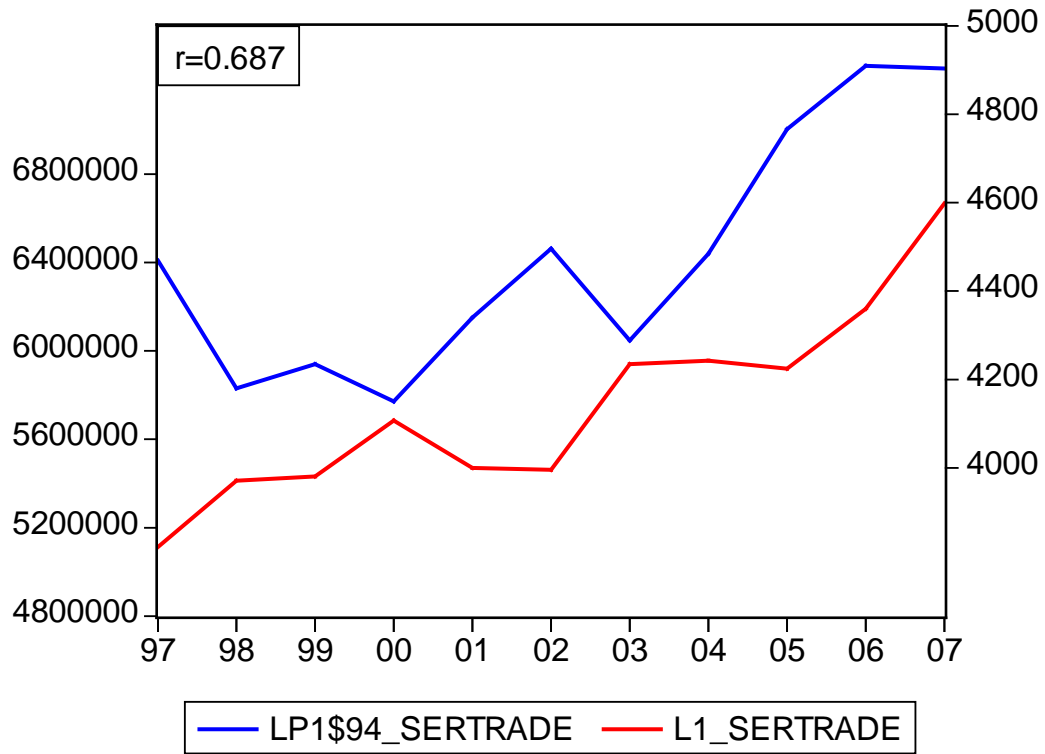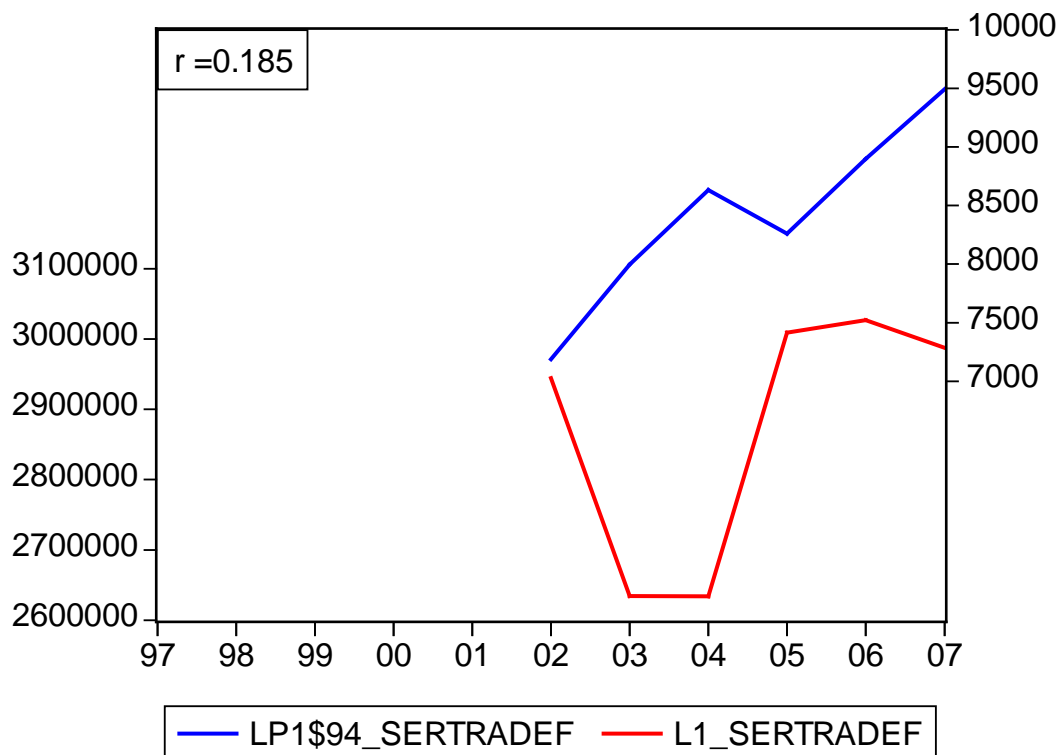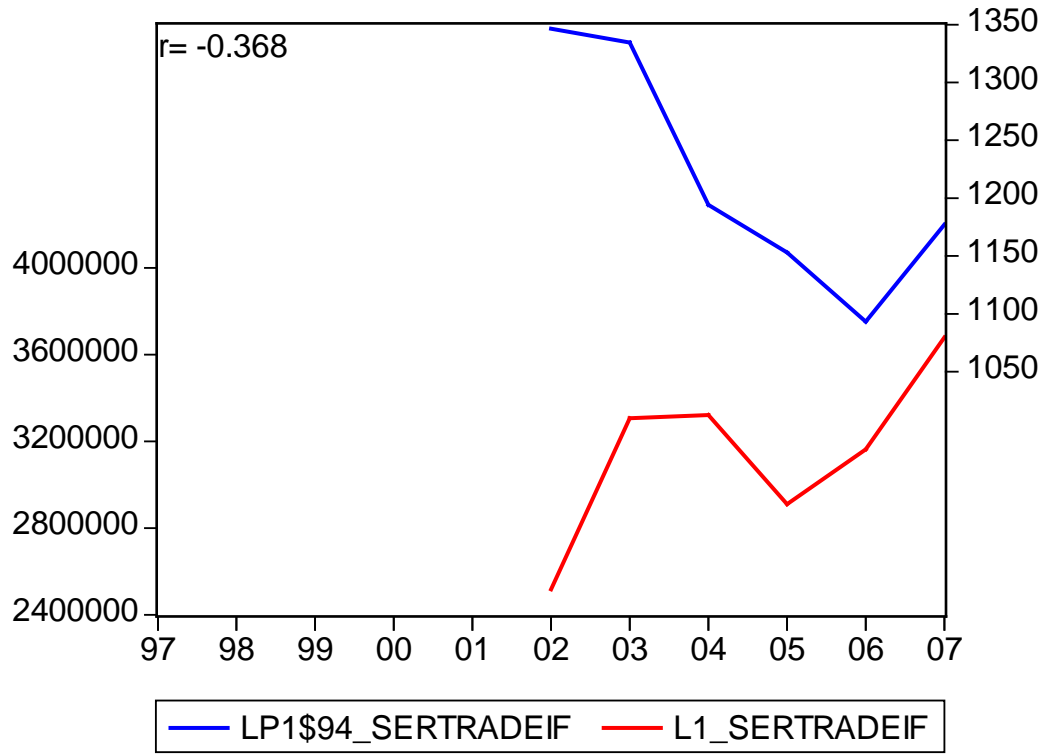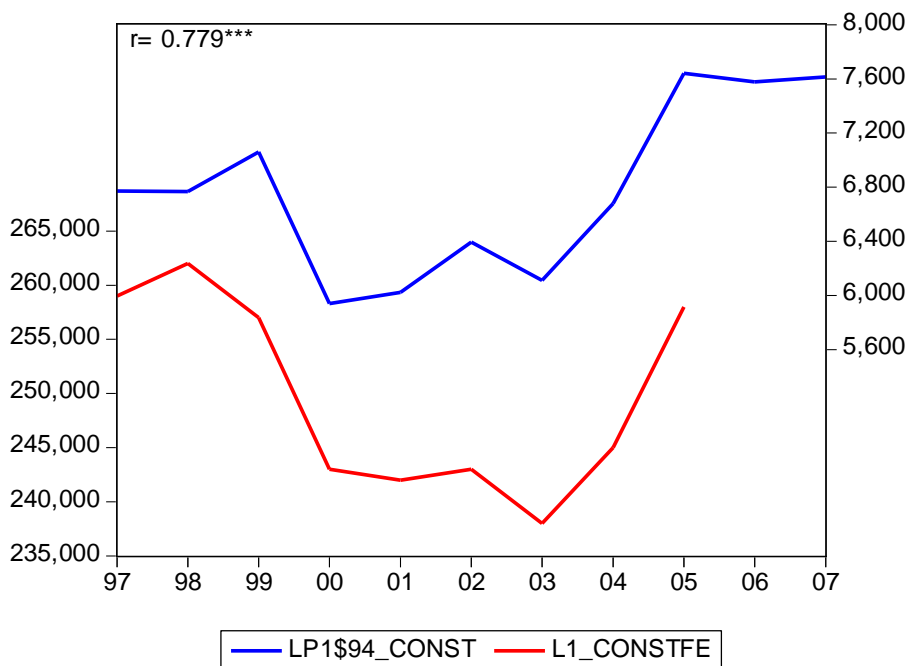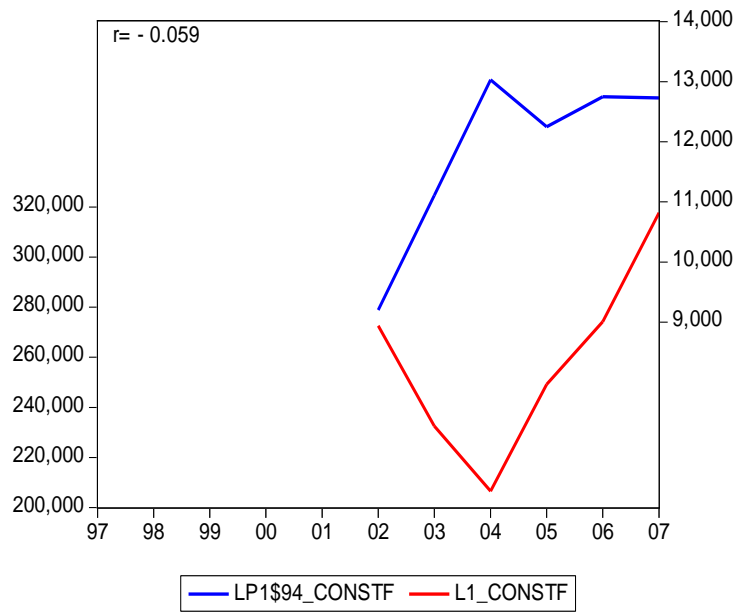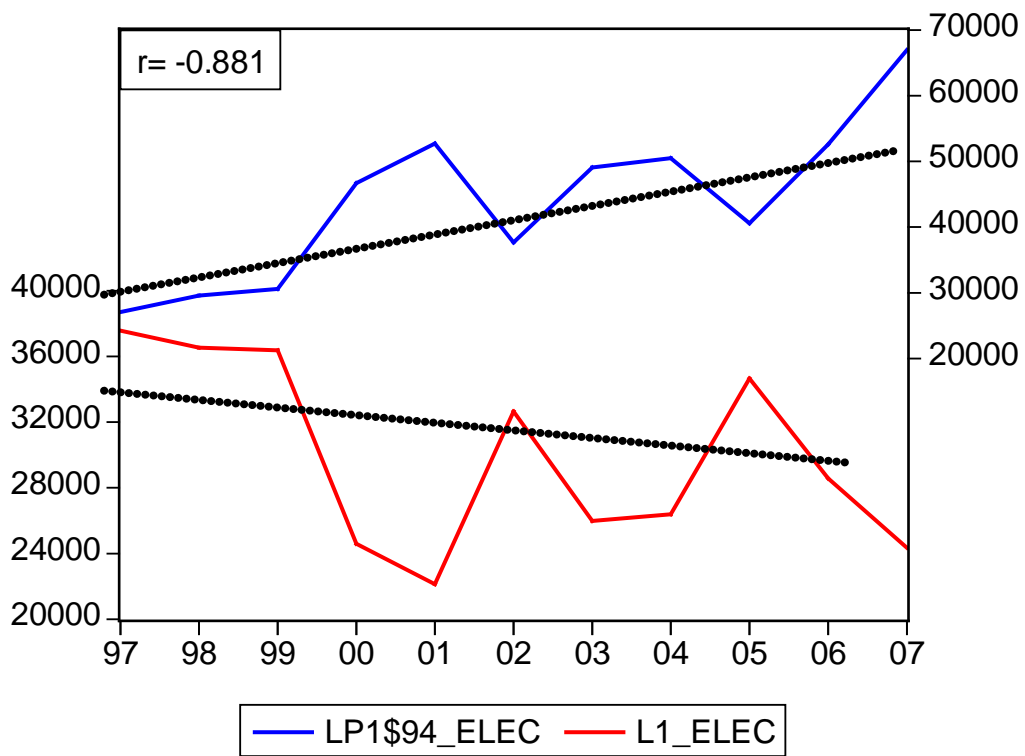
To change the cyclical behavior of the Peruvian GDP per worker in relative short periods of time would demand a set of 'reforms' designed to transform the productive structure in a way that their dynamic on the one hand absorb the labor force of the informal and traditional agriculture sectors and on the other, generate a continuous and sustainable positive rate of growth of total factor productivity of all the sectors in the economy, regardless of the potential (internal or external) shocks that economy may face in the future.

II. LABOR PRODUCTIVITY AND EMPLOYMENT IN THE INFORMAL MICRO-ENTERPRISES SECTOR IN URBAN AREAS OF PERU.

This section of the document aims to: (i) estimate the size of the urban informal sector in terms of employment and production, (ii) describe this sector considering some characteristics of the micro-entrepreneurs, the microenterprises and their workers, and (iii) to calculate the productivity of these sector and evaluate some of the characteristics to which are associated the differences in productivity as well as with the evolution of productivity along the period of economic growth from 2002 to 2007.

The information used for this section comes mainly from ENAHO from 2002 to 2007. Starting in year 2002 the survey includes 2 special questionnaires with the particular objective to collect information about "informal" economic activities.[29] For the purposes of those questionnaires, informal activities are considered as such if those activities: (i) are not functioning by registered entrepreneur for tax purposes, or (ii) are managed by entrepreneurs that do not keep any system of business accounting.

We will occupy ourselves here only with the information of questionnaire that registers non-farm economic activities in urban areas.[30] Henceforth we will refer to the information in this questionnaire as the one relating to *informal micro entreprises* (IME) in urban areas. The questionnaire is to be answered by all those people that are part of the occupied labour force (according to module 500 of labour activities of the ENAHO survey) and comply with the following characteristics: (i) are employers or independent workers in the principal or secondary occupation and, as was mentioned above, (ii) the enterprises or firms that they conduct are not registered as legal persons or keep a system of business accounting.

Diagram II.1 helps us identify the universe of informal enterprises that have been identified from the ENAHO survey. Taking as a reference the survey for year 2007, it can be observed that out of the 15.3 million people occupied in the labour force approximately 6.0 million are employers or self-employed in the main occupation. In the secondary occupation other 700 thousand are employers and self-employed. Out of these 6.7 million people (60% of them are in urban areas, i.e. around 4.0 million), there is a

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[29] *Ingreso del Trabajador Independiente* in non-farm activities (questionnaire 02) and in farm activities (questionnaire 04). The information collected with these questionnaires has been scarcely and recently used. Among the few works that used it are: Herrera (2003), Hidalgo et. al (2004), Chacaltana (2008), The World Bank (2008), Yamada (2009) and Díaz and Trivelli (2009).

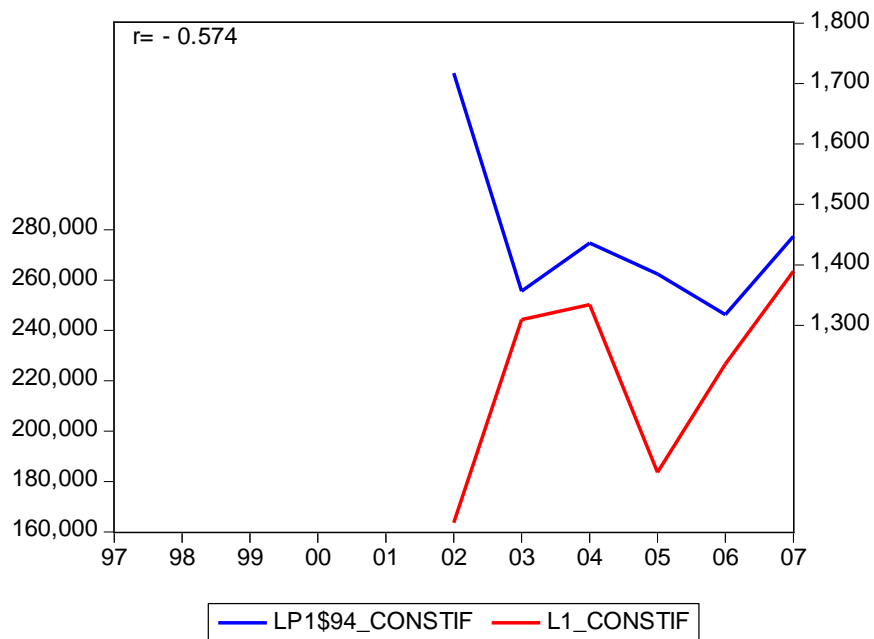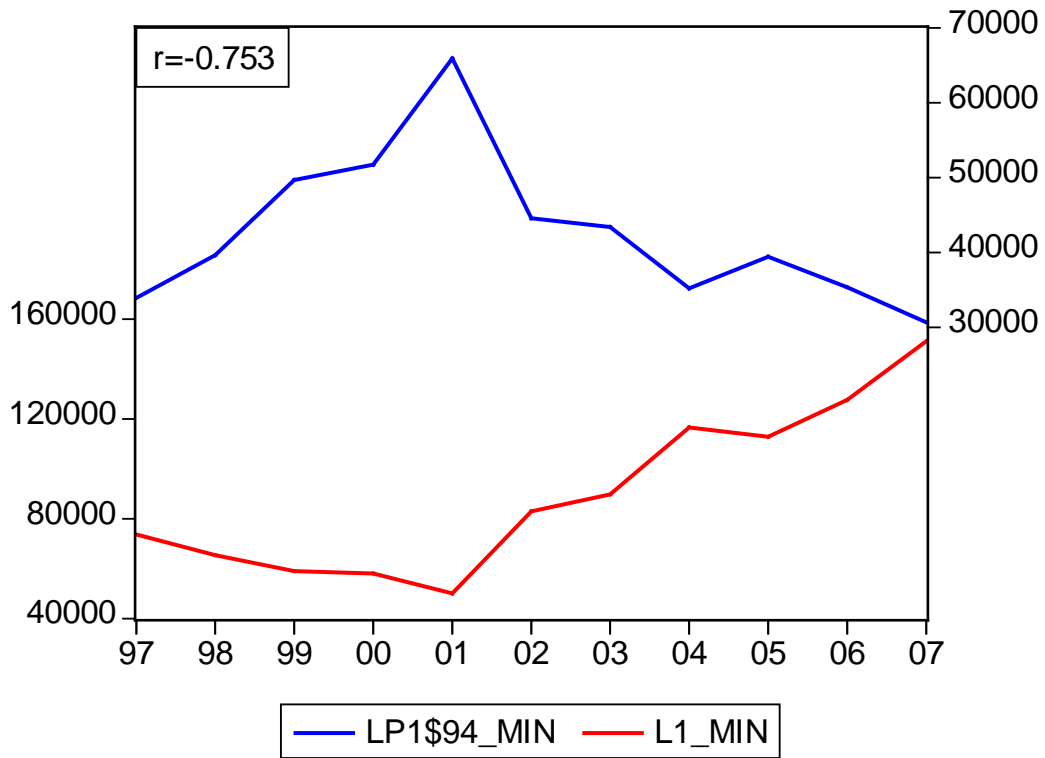[30] The questionnaire related to the "informal economic activities" are organized in 5 sections: (i) basic characteristics of the enterprise or firm, that includes information about the infraestructure, equipment and labour force, (ii) information about the productive and extractive activities (sales, self-consumption and expenses in inputs: product, quantity, price and frequency), (iii) information about the commercial activities (similar to that in production), (iv) information about the services' activities (similar to that in production), and (v) other general expenses apart from inputs.

group that manages their own business without being registered for work on such activity[31]. Considering only those non-registered entrepreneurs in urban areas they represent 3.0 million of *informal entrepreneurs in urban areas* who manage 3.2 million firms and that employ 1.5 million workers (in addition to the entrepreneur).

In the following section we will describe the characteristics of these enterprises that, as we will see later on, are small since the majority of them are single-person activity or employ one or two workers. In that sense, this is the universe of the *informal micro enterprises* (henceforth IMEs) in urban activities of Peru.

II.1. General characteristics of the urban IMEs of Peru

Considering the characteristics of the entrepreneurs of the urban IME sector (see Table II.1), it has been found that women predominate lightly over men, they are approximately 40 years of age and have 9 years of school education (approximately third grade of secondary education). More than 40% of the micro entrepreneurs are household heads and almost 30% are spouses of the head. On average, micro entrepreneurs work between 33 and 37 hours per week. This represents somewhat less than a full-time working week of 40 hours. Some of these characteristics contrast with those of all the occupied EAP in urban areas of Peru and in particular with those of the entrepreneurs (see Figure II.1). For example, women's participation in the informal sector exceeds the one of the total urban occupied EAP and also those in the 2 categories from the entrepreneurs come (i.e. employers and self-employees). They also are relatively younger than employers (but do not of the whole occupied EAP). In terms of schooling, informal micro-entrepreneurs have fewer years of education than all the self-employees. Finally, they work shorter shifts per week than any other occupational category except UFW.

Urban micro-enterprises tend to specialize in one of 3 large types of economic activities: production (including manufacture, construction and extraction), trade and services (see Table II.1). It is very rare to find micro enterprises that combine 2 if not 3 activities. An important proportion of the IMEs (between 24 and 32%) have less than one year of age. On the other hand, between 36 and 41% have 5 years and more since they were created. These results suggest a high rotation, since the presence of firms with less than one year of age is important. Between 69% and 78% of the micro enterprises do not utilize more workers than the entrepreneur himself. Between 20 and 27% have one or two workers and less than 5% have 3 or more workers[32].

The labour force that the IMEs employ (without counting the micro entrepreneur and considering only the group of micro enterprises that do utilize additional workers) is slightly more masculine and with an average age of approximately 27 years (see Table II.1)[33]. It is not possible to calculate the average years of schooling but it is indeed possible to observe that somewhat less than a third of them have complete primary

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[31] They are not registered as a legal business nor as a "natural" person at the SUNAT meaning that, for practical purposes, are not subject to supervision from the tax system and do not pay taxes.

[32] The questionnaire allows on the most the registration of detailed information about 10 workers, but does allow the registration of the global number of workers (without further details apart from the differentiation if they receive remuneration or not).

[33] It is important to mention that around 10% of the labor force in urban IME is less than 14 years old, below the minimum working age according to Peruvian laws. The figures mentioned here of the whole EAP come from the module 500 of the ENAHO which include only people with 14 and more years. So, figures from the IME and the whole economy are not strictly comparable.

education at most. Those that do have complete or incomplete secondary education represent the majority group: between 54 and 60%. According to the ENAHO survey of 2007 that does collect information about the kinship relationship with the entrepreneur, it can be observed that 81% of the workers are relatives of the micro entrepreneur. Given the high proportion of micro entrepreneurs that are heads of households or spouses of the head, what can be concluded is that the micro enterprises are *family production units*.

The comparison of the employees by the IMEs with the whole occupied EAP and in particular with similar categories (i.e. wage-earners and unpaid family workers) shows once again that women have greater participation, they are younger and have lower levels of education (see Figure II.2). Working hours are shorter and quite likely associated with it, they received lower wages (considering only those who receive positive wages) are than the whole group of wage-earners.

II.2. Production and employment in the IMEs

During the period for which there is information available in the ENAHO survey about the IMEs, it has been found that this sector of enterprises is relatively important from different point of views. First, according to the information for year 2007, somewhat less than half of the Peruvian households report some non-farm business activity that presents signs of informality. Second, as shown in Diagram II.1, out of the total number of urban entrepreneurs identified in 2007 (3,560 plus 489 thousand), somewhat less than 75% are informal (2,993 thousand).[34] Third, as we will see later on, the volume of employment related to the sector of the urban IMEs represent 30% of the total economically active population actually employed in the country or 47% of the occupied EAP in urban areas[35]. In this section, the absolute and relative size of the sector of the IMEs in terms of production and employment will be shown. For that purpose, different measures will be used for both variables.

Taking as a reference the year 2007, it can be observed in Table II.2 that the number of IMEs that dedicate only to one activity was almost 3.2 million[36]. The largest number of enterprises (80%) dedicates to trade and services activities during all the years included between 2002 and 2007. The number of people that work in the IMEs (including the employer) was 4.6 million in 2007; however, when the working week of 40 hours is standardized that number gets reduced to 3.7 million. In any of those 2 cases, trade and services absorb approximately 80% of the total of the employment in this sector of the IMEs. Manufacturing employs on average between 12% of IME´s labour force and construction 6%. Regarding production, on Table II.2 gross output and valued added are reported. Gross output tends to be a little more concentrated in trade and services (on average 87%) in comparison with the value added (approximately 82%). On the other hand, the relative importance of trade in the value added is almost 20 percentage points below the value added compared to gross output.

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[34] Without considering the employers and the employees who work in informal farm activities in rural areas.

[35] These percentages are higher if we in addition consider agricultural and cattle-ranching activities reported in the rural areas. These, as explained in the Appendix, are collected in another questionnaire of the ENAHO.

[36] The micro enterprises that dedicate themselves to 2 or more activities are excluded. These represent less than 5% of the total of enterprises. Additionally, the enterprises in the primary sector have been excluded since the largest share of them dedicates themselves to agricultural and cattle-ranching activities, activities that should be registered in a different, special form for these purposes. Some few enterprises pertaining to this primary sector dedicate themselves to mining and fishing activities, but the number is very small and it was preferred to exclude them from the analysis.

The evolution of production and employment level along the period 2002 and 2007 show annual growth rates relatively high. In the first place, the annual rate of growth of the number of enterprises was 6.4%. Secondly, total employment (including the employers) grew at an annual rate of 8.2% (non-standardized employment) and 6.0% (standardized employment). Thirdly, gross output grew at an annual rate of 6.4% while the value added at a rate of 5.2%. It is clear, however, that when the number of enterprises and the employment grow more rapidly than the gross output and the value added, the ratios of production per firm fall between 2002 and 2007 (see Table II.3), as well as was the case with the gross output and the value added per worker. We will analyze this with more detail later on.

Table II.2 also evaluates the performance of the IME by major types of economic activities. The activity with its value added highest annual growth rate between 2002 and 2007 was the construction. In the same way it was the sector where employment grew more rapidly (either standardized or not). At the other extreme, with the lower growth rates both in value added and employment was trade. In any case, the value added of any of the 4 economic sectors in the IMEs grew at rates below the value added at national scale (which grew in the same period at annual rates of 6.5%, see Table II.4a later). Unlike what was observed with the value added, employment in these 4 sectors grew faster than aggregated employment and also in comparison with the correspondent economic sector.

On Table II.3 some ratios and percentages are presented that help us understand the description shown above. First, the ratio of standardized employment to the non-standardized employment shows that for the whole sector of the urban IMEs, each worker works between 80 and 90% of a working week of 40 hours. This ratio presents notorious differences between sectors of economic activity. While in manufacturing the ratio lies between 70 and 78%, in construction it lies much closer to 100%; in services between 82 and 88%; and in trade presents great variability since it varies between 81 and 98%. Second, the gross output per firm also presents important differences between sectors. The trade activity presents the highest values for all the years, while manufacturing and construction the lowest ones. On the other hand, the value added per firm presents a rather different behaviour. In this case it is construction that presents the highest value added per firm, while trade is the second lowest. This change in behaviour of gross output and value added is associated with the proportion of the gross output that value added represents. As can be seen from Table II.3, construction has the largest proportion while trade has the lowest, and the difference between these proportions can reach up to 60 percentage points (e.g. 28% in trade versus 98% in construction in 2007).

II.3 Value added per worker in the sector of the IMEs

For the calculation of the value added per worker it has been preferred to employ the number of workers (including the employer) standardized in shifts of 40 hours. The effect that this has on the ratio of value added per worker is to raise it in relation to a ratio that does take into account the number of non-standardized workers. This is so because, as was already mentioned, in the sector of IMEs workers on average work less than a working week of 40 hours. The calculations for the sector of the IMEs are presented as well as for the economy as a whole in order to do the proper comparisons. On Table II.4a the volume of employment and the value added for the whole of the economy is reported,

while in Table II.4b the value added per standardized worker is reported for the IME sector and the whole economy (see also Figure II.4). Both tables include the relative importance of the sector of the IMEs in relation to the total of the economy.

Let us start pointing out the relative importance of the sector of the urban IMEs in relation to the overall economy regarding employment and value added in the period between 2002 and 2007. In terms of employment, the overall sector of the IMEs represents on average 25.9% of total employment and 7.5% of value added.[37] The comparison between the 4 large groups of economic activity shows important differences. Trade is the one that presents the largest share of IMEs in employment with an average of 52%, while manufacturing and services have lesser shares in employment of 25 and 30%. In construction that share amounts to 42%. In terms of value added, again trade has the greatest share in the IMEs with 15%, while manufacturing has the smallest with 4%. Construction and services have intermediate values of 9 and 8%, respectively (see Figure II.3).

Regarding the evolution of employment and value added, and comparing the initial and final year of the period from 2002 to 2007, it can be observed in Figure II.5 that employment in the economy in its totality grew at a rate lower (2.6% per year) than the rate of growth of the sector of the IMEs (6.0%). In general in each of the 4 sectors, the EMI employment grows at higher rates compared to the overall economy. The sector with the highest rate of annual change in employment is the construction (9.5%) and lowest trade (3.3%).

With respect to value added, contrary to what was observed with the employment, value added, the whole IME sector grew at lower rates (5.2%) in comparison with the whole of the economy (6.5%) as is shown in Figure II.6. The comparison between sectors of activity also shows that each IME activity sector grew less than the respective aggregated sector in the whole economy. Only in services activities annual rates are very close (but not equal).

The combination of the dynamics of value added and employment in the economy as a whole and in the sector of the IMEs, produce growth in the value added per worker in the economy as a whole (3.8% of annual growth) while a decrease in the IMEs (-0.7% annually) (see Figure II.7). In the economy as a whole it is the trade sector that grows more rapidly (5.4%), followed by construction (4.3%). Services and manufacture are, in that order, the ones that grow least (2.4% and 1.9%, respectively). In the sector of the IMEs, all economic activities, except trade, show negative rates of variation. Construction and services are the ones that decrease the most (-2.9 and -1.7%, respectively), while manufacture decreases at -0.6%. The combination of high rates of growth of employment, even higher than the rates of growth of value added, between the IMEs has caused the average productivity of labour to decrease during this period.

To measure the contribution of the within and between effects on productivity changes in the informal sector we follow the methodology explained in Appendix of Formulas (section A). The decomposition was made for each pair of years from 2002 and 2007, and the mean of them is reported in Figure II.8. As was mentioned above, the productivity of

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[37] It should be remembered that these percentages will be higher if the IMEs in rural areas are also considered besides the extractive industries (mainly farm production i.e. agricultural and cattle-ranching production).

the whole informal sector here considered decreased from 2002 to 2007. Most of this decrease was due to the within effect (changes in productivity within the 4 sectors) than between effects (or shifts of labour force between sectors). Services is the mayor contributor to the within effect, while Services and Trade tend to compensate their contribution to the between effect. Manufacture and Construction do not contribute much to the changes of the productivity of the whole informal sector, probably because is not easy to have reallocation of labour force from/to these sectors to services and trade. This results suggest that, given what we have shown before, increase of productivity in the informal sector will be difficult because there is no room to productivity gains from reallocation of labour force among sectors.[38] Increases of productivity in the informal sector must be a result of a general improvement in the whole sector.

The gaps in value added per worker between the whole economy and the sector of the IMEs can be observed in Table II.4a as well as in Figure II.4. On average, value added per worker in the economy as a whole was 10,072 constant soles of 1994, while it was 3,072 in the sector of the IMEs, that is, the average product in the sector of the IMEs is less than one third (30.5%) of the level in the economy as a whole. The largest gap can be observed in manufacture (17.5%) and the smallest in commerce (29.5%). Construction and services lie between those ranges (20.8 and 26.5%, respectively). It is noticeable that the 4 sectors of activity here analyzed show large differences on a global economy scale. For example, the average product per worker in manufacture is 17,178 soles of 1994 while in trade it is only 8,142, that is, a difference of more than 100%. In the IMEs sector, you cannot observe relative differences that are so big and, consequently, it is relatively more homogeneous in terms of value added per worker than in the whole economy.

II.4. Exploring the differences in productivity

It has been shown that there are differences in value added per worker between the 4 big types of economic activity inside the IMEs (i.e. manufacturing, construction, trade and services). Those differences are not so pronounced as those that can be observed at the aggregate level but even so they are important. For example, among the IMEs the services' activity is the one that presents the highest productivity and it is somewhat more than 40% higher that the one for commerce which is the activity with the least productivity. On the other hand, on an aggregate scale, the difference between the most and least productive (i.e. manufacturing and trade, respectively) is more than 100%. With the goal of trying to identify the characteristics to which the differences in productivity inside the IMEs are associated, in this section we will present the characteristics of the IMEs according to their belonging to the big sectors of activity (the 4 mentioned above), and according to the levels of productivity inside each one of the sectors. For these exercises the average information for the whole period 2002 to 2007 has been utilized. In the case of the levels of productivity, the IMEs are segmented according to whether they belong to the quartile of highest productivity or the quartile with least productivity inside the corresponding sector of activity.

Table II.5 presents the average characteristics of the IMEs for the period 2002-2007, distinguishing between the 4 big sectors of activity. It can be observed that, in relation to the characteristics of the micro entrepreneurs, construction and trade tend to show a

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[38] We already mentioned the difference in productivity heterogeneity between activities in informal sector compared with the formal sector. The former is less heterogeneous than the last one.

specialization by gender: while in construction there are practically no women, in trade the great majority are women. In manufacture and services the participation by gender is more balanced. Regarding schooling, it can be observed that construction and services tend to present an average of years of schooling slightly higher (between one year and one year an half more) in comparison to the other 2 sectors. With respect to the relationship between the micro entrepreneur, be it he or she, and the head of household, it can be observed in all the sectors that the micro entrepreneur usually is the head of household or the spouse of the head. Finally, with respect to the average of work per week, trade presents an average that is rather close to a full-time working week of 40 hours, while manufacturing has an average of less than ¾ parts of a full time working week.

With respect to the characteristics of the micro enterprise itself, it can be observed that manufacturing and construction tend to have enterprises of a higher age (see Table II.5). In any of these 2 cases, more than 50% (if not 60%) have more than 5 years of existence. On the other hand, in trade and services, without being the largest part, an important fraction has one if not 2 years of age. This is a suggestion of higher relative rotation in these 2 activities in comparison to manufacture and construction. Regarding the size of the enterprises, even if it is true that there are differences in the proportion of the single-person enterprises (i.e. only the micro entrepreneur), in general, the proportion of the IMEs that have more than 2 workers is very low (beside the micro entrepreneur).

With respect to the characteristics of the workers in the IMEs (excluding the micro entrepreneurs), the most noticeable is that also in construction the manpower is concentrated in men, the average is between 26 and 29 years of age and the levels of schooling are not very different between sectors, with the highest concentration in secondary education (see Table II.5). Regarding remunerations, it is rare to see workers in constructions without a monetary wage, while in trade, on the contrary, it is very frequent that that is the case. Finally, the highest real wages are paid out in construction (with large working hours per week) and the lowest ones in manufacturing and trade, but in all of these cases they are below the minimum wage.

The analysis of the IMEs according to the level of productivity in each sector reinforces some of the findings already mentioned and gives us additional elements to identify variables associated with the differences in productivity. In Table II.6 the results of these comparisons are reported. The regularities that can be observed can be summarized in the following points. First, the women micro entrepreneurs are systematically overrepresented in the quartiles of less productivity, while the men micro entrepreneurs are so in the quartiles of highest productivity. This happens not only in construction where there are a lot less women as entrepreneurs. Secondly, the years of schooling are notably higher for the entrepreneurs whose enterprises present higher levels of productivity. The only exception could be construction where the difference is very small to be significant. Third, the proportion of the entrepreneurs that are household heads tends to be higher in the group of enterprises with high productivity in comparison with the ones with low productivity. Fourth and last characteristic of the entrepreneur, the work shifts per week in the high productivity group are shorter than in the low productivity one.

Regarding the characteristics of the enterprise itself that has been considered, it can be observed that, on the one hand, amongst the ones with the highest productivity those with 5 or more years of age are overrepresented, while amongst the ones with the least

productivity enterprises with 2 or less years of age have a bigger relative importance. On the other hand, a systematic behaviour in the number of workers cannot be found. Given that there are very few enterprises with more than 3 workers, the comparison practically limits itself to the participation of the single-person enterprises (only the entrepreneur without any worker) versus those that have 1 or 2 additional workers. Even in these cases a clear pattern where the higher productivity is associated with one of these 2 types of enterprises cannot be observed.

Regarding the characteristics of the workers, what can be observed is that the enterprises with the highest productivity tend to have more men than women amongst its workers. Second, the distribution of the workers according to their schooling levels shows a greater participation of workers with higher levels of education in the enterprises with higher productivity. Third, in the enterprises with higher productivity there is a lesser relative participation of workers that do not receive a monetary wage. Fourth, the differences in the real remunerations are very strong between the 2 quartiles of productivity.

Summing up the findings so far, it can be said that the differences in productivity have a gender dimension (both of the employer as well as of the employees) that could be associated in some measure with the differences in human capital, as reflected in the differences in the years and levels of schooling. It is noticeable, on the other hand, that the enterprises with more years of existence are overrepresented in the segment with the highest productivity. A possible interpretation is that the experience gained with the passing of time allows for gains of productivity. The other possibility is that precisely because they are productive they tend to have a longer life. This is something that requires more analysis. Finally it is noticeable how the differences in productivity are associated with the presence of paid workers and with the wage levels. These results suggest that the more productive ones are less "family production units" because they tend to recur to more conventional market labour relationships.

II.5. Why does the labor productivity in the urban informal sector decreases?

Considering the evolution of the value added between 2002 and 2007, it was observed that while the economy grew at an annual rate of 6.5%, the informal sector did at 5.2%. This probably implies that the formal sector grew at rates even higher than 6.5%. Moreover, the aggregate employment grew at an annual rate of 2.6% while employment in the informal sector did so at an annual rate of 6.0% suggesting that most likely the formal sector employment grew at rates below 2.6 %. In this scenario, the average productivity across the economy grew at an annual rate of 3.8% and in the informal sector shrank at an annual rate of -0.7%.[39] Again most likely the growth of productivity in the modern formal sector has been increased at rates higher than 3.8%.

How can we explain the poor performance of productivity in the informal sector during the boom that the whole economy experienced? Some points that may be taken into account in the construction off a complete answer are the following.

First, it has been noted before (in sections I and II of this document) and other works (see for instance Diaz, 2009 and Chacaltana, 2008) that employment always is growing, with a

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[39] In the analysis of each of the 4 sectors in the urban informal economy only one of them showed a positive growth rate but very small (0.4%), whereas in the other 3 were negative.

recession, stagnation or growth. Between 1997 and 2001 the economy grew less than 1% per year while between 2002 and 2007 grew at just over 6%. In these periods of employment grew 2.4% and 2.9% respectively. During the stagnation from 1997 to 2001 employment grew because more workers were absorbed by sectors with higher participation of informal or traditional activities: small and micro enterprises, low-skills self-employees, domestic workers and unpaid family workers. Instead those sectors withy lower presence of informality -like medium and large enterprises and high-skills self-employees- grew at negative rates. During the boom from 2002 to 2007, however, employment grew in all sectors –formal and informal- but grew more rapidly among medium and large enterprises (Chacaltana, 2008). Clearly, the informal sector is operating as a shelter or residual especially in times of recession and stagnation.

Second, differences in productivity between the informal sector and the economy as a whole are quite large. The scarce evidence of these differences (Chacaltana, 2008, Villarán (2007) and Sierra and Sato (2004)) suggests that the productivity gap between the micro and small enterprises and large ones are far greater than we have here shown between the informal sector and the overall economy. The comparison between the modern formal sector and the informal one within manufacturing industries analyzed earlier in this paper shows a gap of almost 18 times the size of the informal sector productivity.[40]

Part of the differences in productivity may be associated with the attributes of micro-entrepreneurs, enterprises and their workforce. We have seen that indicators of human capital (schooling and experience) show that micro-entrepreneurs and informal workers have lower levels of education when compared to similar occupational categories. The comparison of IMEs by productivity also showed the expected difference in human capital, also shows that the age of the enterprise –proxy of experience accumulated over time- is associated with higher levels of productivity. None of these variables showed substantial changes during the period 2002 to 2007 which implies that to these variables can not be attributed any contribution to the evolution of productivity. In contrast, the absence of changes in these variables to suggest that the total factor productivity has not been altered in a context in which the sector has continued to absorb labor.

Third, although no information was provided on the capital stock or the capital-labor ratio, the low value added per worker and per firm suggest that the possibilities of capital accumulation thru net investment must have been very small but non-existent. If this was so, the capital-labor ratio may have tended to decrease throughout the period of analysis and hence the productivity of labor should have declined as the results show indeed.

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[40] In section II of this report the value added per worker in manufacture in 2007 is around 25.310 US$ of 1994 (see Table II.2). At the exchange rate of 1994 this value represents 55.682 soles of 1994. Therefore manufacturing productivity in the modern sector is around 56 thousand soles while in the informal sector is 3 thousand soles (see Table III.4b). On average manufacturing productivity are 17 thousand soles of 1994.

Diagram N° III.1

Peru 2007: Informal entrepreneurs according to household surveys *(thousands)*

Occupied economically active
population
15,258

*Classified by occupational
category in the main job*

Employers
Total: **837** *(5,5%)*
Urban:566

Wage-earners
Total: **5,573** *(36,7%*
Urban:4,516

Self-employees
Total: **5,219** *(34,4%*
Urban:2,994

Unpaid family workers
Total: **3,038** *(20,0%)*
Urban:962

Domestic workers
Total: **504** *(3,3%)*
Urban:444

Others
Total: **88** *(0,5%)*
Urban:57

Entrepreneurs
6,056
(59% in urban areas: 3,560)

*entrepreneurs in the
secondary job*

Entrepreneurs
724
(67% in urban areas: 489)

*non-registered
entrepreneurs*

*non-registered
entrepreneurs*

**Urban Informal Enterprises in
non-farm activities**
2,993 entrepreneurs
3,246 firms
1,520 workers

Source: ENAHO 2007. Authors' calculations.

Table III.1

Peru 2002 - 2007: Characteristics of the Informal Micro-enterprises in non-farm activities[1]

	2002	2003	2004	2005	2006	2007	Average 2002 to 2007
Number of IME *(thousands)*	2,345	2,888	2,900	2,526	2,836	3,246	
Characteristics of the micro entrepreneurs							
Gender - female *(%)*	51.6	51.1	52.5	53.6	53.9	54.5	52.9
Age - average years	40	40	41	42	42	42	41
Schooling - average years	9.0	9.4	9.3	9.2	9.5	9.5	9.3
Relationship with the household head *(%)*							
He or she is the household head	46.9	43.6	43.4	44.4	44.6	42.6	44.2
Spouse	27.9	26.7	28.1	29.7	29.1	30.3	28.6
Sons and daughters	18.9	22.1	21.3	18.5	18.9	19.1	19.8
Other	6.3	7.7	7.2	7.5	7.3	8.0	7.3
Working hours per week	37	37	37	37	36	34	36
Characteristics of the micro enterprises							
Economic activity *(%)*							
Only production	15.9	14.9	16.1	15.7	17.2	16.5	16.0
Only trade	39.0	37.9	36.1	38.1	37.1	35.2	37.2
Only services	43.7	45.3	45.5	43.4	42.8	44.7	44.2
Production and trade	0.3	0.4	0.5	0.5	0.4	0.9	0.5
Others	1.2	1.5	1.8	2.3	2.5	2.7	2.0
Age of the microenterprise							
One year at most	24.2	25.1	26.6	25.8	26.3	32.2	26.7
More than 1 year to 2 years	14.1	12.9	11.6	12.7	11.9	11.4	12.4
More than 2 year to 3 years	8.7	9.1	8.8	8.9	9.3	9.1	9.0
More than 3 year to 4 years	6.4	6.9	6.8	5.9	5.2	5.3	6.1
More than 4 year to 5 years	6.6	6.5	6.5	6.8	6.2	6.2	6.5
More than 5 years	39.8	39.4	39.7	39.9	41.0	35.7	39.2
Enterprise size (# of workers excluding the employer)							
Without workers	77.5	73.3	71.7	70.4	71.1	70.4	72.4
1 and 2 workers	19.9	23.5	24.9	26.0	25.3	25.6	24.2
3 and 4 workers	2.3	2.7	3.0	3.0	3.3	3.4	2.9
5 an more workers	0.4	0.5	0.4	0.6	0.3	0.5	0.5
Characteristics of the workers (excluding the employer)							
Number of workers *(thousands)*	785	1,185	1,264	1,168	1,285	1,520	
Gender - males *(%)*	53.3	51.3	54.0	52.7	51.8	51.5	52.4
Age - average	28	27	27	28	27	28	27
Schooling *(%)*							
Primary or less	28	25	23	27	25	26	26
Secondary	59.0	60.5	61.7	57.4	58.3	56.4	58.9
Tertiary	12.7	14.5	15.7	15.1	16.3	18.0	15.4
Relationship with the employer: relative *(%)*	na	na	na	na	na	81.0	81.0
Working hours per week - average	26.8	28.4	28.7	26.3	26.7	24.9	27.0
Wages							
Workers without monetary paid	72.4	74.3	73.9	73.7	73.0	74.0	73.5
Monthly wage *(1994 soles)*	180	177	163	164	158	177	170

Notes

[1] Weighted figures using module 500 weights

Source: Questionnaire Enaho-04. Authors' calculations.

Figure III.1

Peru 2007: Characteristics of IME entrepreneurs and urban occupied EAP

Gender - males (%)

Age - average

Schooling (years)

Working hours per week
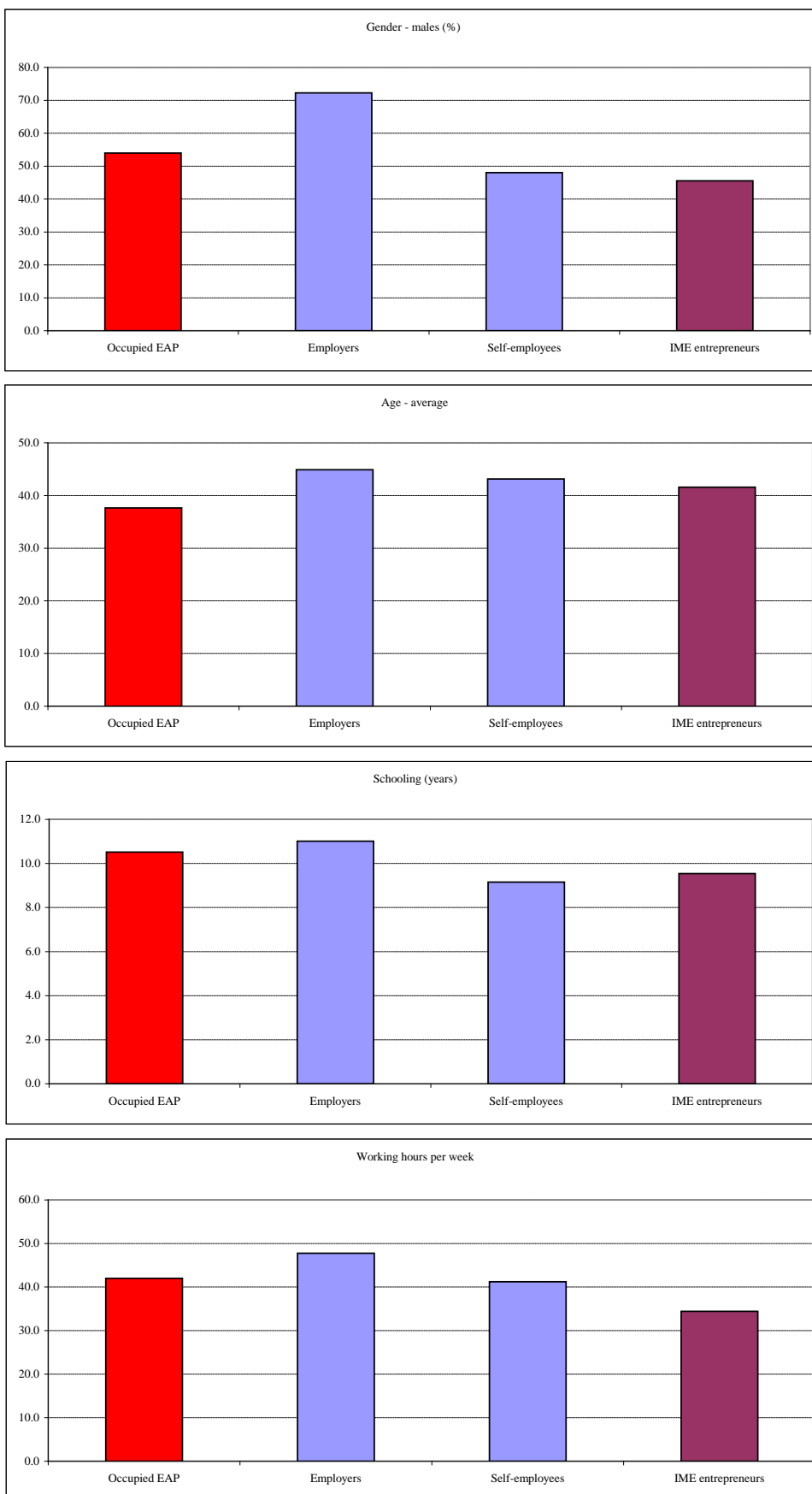
Source: ENAHO 2007. Authors' calculations

Figure III.2

Peru 2007: Characteristics of IME workers and urban occupied EAP

Gender - males (%)

Age - average

Secondary or less

Working hours per week

Monthly wage (1994 soles)
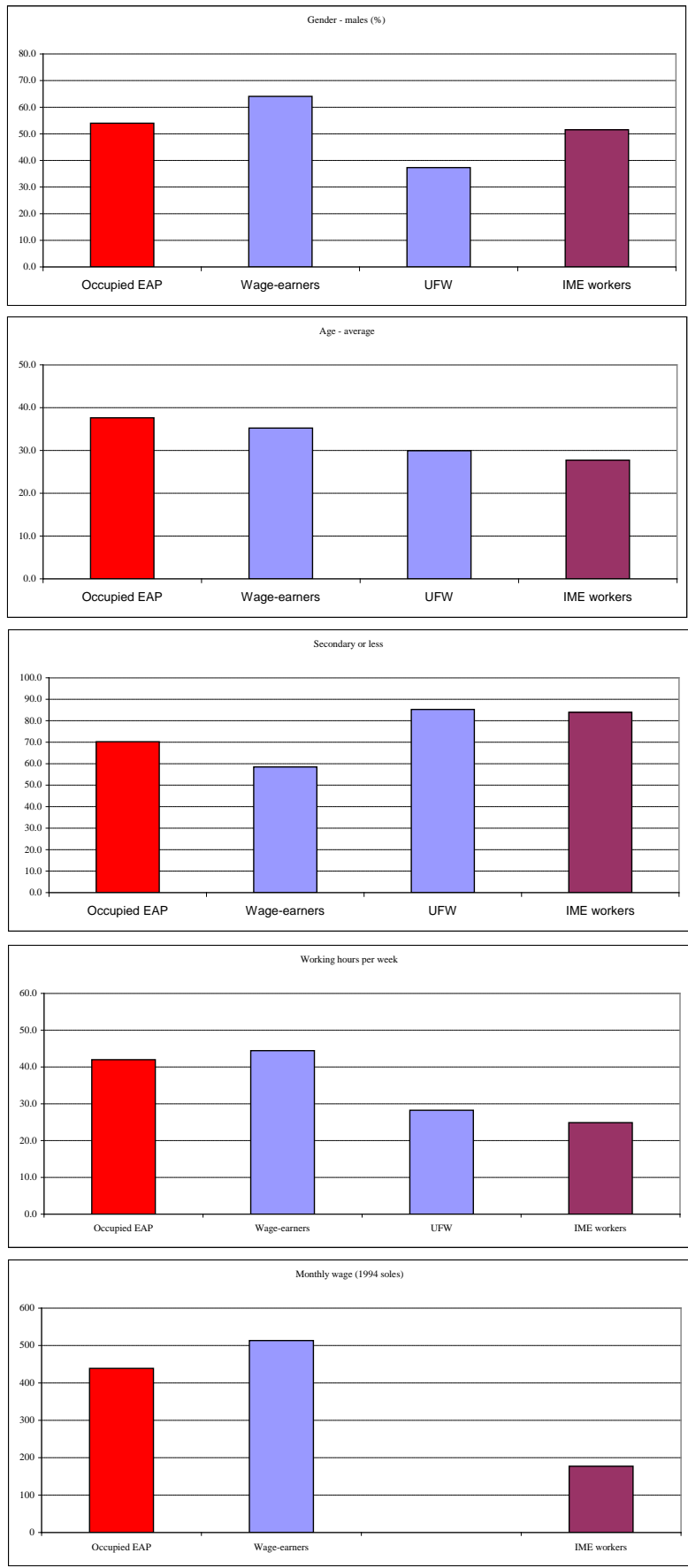
Source: ENAHO 2007. Authors' calculations

Table III.2

Peru 2002-2007: Enterprises, Gross product, Employment and Value added in the IME sector[1]

Economic sector	2002	2003	2004	2005	2006	2007	Distribution by sectors 2002 to 2007 (%)	Annual rate of growth 2002 to 2007 (%)
Number of Informal Micro Enterprises *(thousands)*								
Manufacture	256	276	305	289	350	383	11.3	8.4
Construction	116	155	161	112	140	155	5.1	6.0
Trade	913	1,091	1,044	961	1,051	1,141	37.6	4.6
Services	1,021	1,306	1,316	1,091	1,211	1,445	44.9	7.2
TOTAL	2,333	2,859	2,855	2,480	2,775	3,178	100.0	6.4
Gross Output *(1994 million soles)*								
Manufacture	1,537	1,939	1,813	1,968	2,483	2,005	8.3	5.5
Construction	655	753	805	583	680	857	3.0	5.5
Trade	11,055	13,233	11,910	11,938	12,808	13,824	52.6	4.6
Services	7,047	9,301	8,943	7,164	7,947	9,036	34.8	5.1
TOTAL	20,578	25,593	23,760	22,107	24,084	26,055	100.0	4.8
Number of workers including the employer *(thousands)*								
Manufacture	379	416	449	447	550	566	12.0	8.3
Construction	164	244	250	184	227	264	5.7	10.0
Trade	1,241	1,593	1,572	1,455	1,574	1,750	39.3	7.1
Services	1,277	1,713	1,749	1,455	1,589	1,929	41.5	8.6
TOTAL	3,103	4,029	4,079	3,608	3,974	4,603	100.0	8.2
Numbrer of standardized workers including employer *(40 hours per week; thousands)*								
Manufacture	285	321	351	345	404	395	10.4	6.7
Construction	161	226	247	184	219	254	6.4	9.5
Trade	1,210	1,463	1,434	1,310	1,371	1,422	40.6	3.3
Services	1,086	1,505	1,536	1,213	1,366	1,582	41.0	7.8
TOTAL	2,789	3,572	3,619	3,113	3,392	3,732	100.0	6.0
Value Added *(1994 million soles)*								
Manufacture	865	1,059	1,002	1,049	1,154	1,165	10.1	6.1
Construction	618	729	791	560	657	839	6.8	6.3
Trade	3,224	3,774	3,365	3,423	3,200	3,870	33.6	3.7
Services	4,235	5,933	5,360	3,959	4,408	5,658	47.6	6.0
TOTAL	9,150	11,698	10,677	9,239	9,491	11,792	100.0	5.2

Notes:

[1] Weighted figures using module 500 weights

Source: Questionnaire Enaho.04. Authors' calculations.

Table III.3

Peru 2002-2007: Ratio of standardized to unstandardized workers, gross output and value added per firm, and value added as a percentage of gross output[1]

	2002	2003	2004	2005	2006	2007	Average 2002 to 2007
Standarized to unstandarized workers ratio							
Manufacture	0.75	0.77	0.78	0.77	0.74	0.70	0.75
Construction	0.99	0.92	0.99	1.00	0.97	0.96	0.97
Trade	0.98	0.92	0.91	0.90	0.87	0.81	0.89
Services	0.85	0.88	0.88	0.83	0.86	0.82	0.85
TOTAL	0.90	0.89	0.89	0.86	0.85	0.81	0.86
Gross Output per firm *(1994 soles)*							
Manufacture	6,003	7,024	5,940	6,811	7,104	5,241	6,320
Construction	5,647	4,846	5,006	5,205	4,870	5,531	5,166
Trade	12,115	12,131	11,408	12,421	12,181	12,116	12,058
Services	6,899	7,121	6,797	6,565	6,563	6,252	6,689
TOTAL	8,821	8,953	8,323	8,915	8,679	8,199	8,628
Value Added per firm *(1994 soles)*							
Manufacture	3,377	3,836	3,283	3,632	3,301	3,046	3,387
Construction	5,330	4,693	4,915	4,999	4,707	5,416	5,000
Trade	3,533	3,459	3,223	3,561	3,043	3,391	3,363
Services	4,146	4,542	4,074	3,628	3,640	3,915	3,999
TOTAL	3,922	4,092	3,740	3,726	3,420	3,710	3,765
Value Added as a percentage of Gross Product *(%)*							
Manufacture	56.3	54.6	55.3	53.3	46.5	58.1	53.6
Construction	94.4	96.8	98.2	96.1	96.7	97.9	96.8
Trade	29.2	28.5	28.3	28.7	25.0	28.0	27.9
Services	60.1	63.8	59.9	55.3	55.5	62.6	59.8
TOTAL	44.5	45.7	44.9	41.8	39.4	45.3	43.6

Notes:

[1] Weighted figures using module 500 weights

Source: Questionnaire Enaho.04. Authors' calculations.

Table III.4a

Peru 2002-2007: Employment and Value added in the whole economy and the participation of the IME sector[1]

	2002	2003	2004	2005	2006	2007	Annual rate of growth 2002 to 2007 *(%)*
Number of standardized workers[2] in the whole economy *(thousands)*							
Manufacture	1,244	1,234	1,217	1,194	1,364	1,615	5.4
Construction	477	508	442	414	506	612	5.1
Trade	2,535	2,677	2,432	2,412	2,605	2,760	1.7
Services	4,319	4,653	4,192	4,154	4,718	5,228	3.9
Total	**12,650**	**13,409**	**12,595**	**12,412**	**13,575**	**14,384**	2.6
% of the labour force in the IME sector							
Manufacture	22.9	26.0	28.9	28.9	29.7	24.5	
Construction	33.8	44.4	55.9	44.3	43.3	41.5	
Trade	47.7	54.6	59.0	54.3	52.6	51.5	
Services	25.1	32.3	36.7	29.2	29.0	30.3	
Total	**22.1**	**26.6**	**28.7**	**25.1**	**25.0**	**25.9**	
Value Added in the whole economy *(1994 thousand soles)*							
Manufacture	19,147	19,830	21,300	22,887	24,607	27,265	7.3
Construction	6,136	6,413	6,712	7,276	8,350	9,737	9.7
Trade	18,013	18,453	19,604	20,821	23,248	25,495	7.2
Services	51,776	54,163	56,552	60,124	64,308	70,438	6.3
Total	**115,323**	**119,828**	**125,608**	**133,961**	**144,547**	**157,733**	6.5
% of the value added in the IME sector							
Manufacture	4.5	5.3	4.7	4.6	4.7	4.3	
Construction	10.1	11.4	11.8	7.7	7.9	8.6	
Trade	17.9	20.5	17.2	16.4	13.8	15.2	
Services	8.2	11.0	9.5	6.6	6.9	8.0	
Total	**7.9**	**9.8**	**8.5**	**6.9**	**6.6**	**7.5**	

Notes:

[1] Weighted figures using module 500 weights. IME figures excludes enterprises that combine two or more economic activities.

[2] 40 hours per week.

Source: Questionnaire Enaho.04, ENAHO module 500 and national accounts from INEI. Authors' calculations.

Table III.4b

Peru 2002-2007: Value Added per standardizred worker in the whole economy and IME sector[1]

	2002	2003	2004	2005	2006	2007	Average 2002 to 2007
Value Added per standardized worker in the IME sector *(1994 soles)*							
Manufacture	3,032	3,297	2,853	3,039	2,853	2,949	3,004
Construction	3,832	3,230	3,200	3,046	2,996	3,307	3,269
Trade	2,664	2,579	2,346	2,612	2,334	2,721	2,543
Services	3,899	3,941	3,489	3,264	3,226	3,577	3,566
Total	**3,280**	**3,275**	**2,950**	**2,968**	**2,798**	**3,159**	**3,072**
Value Added per standardized worker in th whole economy *(1994 soles)*							
Manufacture	15,394	16,073	17,501	19,170	18,045	16,884	17,178
Construction	12,857	12,623	15,177	17,559	16,492	15,906	15,102
Trade	7,105	6,892	8,061	8,632	8,924	9,237	8,142
Services	11,987	11,640	13,491	14,475	13,632	13,473	13,116
Total	**9,116**	**8,936**	**9,973**	**10,793**	**10,648**	**10,966**	**10,072**
Ratio of the value added per worker in the economy and in the IME sector *(%)*							
Manufacture	19.7	20.5	16.3	15.9	15.8	17.5	17.5
Construction	29.8	25.6	21.1	17.3	18.2	20.8	21.6
Trade	37.5	37.4	29.1	30.3	26.2	29.5	31.2
Services	32.5	33.9	25.9	22.5	23.7	26.5	27.2
Total	**36.0**	**36.6**	**29.6**	**27.5**	**26.3**	**28.8**	**30.5**

Notes:

[1] Weighted figures using module 500 weights. IME figures excludes enterprises that combine two or more economic activities.

[2] 40 hours per week.

Source: Questionnaire Enaho.04, ENAHO module 500 and national accounts from INEI. Authors' calculations.

Figure III.3

Peru 2002 to 2007: Participation of Urban IME sector in employment and value added by economic activity(%)
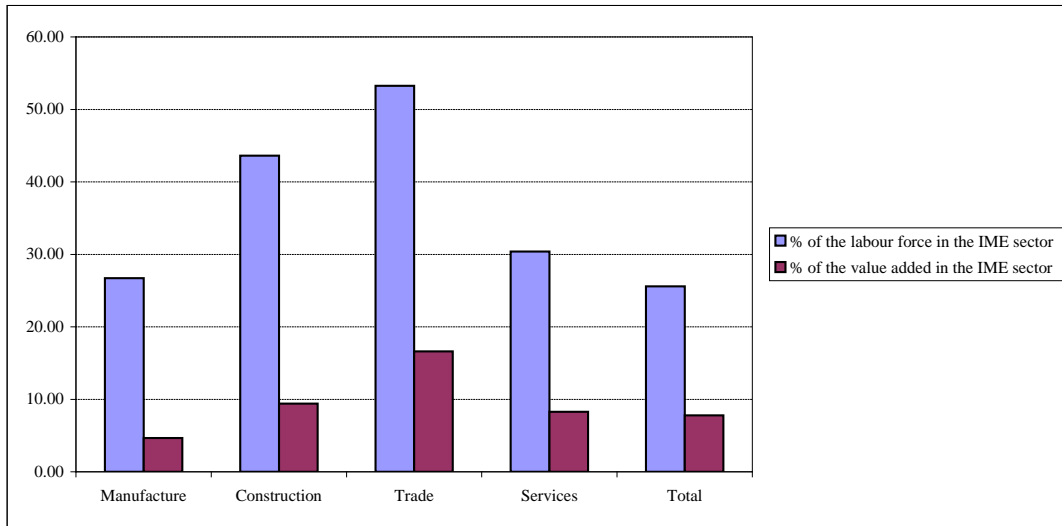
Source: ENAHO 2002 to 2007. Authors' calculations

Figure III.4

Peru 2002 to 2007: Value added per standardized worker by economic activity (1994 soles)

Source: ENAHO 2002 to 2007. Authors' calculations

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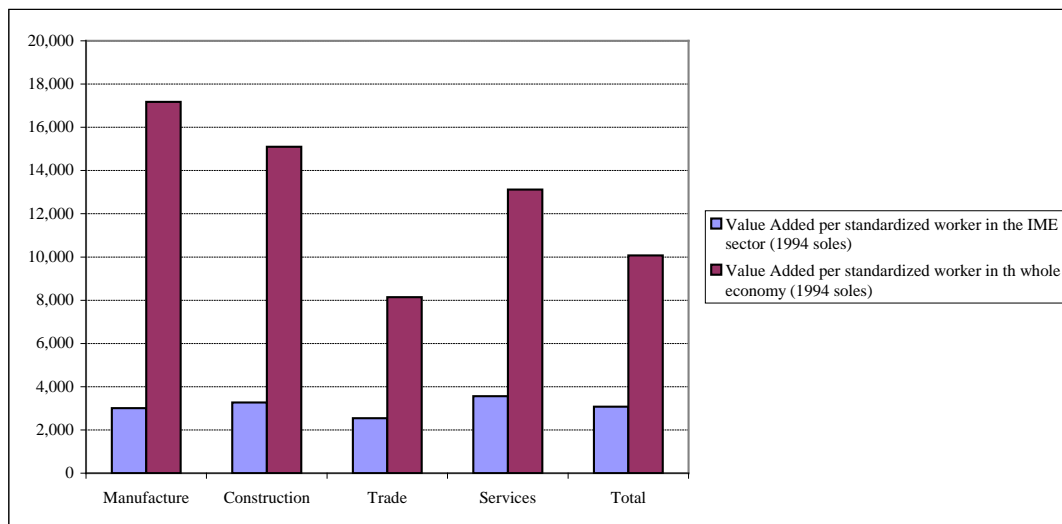
Figure III.5

Peru 2002 to 2007: Annual growth rates of employment in the urban IME sector and the whole economy by economic activitiy (%)
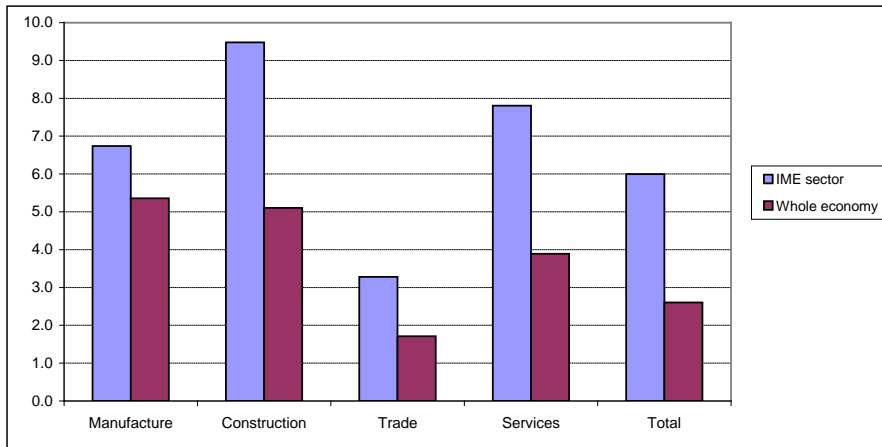
Source: ENAHO 2002 to 2007. Authors' calculations

Figure III.6

Peru 2002 to 2007: Annual growth rates of value added in the urban IME sector and the whole economy by economic activitiy (%)
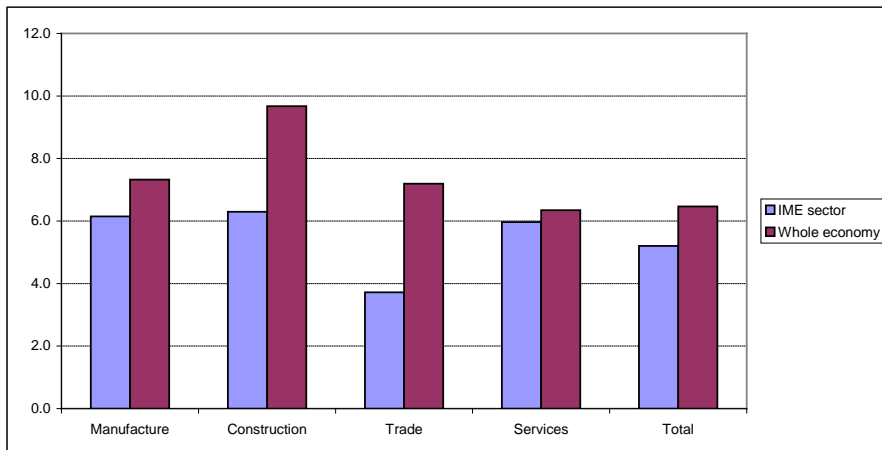
Source: ENAHO 2002 to 2007. Authors' calculations

Figure III.7

Peru 2002 to 2007: Annual growth rates of value added per standardirez worker in the urban IME sector and the whole economy by economic activitiy (%)
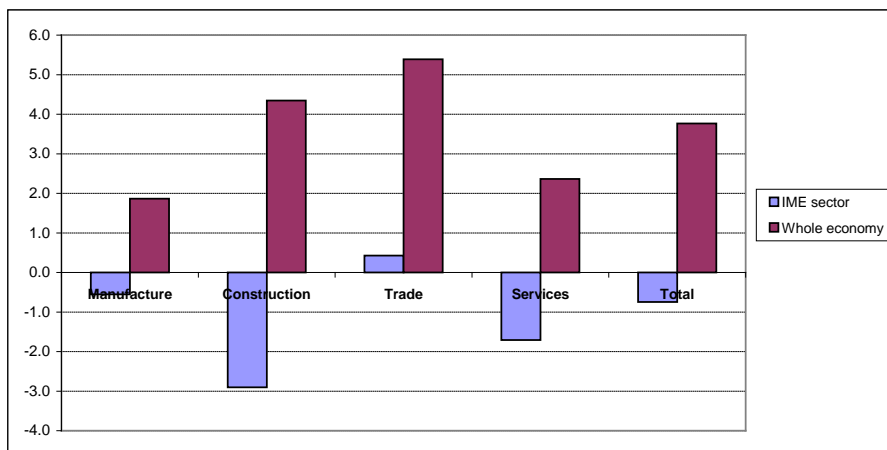
Source: ENAHO 2002 to 2007. Authors' calculations

Figure II.8

Average annual growth rate contribution in Value Added per full-time worker in the informal sector, 2002-2007

	Manufacture	Construction	Trade	Services	Total
Between Effect	0.125	0.227	-0.854	0.854	0.353
Within-Effect	-0.079	-0.197	0.029	-1.019	-1.268
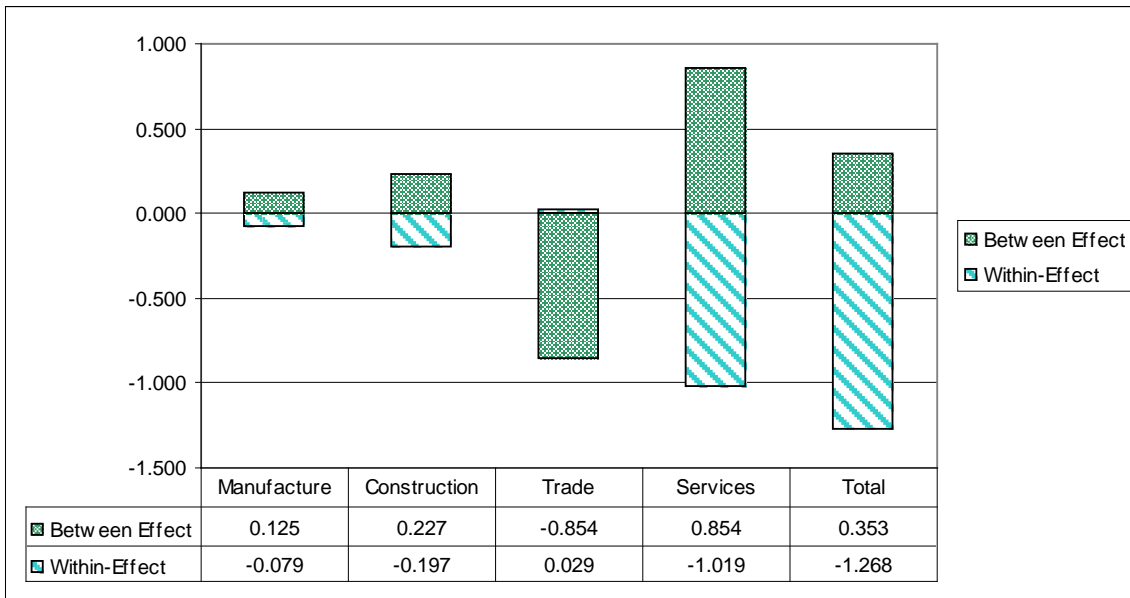
Table III.5

Peru 2002 - 2007: Characteristics of the Informal Micro-enterprises by Economic Sector[1]

	Manu-facture	Construc-tion	Trade	Services
Characteristics of the micro entrepreneurs				
Gender - female *(%)*	56.5	0.1	71.5	43.7
Age - average years	43.4	42.3	41.6	39.7
Schooling - average years	8.0	9.6	8.4	9.6
Relationship with the household head *(%)*				
He or she is the household head	48.3	70.5	36.9	45.4
Spouse	30.2	2.3	41.0	23.3
Sons and daughters	15.5	20.0	15.7	23.5
Other	6.0	7.3	6.4	7.7
Working hours per week	28.1	34.4	37.6	34.7
Characteristics of the micro enterprises				
Age of the microenterprise				
One year at most	19.9	17.5	28.7	28.9
More than 1 year to 2 years	8.6	6.4	13.1	13.3
More than 2 year to 3 years	7.7	5.6	9.6	9.5
More than 3 year to 4 years	4.8	3.8	5.9	6.7
More than 4 year to 5 years	6.3	6.3	6.8	6.4
More than 5 years	52.8	60.4	36.0	35.1
Enterprise size (# of workers excluding the employer)				
Without workers	70.6	66.9	64.3	77.7
1 and 2 workers	24.5	26.6	31.9	19.5
3 and 4 workers	4.0	4.9	3.4	2.4
5 an more workers	0.9	1.5	0.3	0.4
Characteristics of the workers (excluding the employer)				
Gender - males *(%)*	53.3	98.2	47.8	48.3
Age - average	27.7	29.2	27.0	26.6
Schooling *(%)*				
Without schooling	3.7	1.1	2.5	2.4
Pre-school and primary	28.5	33.6	28.1	22.7
Secondary	55.9	59.7	54.8	58.1
Tertiary	11.9	5.6	14.6	16.8
Relationship with the employer: relative *(%)*	na	na	na	na
Working hours per week - average	25.1	42.5	23.0	25.9
Wages				
Workers without monetary paid	69.1	7.3	90.4	71.1
Monthly wage *(1994 soles)*	138	216	131	160

Notes

[1] Weighted figures using module 500 weights

Source: Questionnaire Enaho-04. Authors' calculations.

Table III.6

Peru 2002 - 2007: Characteristics of the Informal Micro-enterprises by value added per worker level and economic activities[1]

	Manufacture		Construction		Trade		Services	
	Low	High	Low	High	Low	High	Low	High
Characteristics of the micro entrepreneurs								
Gender - female *(%)*	81.7	36.9	0.2	0.4	76.8	64.3	52.7	35.6
Age - average years	43.4	42.7	41.8	41.8	44.4	39.0	39.7	40.3
Schooling - average years	5.2	10.3	9.1	10.5	6.7	10.3	8.1	11.1
Relationship with the household head *(%)*								
He or she is the household head	30.3	61.1	62.8	66.8	33.0	39.1	38.6	51.6
Spouse	41.7	18.8	2.3	2.7	45.4	34.3	27.8	18.6
Sons and daughters	19.5	15.3	24.4	25.7	14.7	19.5	25.5	21.6
Other	8.5	4.7	10.5	4.8	6.9	7.1	8.0	8.2
Working hours per week	26.0	26.1	35.9	23.5	44.7	24.5	32.5	28.8
Characteristics of the micro enterprises								
Age of the microenterprise								
One year at most	21.4	20.4	28.3	13.1	33.8	28.1	35.7	24.6
More than 1 year to 2 years	7.1	8.0	5.8	6.1	14.2	12.5	12.3	13.7
More than 2 year to 3 years	8.5	6.6	6.8	6.3	10.4	8.0	9.6	9.7
More than 3 year to 4 years	4.4	4.4	3.9	4.2	5.4	5.6	4.8	6.7
More than 4 year to 5 years	6.4	6.1	6.8	6.7	5.9	6.5	6.0	6.9
More than 5 years	52.1	54.6	48.4	63.6	30.4	39.1	31.4	38.4
Enterprise size (# of workers excluding the employer)								
Without workers	69.6	72.1	63.0	70.0	65.8	65.2	78.6	78.7
1 and 2 workers	26.1	22.8	30.9	22.7	30.8	31.2	18.8	19.0
3 and 4 workers	3.6	3.9	5.6	4.5	3.1	3.2	2.4	1.8
5 an more workers	0.6	1.1	0.4	2.8	0.3	0.5	0.2	0.4
Characteristics of the workers (excluding the employer)								
Gender - males *(%)*	40.8	62.9	97.0	99.0	45.2	52.2	42.4	57.3
Age - average	27.7	28.0	26.5	30.7	26.9	28.4	25.9	27.7
Schooling *(%)*								
Primary or less	41.6	25.1	30.6	23.3	37.0	29.0	40.0	18.9
Secondary	49.0	63.6	62.4	70.3	50.9	54.9	48.2	60.4
Tertiary	9.5	11.3	7.0	6.4	12.1	16.2	11.8	20.7
Working hours per week - average	21.8	24.4	41.3	38.6	22.9	21.6	22.0	28.0
Wages								
Workers without monetary paid	88.4	55.6	16.6	3.3	98.2	77.5	85.5	46.9
Monthly wage *(1994 soles)*	50	178	100	318	63	144	67	206

Notes

[1] Weighted figures using module 500 weights

Source: Questionnaire Enaho-04. Authors' calculations.

IV. CONCLUSIONS AND FINAL REMARKS

This paper has reported a set of new evidences at the macro-sectoral and micro levels on the dynamics of labor productivity in Peru for periods 1997-2007 and 2002-2007 respectively.

At the macro level, and in contrast to previous results (e.g., Timmer and de Vries, 2007 and 2007), it is found that in both periods of 1997-2001 and 2002-2007, labor productivity changes in Peruvian economy seem to be primarily explained by reallocation of employment between sectors rather than changes in labor productivity within sectors. On the other hand, labor productivity improvement in the manufacturing sector in the booming period 2002-2007 has been more important than labor productivity growth in some low labor-productivity services sectors (e.g., household and education services and hotels and restaurants) and the agriculture sector. Conversely, in the recession period 1997-2001, the decline of labor productivity in some low-productivity services sectors and the agriculture sector (when difference between marginal and average labor productivity is taken into account) have been more important to explain the decrease of the labor productivity of the economy than the decrease of labor-productivity in the manufacturing sector.

At the micro level, the data from the informal micro-enterprises in urban areas brings interesting results. The entrepreneurial activities are highly extended in Peru. Almost half of the families at national level have some member that is an employer or is self-employed, and they represent around of 44% of the EAP actually occupied in the country in 2007. On the other hand, the informal economic activities are highly extended. Solely considering urban areas the informal employers represent almost 45% of the total of the employers in these areas, and informal self-employed represent approximately 80% of urban self-employed. These percentages will be higher if one additionally considers farm activities of the rural areas.

The urban IMEs are about 3.0 million and absorb approximately 4.6 million people that standardized in working weeks of 40 hours amount to 3.7 million. The greater share of those enterprises dedicate themselves to activities in the sectors of services and trade; manufacturing and construction are also present but in a lesser proportion. Total employment (including employers and employees) associated with the urban IMEs represents 20% of the EAP occupied nationally and 31% of the urban EAP. In terms of the value added 7.5% comes from urban IME with respect to the national value added in those economic activities conducted in urban areas.

On average, value added per worker in the economy as a whole was 10,072 constant soles of 1994, while it was 3,072 in the sector of the IMEs, that is, the average product in the sector of the IMEs is less than one third (30.5%) of the level in the economy as a whole. In terms of the evolution of productivity across time, it has been found that both the whole of the IMEs as well as each one of the 4 sectors analyzed, productivity has decreases at average rates of -0.7%. In the economy as a whole, however, productivity grew at annual rates of 3.8%. This implies that productivity in the formal sector must have grown at rates that are even higher.

The exploratory and descriptive analysis of the differences in value added per worker shows some evidence and opens paths for a more detailed and deeper analysis. Three sets

of characteristics were analyzed: characteristics of the micro entrepreneurs (related to demography, education and labor), characteristics of the micro enterprises (age and size), and characteristics of the employers (when they exist).

The comparison between the 4 sectors, that represent different levels of productivity, gave us the following findings. In the sectors with higher productivity (i.e. services and construction according the average from 2002 to 2007), firstly, there is a stronger presence of men amongst the employers as well as amongst the employees; secondly, the employers tender to have higher schooling and in some measure also the employees; thirdly, the employees tend to work in somewhat longer shifts; and fourthly, the wages tend to be higher.

On the other hand, from the comparison of the higher and lower strata of productivity within each of the 4 sectors, much clearer findings appear. In the strata of the IMEs that belong to the quartile with higher productivity, it can be found that: (i) men are overrepresented both as employers and as employees, (ii) the years of schooling of the employers and employees is higher, (iii) the employer is also the head of household, (iv) the hours of work are longer both for the employer as well as for the employee, (v) there are more enterprises with a longer age, (vi) the presence of employees that receive no remuneration is less frequent, (vii) the monetary salaries, amongst those that do receive them, are higher.

It is not surprising that human capital (i.e., the years or levels of schooling) is associated with higher levels of productivity. What does cause surprise is that there is a systematic gender relationship. This can be due, at least in part, to the fact that gender and education are associated one with the other. It is possible that is women that have lower levels of schooling. The greater relative presence of enterprises with a higher age amongst the most productive corresponds to the fact that enterprises with less years of existence amongst those with lower productivity have more relative importance. This suggests that the newest enterprises or the ones recently created are less productive than the average of already existing enterprises. Finally, it is noticeable that the differences in productivity are associated to the relative presence of salaried workers, on the one hand, and to the level of the wages. Although we do not have direct evidence of the case, what could be happening is that the low levels of productivity make the payment of wages non-viable and, in consequence, the only way to produce, employing additional workers, is utilizing the labor force of the own family under the form of family workers without remuneration.

The macro and micro evidence presented in this paper lead to two plausible conclusions for economic policy. The first one comes from the fact the cyclical behavior of Peruvian GDP per capita in the last 10 years (which is also true in the last 50 years). As it was shown in this paper, this cyclical behavior seems to be associated to the Peruvian productive structure existent in the last 50 years and to the sectoral differences in the dynamic of labor productivity among sectors which under an absence of continuous and sustainable positive changes in total factor productivity of the sectors produce the cyclical behavior of the GDP per capita. In consequence, regardless of the short run internal or external shocks that Peruvian economy is facing o may face in the future what is needed are long run structural reforms oriented to change the productive structure that produces continuous and sustainable total factor productivity growth in all the sectors of the

economy[41]. Concentration upon short run tailored economic policies to face external o internal crisis would not change the cyclical behavior of the economy. Second, these structural long run policies need to incorporate into the productive structure the informal and low productive agriculture sectors which contribute a large share of the total employment in Peru, have low labor productivity, real wages and wherein most people in these sectors lives in poverty conditions. These reforms need to go beyond issues on legal status of the informal sector or granting land property rights[42].

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[41] Guidelines of these reforms are reported in the Barcelona Development Agenda (2004), World Bank (2005) and Serra and Stiglitz (2008).

[42] A recent book of Maloney *et al* (2007) deals with this kinds of reforms. In their book's overview they postulate: *"Achieving significant reductions in present informality levels will require, first and foremost, actions to increase the aggregate productivity in the economy. A more enabling investment climate will permit formal firms to expand and pay higher wages. Raising human capital levels, especially for the poor, will permit more workers to find remunerative jobs in a more dynamic formal sector. Without such improvements in aggregate productivity, we will continue to find a very large number of micro-firms, characterized by high turnover, weak growth prospects, and low productivity, that would see little benefit in engaging with formal institutions"*.

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APPENDIX TABLES

Table No A1

GDP Per Worker (2000 US $) for A Sample of Upper and Middle Income Latin American, Caribbean and Asian Countries, 2002-2007

Countries	2007	Rate of Growth, 2002-07
1. South America		
Peru	5430	3.3
Brazil	8282	1.2
Argentina	20248	3.6
Colombia	5943	3.4
Chile	14557	2.5
2. Other LACs		
Mexico	15529	1.0
Costa Rica	11455	3.4
Jamaica	6966	0.3
Dominican Republic	6671	
3. Asian Countries		
People Republic of China	3039	9.7
Philippines	2892	3.3
Thailand	4727	4.6

Source: WDI (2009). Author's work.

Table N° A11
Value added per full-time workers OLS estimation

Independent variables	Coefficient	t	P>|t|
Age of the enterprise (years)	0.1973	12.63	0.00
Gender of the entrepreneur (0=male,1=female)	-0.7182	-23.43	0.00
Relationship with the household head (1=HH, 0=otherwise)	0.2303	7.82	0.00
Age of the entrepreneur (years)	0.0503	11.09	0.00
(Age of the entrepreneur)2	-0.0007	-13.49	0.00
Schooling years of the entrepreneur	0.0478	15.35	0.00
Working hours of the entrepreneur	-0.0079	-12.66	0.00
Number of full-time workers	-0.2332	-15.89	0.00
Ln(capital stock per worker)	0.0903	18.45	0.00
Manufacture (=1, 0=otherwise)	-0.5617	-14.79	0.00
Construction (=1, 0=otherwise)	0.2001	3.28	0.00
Trade (=1,0=otherwise)	-0.2249	-7.79	0.00
Year 2004	-0.0327	-0.99	0.32
Year 2005	0.0104	0.31	0.76
Year 2006	0.1230	3.76	0.00
Constant	4.5497	44.13	0.00
Adjusted R^2		0.3691	
F(15,9922)		388.55	
Number of observations		9938	

Source: Authors estimation using the ENAHO 2003 to 2006.

Appendix of Formulas

A. Output, Employment and Labor Productivity Sectoral Decomposition

This section is based on the methodology described in Timmer and de Vries (2008 and 2007) and Timmer and Ark (2003). Let Xit be the variable X to be analyzed from sector 'i' in period t. Three Xit variables will be analyzed: Lit, VAit and LPit. Wherein Lit is the employment in sector 'i' at period t, VAit is the real value added of sector 'i' and Pit=VAit/Lit is the labor productivity of sector 'i' at period t. Then:

[I.1] $X_t = \sum_{i=1}^{N} \omega_{it}.X_{it}$; $0 \leq \omega_{it} \leq 1$; $\sum_{i=1}^{N} \omega_{it} = 1$; for Lit and VAit, $\omega_{it}=1$; and for LPit, $\omega_{it}=L_{it}/L_t$

[I.2] $\Delta_k X_{it} = X_{it} - X_{i(t-k)}$; $X_{di(t-k)} = 0.5*(X_{it}+X_{i(t-k)})$ and $g_k X_{it} = [\Delta_k X_{it}/(X_{di(t-k)})]/k$

   gkXit is the growth rate of Xit.

[I.3] $\Delta_k X_t = (\sum \omega_{it}.X_{it} - \sum \omega_{i(t-k)}.X_{i(t-k)}) + (\sum \omega_{it}.X_{i(t-k)} - \sum \omega_{it}.X_{i(t-k)})$;

   $= (\sum \omega_{it}.X_{it} - \sum \omega_{i(t-k)}.X_{i(t-k)}) + (\sum \omega_{i(t-k)}.X_{it} - \sum \omega_{i(t-k)}.X_{it})$

[I.4] $\Delta_k X_t = \sum (X_{it}-X_{i(t-k)}).\omega_{it} + \sum (\omega_{it}-\omega_{i(t-k)}).X_{i(t-k)}$;

   $= \sum (X_{it}-X_{i(t-k)}).\omega_{i(t-k)} + \sum (\omega_{it}-\omega_{i(t-k)}).X_{it}$;

[I.5] $\Delta_k X_t = \sum (X_{it}-X_{i(t-k)}).\omega_{ia} + \sum (\omega_{it}-\omega_{i(t-k)}).X_{ia}$;

   Where $\omega_{iat} = [\omega_{it}+\omega_{i(t-k)}]*0.5$;
   $X_{iat} = [X_{it}+X_{i(t-k)}]*0.5$.

[I.6] $\Delta_k X_t = \sum (C_{wit}+ C_{bit})$; $C_{wit}=(X_{it}-X_{i(t-k)}).\omega_{ia}$; $C_{bit}= (\omega_{it}-\omega_{i(t-k)}).X_{ia}$;

In rate of growth I.6 is transformed in:

[I.6]' $g_k X_t = \sum (C_{wit}/X_{iat}).(X_{iat}/X_{at}) + \sum (C_{bit}/X_{iat}).(X_{ia}/X_a)$;

Equation [I.6] (or [I.6]') decompose the change of Xt (i.e., ΔkXt) in two components the within sectoral change (the first term on the right-hand side which we call the ''within-effect'', also known as ''intra-effect'') and the effects of changes in the sectoral allocation of labor (the second term, which we call the 'between-effect'', also known as the ''shift-effect'')[43].

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[43] A number of criticisms can be raised against this type of decomposition when Xit is labor productivity. Firstly, this decomposition is based upon a labor productivity model and as such non-labor inputs are ignored. Ideally, sectoral productivity measures should treat all inputs symmetrically and take into the inputs of capital, materials and service inputs along with labor. Unfortunately, lack of capital data at industry level precludes this type of analysis for a wide range of countries. Secondly, the decomposition into shift effects and intra sectoral effects depends crucially on the selected price base year of the output series. When price developments vary across sectors decomposition based on, for example, 1985 prices will differ from a decomposition based on 1995 prices. Especially for developing countries, these differences can be large. During the process of industrial development, manufacturing prices generally decline rapidly relative to prices in the traditional part of the economy. Hence given an increasing labor share in manufacturing, the shift effect will be bigger with earlier base years than with later. This problem can be remedied by applying the decomposition presented in (I.6) to shorter time intervals and/or rebasing sectoral series each period or even annually. The third and fourth criticism, which dealt with the issue of surplus labor and the distribution of shift effects across sectors respectively, can be also taken into account by

An adjusted methodology to estimate the contribution of each sector to the changes of labor productivity (i.e., when Xt=LPt) is reported in Timmer and Ark (2003). These authors propose two adjustments. The first adjustment assumes that marginal and average in the agriculture sector are identical and the second assumes that marginal labor productivity is lower than average productivity in the agriculture sector. In both cases, sectors are divided in two sets. The first set of 'K' expanding sectors defined as sectors which their labor shares increases between period t and t-k, and the second set 'J' of shrinking sectors defined as sectors which theirs labor shares decrease between two time periods. Since the agriculture sector (i.e, when i=1) in the development process may decline its employment share then its respective shift effect will always will be negative. Since it is not clear how to interpret this negative shift effect from an analytical perspective, Timmer and Ark (2003) suggested that all shift (or between industry) effects from sectors that experienced shrinking labor shares be reallocated to sectors that expanded their share in total labor. The implication of this reallocation of sectors is that the sectors that grow get credited for the shift effect. This 'adjusted' shift effect is positive when an expanding sector's productivity is higher than the average productivity of the shrinking sectors. But it can also be negative when the expanding sector's productivity is lower than the average productivity of the shrinking sectors. The adjusted 'shift effect' to allocated to the expanding sectors will depend upon the difference between average and marginal labor productivity. Let ε be the ratio between marginal to average labor productivity, which Timmer and Ark (2003) estimate is 0.410 for Peru. Then:

[I.7] $X^*_{1(t-k)} = [VA_{1(t-k)} - \varepsilon.X_{1(t-k)}.(L_{1(t-k)} - L_{1t})]/L_{1t}$, when $L_{1(t-k)} - L_{1t} > 0$ and

$X^*_{1(t-k)} = X_{1(t-k)}$;   otherwise or when $\varepsilon = 1$

For the set J of shrinking sectors (which may or may not include the agriculture sector), the shift effects components are zero, i.e, $Cb_i = 0$. If $\varepsilon < 1$ then the shift effect is also zero for the agriculture sector. The within effect for the agriculture for $\varepsilon \leq 1$ is:

[I.8] $Cw_{1t} = (X_{1t} - X^*_{1(t-k)}).\omega_1 a$; wherein $X^*_{1(t-k)} = X_{1(t-k)}$ if $\varepsilon = 1$.

The within effect for the rest of (shrinking and expanding) sectors (i.e, for i=2,…N) is the same as the unadjusted case using equation. That is:

[I.9] $Cw_{it} = (X_{it} - X_{i(t-k)}).\omega_i a$;

The adjusted shift effects for the set K of expanding sectors are given by the following equations:

[I.10] $Cb_i = [\omega_{it} - \omega_{i(t-k)}].(X_{ia} - Xa_J)$; $Xa_J = [\sum_{i \in J}(\omega_{it} - \omega_{i(t-k)}).X_{ia}]/[\sum_{i \in J}(\omega_{it} - \omega_{i(t-k)})]$;

for $\forall i \in K$ and $[L_{1t} - L_1(t-k)] \geq 0$;

$Cb_i = [\omega_{it} - \omega_{i(t-k)}].(X_{ia} - Xa_J) + (\omega_{it} - \omega_{i(t-k)}).(X^*_{1t} - X_{1(t-k)}).\omega_1 a/[\sum_{i \in K}(\omega_{it} - \omega_{i(t-k)})]$;

for $\forall i \in K$ and $[L_1 t - L_1(t-k)] < 0$;

Appendix of Labor Force Data of Peru, 1997-2007

Classification of the Employed Economic Active Population (EAP) by 45 Sectors of Economic Activity

The Peruvian Institute for Statistics (INEI in Spanish) uses a 45 economic sectors classification to report the GDP. This annual series is available on the website of the INEI from 1991 until 2007.[44] The economic activities are classified in 45 sectors using the 4-digit ISIC Rev. 3 in most cases. However, in some others INEI uses a larger breakdown including another 2 digits.

The National Household Survey (ENAHO in Spanish) registers the economic activity of the labor force which is classified using the 4-digit ISIC Rev. 3. Since it is not the same level of disaggregation used for the GDP (4-digit for the labor force in the ENAHO versus 6-digit for the GDP in the national accounts) in few cases the whole 4-digit activity was included in one sector and do not split it in two different sectors.

Table N° A12 shows the 45 sectors and the correspondent 4-digit ISIC codes used to the classification. Sectors number 38 and 39 share the same code 7010 (in fact, 38 is compound only by 7010 and 39 has this code among others). That is that reason, in this case to merge both sectors in one. Another reason to combine some of these 45 actions is that the number of cases in the sample of people in the labor force is too small to keep it separated. The number of cases for each one of the 45 sectors is reported en Table N° A13 where we used the ENAHO from 1997 to 2007. Note that the sample for the period 1997 to 2002 was collected along the 4th Quarter (October to December). On the other hand starting in 2003 the fieldwork for sample was conducted during 12 months. Starting in 2004 the interviews were made from January to December. Given that the 12 month continuous sampling started by May 2003 this year the sample was completed in April 2004.

The total number of cases varies from 7,7 to 48,2 thousands. The sample size is smaller in most the 4th Quarter sample than in those which use the continuous 12-month sampling. Depending on the sample size, the disaggregation in 45-sectors results in few cases in some of them. For example, production of sugar (sector 9) and transport equipment (sector 30) had fewer cases in the late nineties ENAHO than in recent ones. There are also other situations where the number of cases is very little along all the ENAHO reported here. This is the case of the production of fish meal (sector 7) and refined petroleum (sector 22).

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44 See www.inei.gob.pe. Contents reviewed on March 29, 2009.

Table No A12
Economic activities classified in 45 sectors according to Peruvian National Accounts

Number	Economic activity description	International Standard Industrial Classification of all Economic Activities (ISIC Rev. 3)
1	Agriculture, hunting and forestry	0111; 0112; 0113; 0121; 0122; 0130; 0150; 0200
2	Fishing	500
	Mining, quarrying, extraction of crude petroleum and natural gas	
3	Mining and quarrying	1110; 1120
4	Extraction of crude petroleum and natural gas	1010; 1020; 1030; 1200; 1310; 1320; 1410; 1421; 1422; 1429
	Manufacturing	
	Manufacture of food products, beverages and tobacco	
5	Manufacture of dairy products	1520
6	Production of fish	1512
7	Production of fish meal	1515
8	Bakery and grain mill products	1531; 1541; 1544
9	Sugar	1542
10	Manufacture of other food products	1511; 1513; 1514; 1532; 1533; 1543; 1549
11	Manufacture of beverages and tobacco products	1551; 1552; 1553; 1554; 1600
	Manufacture of textiles and leather	
12	Manufacture of textiles	0140; 1711; 1712; 1721; 1722; 1723; 1729; 1730
13	Manufacture of wearing apparel	1810; 1820
14	Tanning and dressing of leather; manufacture of luggage, handbags	1911; 1912
15	Manufacture of footwear	1920
16	Manufacture of wood and of products of wood and cork, except furniture	2010; 2021; 2022; 2023; 2029; 3610
	Manufacture of pulp, paper and paper products, and Publishing and printing	
17	Manufacture of pulp, paper and paper products	2101; 2102; 2109
18	Publishing, printing and reproduction of recorded media	2211; 2212; 2219; 2221; 2222; 2230
	Manufacture of chemicals	
19	Manufacture of basic chemicals	2411; 2412; 2413; 2421; 2430
20	Manufacture of pharmaceutical products and medicines	2423
21	Manufacture of other non-metallic mineral products	2422; 2424; 2429
22	Manufacture of refined petroleum products	2310; 2320
23	Manufacture of rubber and plastic products	2511; 2519; 2520
24	Manufacture of other non-metallic mineral products	2610; 2691; 2692; 2693; 2694; 2695; 2696; 2699
	Manufacture of basic metals	
25	Manufacture of basic iron and steel	2710; 2731
26	Manufacture of basic precious and non-ferrous metals	2720; 2732
	Manufacture of metal products	
27	Manufacture of fabricated metal product, except machinery and equipment	2811; 2812; 2813; 2891; 2892; 2893; 2899
28	Manufacture of non-electric machinery and equipment n.e.c.	2911; 2912; 2913; 2914; 2915; 2919; 2921; 2922; 2923; 2924; 2925; 2926; 2927; 2929; 3000
29	Manufacture of electrical machinery and apparatus n.e.c.	2930; 3110; 3120; 3130; 3140; 3150; 3190; 3922
30	Manufacture of transport equipment (motor vehicles, ships, aircrafts, etc)	3410; 3420; 3430; 3511; 3512; 3520; 3530; 3591; 3592; 3599
31	Other manufacture products	2213; 3210; 3220; 3230; 3311; 3312; 3313; 3320; 3330; 3691; 3692; 3693; 3694; 3699
32	Electricity, gas and water supply	4010; 4020; 4030; 4100
33	Construction	4510; 4520; 4530; 4540; 4550
34	Wholesale and retail trade	5010; 5030; 5050; 5110; 5121; 5122; 5131; 5139; 5141; 5142; 5143; 5149; 5150; 5190; 5211; 5219; 5220; 5231; 5232; 5233; 5234; 5239; 5240; 5251; 5252; 5259; 5270
35	Transport, storage and communication	6010; 6021; 6022; 6023; 6030; 6110; 6120; 6210; 6220; 6301; 6302; 6303; 6304; 6309; 6411; 6412; 6420; 7111; 7112; 7113
36	Financial intermediation	6219; 6511; 6519; 6591; 6592
37	Insurance and pension funding, except compulsory social security	6601; 6602; 6603
38	Real estate activities with own or leased property[1]	7010
39	Real estate on a fee or contract basis, renting and business activities	3710; 3720; 5020; 5040; 6599; 6711; 6712; 6719; 6720; 7010; 7020; 7121; 7122; 7123; 7129; 7130; 7210; 7220; 7230; 7240; 7290; 7310; 7320; 7411; 7412; 7413; 7414; 7421; 7422; 7430; 7491; 7492; 7493; 7495; 7499; 9000; 9111; 9112; 9213; 9220; 7250
40	Hotels and restaurants	5510; 5520
41	Household services provided by profit-seeking organisations[2]	5260; 7494; 9211; 9212; 9214; 9219; 9231; 9232; 9233; 9241; 9249; 9301; 9302; 9303; 9309
42	Household services provideb by non-profit organisations[3]	8531; 8532; 9120; 9191; 9192; 9199; 9500; 9900
43	Human health servicies provided by private institutions	8511; 8512; 8519; 8520
44	Education provided by private institutios	8010; 8021; 8022; 8030; 8090
45	Public administration and defence; compulsory social security	7511; 7512; 7513; 7514; 7521; 7522; 7523; 7530

Notes

[1] Peruvian national accounts distinguish code 7010 into 2 subcategories (including a fifth digit to the ISIC), but household surveys at most considerer 4-digit clasification. That is the reason why 7010 is this activity and also in the next one.

[2] Recreational, cultural and sporting activities (92), Other service activities (93)

[3] Social work activities category division Detailed description group (853), Activities of trade unions (912), Activities of other membership organizations (919), Private households with employed persons (95)

Table No A13

Number of cases (sample size) of the Labor Force (occupied economically active population) in the ENAHO 1997-2007

Number	Economic activity description	Economic activity short name	1997 4th Quarter	1998 4th Quarter	1999 4th Quarter	2000 4th Quarter	2001 4th Quarter	2002 4th Quarter	2003 May 03 to April 04	2004 Annual	2005 Annual	2006 Annual	2007 Annual
1	Agriculture, hunting and forestry	Agriculture	5,443	6,072	3,000	2,898	13,701	15,804	17,273	18,368	18,944	19,618	18,677
2	Fishing	Fishing	91	86	47	57	262	260	282	292	274	280	319
	Mining, quarrying, extraction of crude petroleum and natural gas	Minning											
3	Mining and quarrying	Minning	6	8	5	4	22	28	14	25	21	23	30
4	Extraction of crude petroleum and natural gas	Crude petroleum	116	95	45	51	214	322	310	370	353	405	9
	Manufacturing	Manufacturing											
	Manufacture of food products, beverages and tobacco	Food, beverage and tobacco											
5	Manufacture of dairy products	Dairy products	10	12	14	18	48	47	49	55	44	59	66
6	Production of fish	Fish	40	22	6	17	85	63	125	129	94	105	113
7	Production of fish meal	Fish meal	0	0	0	0	0	1	0	0	0	0	0
8	Bakery and grain mill products	Bakery	132	123	70	65	339	375	323	304	367	390	447
9	Sugar	Sugar	4	13	5	0	17	40	18	31	23	29	48
10	Manufacture of other food products	Other foods	24	35	20	35	103	104	136	133	135	181	241
11	Manufacture of beverages and tobacco products	Beverages and tobacco	57	66	31	36	74	146	62	76	53	122	122
	Manufacture of textiles and leather	Textiles											
12	Manufacture of textiles	Textiles	246	245	95	126	445	567	489	545	556	585	748
13	Manufacture of wearing apparel	Wearing apparel	165	152	85	100	376	431	419	447	468	484	576
14	Tanning and dressing of leather; manufacture of luggage, handbags	Leather	10	5	4	5	8	21	17	18	20	14	40
15	Manufacture of footwear	Footwear	30	41	20	13	97	94	99	126	92	98	88
16	Manufacture of wood and of products of wood and cork, except furniture	Wood	173	175	92	94	408	470	463	530	488	485	546
	Manufacture of pulp, paper and paper products, and Publishing and printing	Paper and printing											
17	Manufacture of pulp, paper and paper products	Pulp and paper	8	7	7	4	14	21	13	18	10	23	18
18	Publishing, printing and reproduction of recorded media	Publishing ad printing	21	16	13	16	81	80	83	86	67	104	103
	Manufacture of chemicals	Chemicals											
19	Manufacture of basic chemicals	Basic chemicals		4		0	10	7	9	3	3	8	4
20	Manufacture of pharmaceutical products and medicines	Pharmaceutical	14	8	1	4	10	20	13	20	19	23	36
21	Manufacture of other chemicals	Other chemicals	8	7	2	5	40	33	36	57	53	32	43
22	Manufacture of refined petroleum products	Refined petroleum	1	0	0	0	2	0	13	6	1	0	5
23	Manufacture of rubber and plastic products	Rubber	13	4	7	5	25	29	33	42	33	38	34
24	Manufacture of other non-metallic mineral products	Other non-metallic mineral	59	56	24	29	131	134	138	118	127	113	157
	Manufacture of basic metals	Basic metals											
25	Manufacture of basic iron and steel	Iron and steel	5	3	2	1	11	19	13	12	28	16	12
26	Manufacture of basic precious and non-ferrous metals	Non-ferrous metals	2	3	1	2	9	7	10	16	10	6	15
	Manufacture of metal products	Metal products											
27	Manufacture of fabricated metal product, except machinery and equipment	Metal products (non-machinery)	62	69	45	57	247	208	190	225	182	215	249
28	Manufacture of non-electric machinery and equipment n.e.c.	Non-electrical machinery	7	6	6	3	34	13	22	26	39	80	85
29	Manufacture of electrical machinery and apparatus n.e.c.	Electrical machinery	5	8	6	2	16	13	17	14	7	17	33
30	Manufacture of transport equipment (motor vehicles, ships, aircrafts, etc)	Transpor equipment	5	6	5	5	19	23	36	31	34	50	55
31	Other manufacture products	Other manufactures products	43	73	31	28	132	132	123	150	144	154	192
32	Electricity, gas and water supply	Electricity, gas and water	42	47	21	16	70	106	88	77	90	88	83
33	Construction	Construction	554	546	252	263	1,092	1,224	1,246	1,217	1,151	1,341	1,718
34	Wholesale and retail trade	Trade	2,523	2,825	1,454	1,522	5,774	6,417	6,875	7,176	6,980	7,312	8,087
35	Transport, storage and communication	Transport and communication	578	672	375	394	1,620	1,884	1,990	2,119	2,021	2,352	2,817
36	Financial intermediation	Finance	43	36	20	11	51	63	81	76	72	114	116
37	Insurance and pension funding, except compulsory social security	Insurance	8	10	7	1	15	15	12	23	9	29	26
38 and 39	Real estate, renting and business activities[1]	Real state	518	537	319	316	1,234	1,437	1,385	1,620	1,451	1,546	1,781
40	Hotels and restaurants	Hotels	582	635	365	384	1,705	1,845	2,246	2,218	2,179	2,366	2,823
41	Household services provided by profit-seeking organisations[2]	Household servicies	400	467	222	251	1,119	1,113	908	1,089	1,099	1,088	1,264
42	Household services provideb by non-profit organisations[3]	Household servicies by NGO	350	399	262	227	1,015	1,096	1,398	1,477	1,308	1,448	1,677
43	Human health servicies provided by private institutions	Private health	204	192	106	128	403	512	501	561	472	591	661
44	Education provided by private institutios	Private education	680	742	360	474	1,704	1,945	1,842	1,980	1,837	1,947	2,294
45	Public administration and defence; compulsory social security	Government	429	455	236	232	993	1,267	1,185	1,258	1,327	1,482	1,756
Total - all sectors			13,711	14,983	7,688	7,899	33,775	38,436	40,585	43,164	42,685	45,461	48,214

Appendix of Sample size of microenterprises data by economic sectors

Table A14

Number of Informal Micro Enterprises (non weighted) per year and classified according to 45 economic activities

# of Sector of Activity[1]	ISIC codes (revision 3)	Name of Economic Activities	Number of Informal Micro-Enterprises								
			2002	2003	2004	2005	2006	2007	# min.	# max.	mean
1	0111; 0112; 0113; 0121; 0122; 0130; 0150; 0200	Agriculture, hunting and forestry	10	14	36	46	81	146	10	146	56
2	500	Fishing	61	70	154	210	197	230	61	230	154
3	1110; 1120	Extraction of crude petroleum and natural gas	0	0	0	0	0	0	0	0	0
4	1010; 1020; 1030; 1200; 1310; 1320; 1410; 1421; 1422; 1429	Mining and quarrying (except crude petroleum and natural gas)	29	23	59	86	59	98	23	98	59
5	1520	Manufacture of dairy products	13	12	14	24	26	32	12	32	20
6	1512	Production, processing and preservation of fish	0	0	0	1	0	1	0	1	0
7	1515	Production, processing and preservation of fish's oils and fats	0	0	0	0	0	0	0	0	0
8	1531; 1541; 1544	Manufacture of grain mill products, bakery and farinaceous products	87	76	97	130	170	195	76	195	126
9	1542	Manufacture of sugar	0	0	0	1	0	2	0	2	1
10	1511; 1513; 1514; 1532; 1533; 1543; 1549	Manufacture of other food products	12	18	29	39	72	93	12	93	44
11	1551; 1552; 1553; 1554; 1600	Manufacture of beverages and tobacco products	39	7	9	9	65	70	7	70	33
12	0140; 1711; 1712; 1721; 1722; 1723; 1729; 1730	Manufacture of textiles	173	190	338	445	455	670	173	670	379
13	1810; 1820	Manufacture of wearing apparel, dressing and dyeing of fur	212	204	239	258	303	294	204	303	252
14	1911; 1912	Tanning and dressing of leather; manufacture of luggage, handbags, saddlery and harness	9	9	7	12	11	20	7	20	11
15	1920	Manufacture of footwear	28	17	19	16	27	27	16	28	22
16	2010; 2021; 2022; 2023; 2029; 3610	Manufacture of wood and of products of wood and cork, including furniture	195	182	248	299	270	260	182	299	242
17	2101; 2102; 2109	Manufacture of pulp, paper and paper products	3	1	1	0	4	4	0	4	2
18	2211; 2212; 2219; 2221; 2222; 2230	Publishing, printing and reproduction of recorded media	19	15	13	15	22	20	13	22	17
19	2411; 2412; 2413; 2421; 2430	Manufacture of basic chemicals, agrochemical products and man-made fibres	1	0	0	0	0	1	0	1	0
20	2423	Manufacture of pharmaceuticals, medicinal chemicals and botanical products	4	1	1	5	9	10	1	10	5
21	2422; 2424; 2429	Manufacture of other chemicals	5	4	18	36	17	10	4	36	15
22	2310; 2320	Manufacture of refined petroleum products	0	0	0	0	0	0	0	0	0
23	2511; 2519; 2520	Manufacture of rubber and plastic products	1	4	4	2	4	6	1	6	4
24	2610; 2691; 2692; 2693; 2694; 2695; 2696; 2699	Manufacture of other non-metallic mineral products	31	30	29	53	48	59	29	59	42
25	2710; 2731	Manufacture and casting of basic iron and steel	1	0	0	0	0	0	0	1	0
26	2720; 2732	Manufacture of basic precious and non-ferrous metals	1	1	1	0	0	1	0	1	1
27	2811; 2812; 2813; 2891; 2892; 2893; 2899	Manufacture of fabricated metal products, except machinery and equipment	83	80	100	90	97	96	80	100	91
28	2911; 2912; 2913; 2914; 2915; 2919; 2921; 2922; 2923; 2924; 2925; 2926; 2927; 2929; 3000	Manufacture of machinery and equipment (excluding electrical), manufacture of office, accounting and computing machinery	3	8	6	2	17	15	2	17	9
29	2930; 3110; 3120; 3130; 3140; 3150; 3190; 3922	Manufacture of electrical machinery and apparatus; radio, television and communication equipment and apparatus	1	5	4	1	4	5	1	5	3
30	3410; 3420; 3430; 3511; 3512; 3520; 3530; 3591; 3592; 3599	Manufacture of motor vehicles, trailers and semi-trailers, and other transport equipment	3	10	8	6	12	16	3	16	9
31	2213; 3210; 3220; 3230; 3311; 3312; 3313; 3320; 3330; 3691; 3692; 3693; 3694; 3699	Other instruments, furniture, etc. products	59	66	90	81	92	143	59	143	89
32	4010; 4020; 4030; 4100	Electricity, gas and water supply; sewage and refuse disposal, sanitation and similar activities	9	4	5	7	5	3	3	9	6
33	4510; 4520; 4530; 4540; 4550	Construction	331	415	437	374	444	572	331	572	429
34	5010; 5030; 5050; 5110; 5121; 5122; 5131; 5139; 5141; 5142; 5143; 5149; 5150; 5190; 5211; 5219; 5220; 5231; 5232; 5233; 5234; 5239; 5240; 5251; 5252; 5259; 5270	Wholesale and retail trade	3,360	3,715	4,163	4,572	4,712	5,572	3,360	5,572	4,349
35	6010; 6021; 6022; 6023; 6030; 6110; 6120; 6210; 6220; 6301; 6302; 6303; 6304; 6309; 6411; 6412; 6420; 7111; 7112; 7113	Transport, storage and communication	1,028	1,198	1,313	1,294	1,562	2,033	1,028	2,033	1,405
36	6219; 6511; 6519; 6591; 6592	Financial intermediation, except insurance and pension funding	0	0	0	0	0	0	0	0	0
37	6601; 6602; 6603	Insurance and pension funding, except compulsory social security	0	1	2	0	0	1	0	2	1
38 y 39[2]	3710; 3720; 5020; 5040; 6599; 6711; 6712; 6719; 6720; 7010; 7020; 7121; 7122; 7123; 7129; 7130; 7210; 7220; 7230; 7240; 7290; 7310; 7320; 7411; 7412; 7413; 7414; 7421; 7422; 7430; 7491; 7492; 7493; 7495; 7499; 9000; 9111; 9112; 9213; 9220; 7250	Real estate activities	480	521	593	537	539	800	480	800	578
40	5510; 5520	Services for entrepenurs	886	1,069	1,129	1,246	1,320	1,609	886	1,609	1,210
41	5260; 7494; 9211; 9212; 9214; 9219; 9231; 9232; 9233; 9241; 9249; 9301; 9302; 9303; 9309	Hotels and restaurants	806	703	844	915	936	1,160	703	1,160	894
42	8531; 8532; 9120; 9191; 9192; 9199; 9500; 9900	Private households services (include personal, household and community servicies)	1	223	162	22	51	161	1	223	103
43	8511; 8512; 8519; 8520	Private health services	89	118	121	102	122	161	89	161	119
44	8010; 8021; 8022; 8030; 8090	Private education services	125	158	103	131	152	181	103	181	142
45	7511; 7512; 7513; 7514; 7521; 7522; 7523; 7530	Public services (health and education), administration and defence; compulsory social security	1	0	0	0	0	0	0	1	0
Total[3]	Todos	Total	8,199	9,172	10,396	11,067	11,905	14,777	8,199	14,777	10,919

Notas:

[1] Correspond to INEI's classification in 45 economic activies.

[2] It is not possible to distinguish between households and enterprises in Renting because ENAHO- ISIC classification uses only 4 digits.

[3] We miss some cases because there is no information to classify them in economic activities based on ISIC.

Table A15

Economic Activities Gathered for Informal Micro-Enterprises Analysis

Economic Activities gathered using ISIC codes		INEI Classification		Name of Economic Activities (45 sectors)	Number of Micro-Enterprises (non weighted)					
		11 Sectors	45 Sectors		2002	2003	2004	2005	2006	2007
A - Extractive Industry	I -Extractive Industries	1	1	Agriculture	10	14	36	46	81	146
		1	2	Fishing	61	70	154	210	197	230
		1	3	Petroleum	-	-	-	-	-	-
		1	4	Minning	29	23	59	86	59	98
B - Manufacture Industry	II - Food Industry	2	5	Dairy products	13	12	14	24	26	32
		2	6	Fish products	-	-	-	1	-	1
		2	7	Fish's oil and fats products	-	-	-	-	-	-
		2	8	Grain mill	87	76	97	130	170	195
		2	9	Sugar	-	-	-	1	-	2
		2	10	Other foods	12	18	29	39	72	93
		2	11	Beverages and tobacco	39	7	9	9	65	70
	III - Textil and Leather Industry	2	12	Textiles	173	190	338	445	455	670
		2	13	Clothes	212	204	239	258	303	294
		2	14	Leather	9	9	7	12	11	20
		2	15	Footwear	28	17	19	16	27	27
	IV - Wood and Furniture Industry	2	16	Wood	195	182	248	299	270	260
	V - Other Manufacture Industries	2	17	Paper	3	1	1	-	4	4
		2	18	Publishing	19	15	13	15	22	20
		2	19	Basic Chemicals	1	-	-	-	-	1
		2	20	Pharmaceuticals	4	1	1	5	9	10
		2	21	Other chemicals	5	4	18	36	17	10
		2	22	Refined petroleum	-	-	-	-	-	-
		2	23	Rubber and plastic	1	4	4	2	4	6
		2	24	Mineral Non-metalic	31	30	29	53	48	59
		2	25	Iron and steel	1	-	-	-	-	-
		2	26	Non-ferrous	1	1	1	-	-	1
		2	27	Metal products	83	80	100	90	97	96
		2	28	Machinery and equipment	3	8	6	2	17	15
		2	29	Electrical machinery	1	5	4	1	4	5
		2	30	Trasnport equipment	3	10	8	6	12	16
		2	31	Other manufactured products	59	66	90	81	92	143
C - Construction	VI - Construction	3	33	Construction	331	415	437	374	444	572
D - Trade	VII - Trade	4	34	Trade	3,360	3,715	4,163	4,572	4,712	5,572
E - Services	VIII - Hotels and Restaurants	5	40	Hotel and restaurant	886	1,069	1,129	1,246	1,320	1,609
	IX - Transport and Communication	6	35	Transport	1,028	1,198	1,313	1,294	1,562	2,033
	X - Real Estate and Business	8	38 y 39	Real estate and Services for entrepreuners	480	521	593	537	539	800
	XI - Private Health	9	43	Private health	89	118	121	102	122	161
	XII - Education	9	44	Private education	125	158	103	131	152	181
	XIII - Other Services	7	36	Financial intermediation	-	-	-	-	-	-
		7	37	Insurance	-	1	2	-	-	1
		9	45	Public services	1	-	-	-	-	-
		11	32	Electricity and water	9	4	5	7	5	3
	XIV - Household Services	10	42	Private household services	1	223	162	22	51	161
		11	41	Private household services	806	703	844	915	936	1,160
TOTAL					8,199	9,172	10,396	11,067	11,905	14,777

Source: Questionnaire Enaho.04 and INEI's industrial classification based on ISIC