Fast Economic Growth and Income Distribution (Peru 1990-2010)[1]

Norberto E. García[2]

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SUMMARY

It was found for PERU 1990-2010 a relationship between the decline in the share of the wage bill in GDP, the rise in the private savings share in GDP and the increase in the investment plus net exports coefficient in GDP. In 1990-97 causality ran from the decline in the share of the wage bill towards the rise in the investment plus net export coefficient, while in 2002-10, the period of very fast growth, causality went from the rise in the investment plus net exports coefficient, towards the increase in the share of profits and the decrease in the wage bill share, in the amount needed by the required rise in private savings.

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[2] negarcia@speedy.com.pe

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1. Introduction.

There has been recently in Peru a widespread criticism to the accelerated growth registered in 2002-10, that increase the annual growth rate from 2 percent in 2001 up to 9.8 percent in 2010. This acceleration was based in the rapid increase of private investment and exports. This criticism underlined that such growth paid little attention to the negative effect on the functional income distribution and slow improvement on the household income distribution.

This criticism forgets that rapid growth based on the increase of investment and exports generates *per se*, in a low income country, a trend towards a worsening of the functional income distribution. The real issue is the strength of the Government intervention to compensate such trend and attain better results at the household level. The trend towards a worsening of the functional income distribution takes place through, among others, two channels.

The first channel is that the rapid growth of investment and exports requires an increase in savings and in the rate of profit, facts that in a low income country such as Peru creates a pressure towards increasing the share of profits and the deterioration of the functional income distribution, which in turn makes more difficult to achieve significant improvements in the household income distribution through redistribution policies.

The second channel emerges from the fact that Peruvian income distribution is sensitive to large productivity differentials among sectors and size of the firms. Since the rapid growth of investment and exports in 2002-10 mainly took place in medium and high productivity sectors and firms, it also increased or maintained productivity differentials by size of the firm and economic sectors. Thus, the impact of rapid investment and export growth on productivity differentials also affected the functional income distribution.

Hence one stylized feature of rapid growth based on acceleration of investment and exports in Peru in 2002-2010 is a pressure towards worsening both the functional income

distribution and the sector and firm size productivity differentials. Both trends affected the income distribution at the production level and demanded more efforts to reverse such trend at the household income distribution level.

It is worthwhile to remember that the 2002-10 acceleration of economic growth in Peru created quality employment and decreased the poverty rates. Ministry of Labor figures based on household surveys show that employment in establishments with 10 or more occupied persons (formal employment) grew at a rate higher than 4 percent per year. They also show a reduction in the share of informal urban employment in 2002-10.World Bank estimates suggest that poverty was reduced in the same period from nearly 48 percent to approximately 30 percent.

Thus the issue seems to be if also income distribution could have been improved more rapidly introducing different policies. One should bear in mind that the improvements in employment and poverty, required a fast growth in investment and exports. Hence, any attempt of improving income distribution should not reduce the growth drive. If it does, the improvement in income distribution would have a negative effect in terms of employment creation and poverty reduction.

This paper concentrates attention on the first channel quoted before: how the accelerated growth of investment and exports negatively affected the functional income distribution.

Section 2 summarizes the main results of recent studies on income distribution in Peru. Section 3 presents the theory and the equation used to test the hypothesis of the relationship between a faster growth in investment and in the foreign trade balance with the worsening of the functional income distribution – with causality running in either way depending of specific periods. Section 4 extends the analysis to the increase in the rate of profits required to induce such acceleration in investment in a small open economy and how this fact reinforces the pressure on the functional income distribution. Section 5 presents the empirical evidence of Peru 1990-2010, including both the statistical tests and the raw data, showing the relationship between the rise in the investment plus net

exports coefficient and the functional income distribution – emphasizing that the direction of causality in 1990-97 was different from the verified in 2002-2010. Section 6 presents estimates of the macroeconomic rate of profit for selected years within 1990-2010, confirming the hypothesis of Section 4 and its consequences for the functional income distribution. Section 7 summarizes the main conclusions of this paper.

2.Background.

Previous studies on the functional income distribution in Peru tend to suggest that starting with a quite concentrated distribution, the dominating trend in 1975-2010 is towards a worsening of such distribution. This issue is rose in [Mendoza, W.Leyva,J. and Flor, J.(2011), p.81-84]; [Figueroa A. (2010), p.22-28]; [Figueroa A.(1990), p.7]; [Figueroa A.(1982), p.6]; [Webb R. and Figueroa A.[(1975), p.8] and [Webb R.[(1977), p.6].

With regard to the household income distribution, the conclusion is different. [Jaramillo, M. and Saavedra, J. (2011), p.14-22] conclude that between 1997 and 2006 the Gini coefficient of the household income distribution, improved in Peru since such coefficient decreased from 0.54 to 0.49. However, the previously quoted authors do not adjust the family income data from the household surveys, to the income of National Account data. Hence they include a severe underestimation of incomes, particularly incomes from profits and rents in the higher deciles, frequently under declared in the household surveys.

The previous fact has already been underlined by [Yamada, G. and Castro,J. (2006), p.3-21], who adjusted the Consumption in Household Surveys to its level in National Accounts. Doing this they find that the original Gini of 0.37 gives place to an adjusted Gini of 0.60 for 2004. [Figueroa, A.(2010), p.22-28] obtains a similar result for 2003. [Escobal, J. and Ponce, C.(2010), p.7] with a similar method to the one used by [Yamada, G. and Castro, J. (op.cit.)], estimated an adjusted Gini of 0.6 for 2004 and 0.5 for 2009. [Mendoza, W.,Leyva, J. and Flor, J. (2011), p. 81-84] estimated a National Account adjusted Gini of 0.686 for 2001 and 0.588 in 2010. Hence there is ground to believe that the household

income distribution, adjusted by National Account Income's data, exhibit a slow improvement in 2002-10. Several authors sustain that it was due to redistribution policies, (particularly poverty programs) and the income upgrade through employment creation.

3. Growth and the functional income distribution.

3.1. A short reminder.

Many years ago, the post Keynesian economic growth school explored the interaction between growth and income distribution. Two of the main approaches were developed by [Kaldor, N. (1956), p.83-100] and [Pasinetti, L. (1974), p.103-116]. In short, starting with the full employment GDP growth rate (gr), the growth of economic active population (e) and the growth of productivity (q), we have:

$$gr = e + q \qquad \text{(i)}$$

Defining the savings ratio (s =S/Y) and the capital-output ratio (k),the full employment savings–investment equilibrium requires:

$$gr = s/k \qquad \text{(ii)}$$

Hence the rate of growth that warrants full employment is:

$$gr = e+q = s/k \qquad \text{(iii)}$$

From equation (iii) arises the "knife edge" equilibrium problem, where using Pasinetti's words (gr) is attained "just by a fluke". Since (s), (k), (e) and (q) are considered constants, only certain combination of them warrants full employment growth. Within that combination, only one savings ratio can ensure full employment growth and any departure from that ratio introduces a persistent trend towards unemployment or towards an excess demand over the maximum sustainable growth determined by technical conditions.

Hence, the only way to avoid this analytical problem is to abandon the rigid assumption of considering constants (q), (e), (s) and (k).

Since the aggregate savings rate (s) is a weighted average of several rates, the way out explored by Kaldor and Pasinetti was to introduce a *variable* savings ratio (S/Y), introducing the interaction between savings and income distribution. Following [Pasinetti (1974), p. 103-116][3]/, from (iii):

$gr * k = s$; which implies $(I/Y) = s = S/Y$ (iv)

Defining profits (P), the wage bill (W), the savings propensity out of profits (sp) and the savings propensity out of wages (sw), and assuming (sp>sw> 0)we have:

$gr* k = (I/Y) = S/Y = (sp*P/Y) + (sw*W/Y)$ (v)

From (v):

$gr = (1/k)(I/Y) = (1/k) (sp*P/Y + sw*W/Y)$ (vi)

And:

$(I/Y) = (sp*P/Y + sw*W/Y)$ (vii)

From (v), (vi) and (vii) if growth needs to be accelerated to achieve full employment, an increase in (I/Y) will be needed. But in order to attain this, savings must rise. Since (sp>sw), a shift in income distribution from wages to profits in (v), (vi) and (vii) will provide the rise in savings to match the increase in (I/Y).

[Kaldor, N.(1956), p.83-100] approach was to assume sw=0.[Pasinetti, L. (1974),p.103-116]demonstrates that when we defined savings out of profits and savings out of wages –

[3]/ While Kaldor distinguishes among savings from profit earners and wage earners, Pasinetti defines savings out of profits and savings out of wages. Pasinetti's approach is more general than the first one. A wage earner might be receiving also a part of profits – which is the legal case in some sectors of Peru - and a profit earner can be receiving also a wage income. This case is closer to the Income Chapter of the National Accounts of Peru.

instead of savings of profit earners and savings of wage earners as Kaldor does- the savings side of (vii) is reduced to (sp*P/Y). This renders a similar result to assuming that savings out of wages are zero (sw = 0). In this case equation (vi) collapses into:

$$gr = (1/k)\ (I/Y) = (1/k)\ (sp*P/Y) \qquad \text{(viii)}$$

And:

$$sp*(P/Y) = (I/Y) \qquad \text{(viii.a.)}$$

In (v), (vi), (vii) and (viii.a.))the flexible savings ratio (S/Y) depends of changes in income distribution between wages (W) and profits (P). This means that there is an income distribution that allows us to achieve thefull employment growth rate. It also means that the adjustment in income distribution solves the knife edge problem.

There are more new approaches to the “knife edge” adjustment problem. Neo-Kaleckian economists emphasize that raising the rate of capacity utilization could adjust to the growth of demand – see [Hein, E., Lavoie, M. and T. Treek(2011),p.587-612]. Neo Sraffian writers, such as [Palumbo, A. and Trezzini, A. (2003), p.109-135] also believe that the adjustment to demand growth is attained through variations in the degree of capacity utilization. Others Neo Sraffians, such as [Serrano, F.(1995),p.67-90], [Bortis, H. (1997),p. 250-440] and [Dejuán,O. (2005), p.231-252] suggests that structural change can ensure the warranted full capacity rate of growth – a rise in the degree of capacity utilization associated with structural change induces an acceleration of investment and allows a faster growth rate to cope with the acceleration of demand. Marxist approaches, such as [Shaikh, A. (2009), p.455-494] sustain that the adjustment to a faster demand growth can be explained by an autonomous raise of the ratio of (reinvested profits/total profits), making possible a higher savings ratio and a faster investment growth.

However, all the previously quoted approaches do not explain the persistent downward trend in the wage bill share in GDP. They had in mind the analysis of growth conditions in a developed economy were both the share of wages and profits tend to be empirically

constant and the same happens for the capital-output ratio. While the opposite is found for the case of underdeveloped experiences such as Peru: a trend towards a decrease of the share of the wage bill in GDP and a reduction ofthe capital/output ratio. In a underdeveloped experience a very fast growth of exports and investment includes numerous new products and new activities and it is not a problem of adjusting the degree of capacity utilization of the previously existing ones or an autonomous raise in reinvested profits, but an issue of how fast investment and net export growth can change the capital structure and how to finance such drive through the creation of new savings.

3.2. The approach of this paper.

In order to simplify the approach, in this paper we will not deal with a complete growth model, but starting with equation (viii.a.) above, we shall use a pair of equations that, through comparative statics, will be useful to understand and analyze empirically what happened in Peru in 1990-2010.

[Kaldor(1956), p. 83-100] pointed out the reasons why we could expect that a fast growth in investment could lead to a worsening of the functional income distribution through the forced increase in savings and reduction of the wage share to finance investment. The Kaldor analysis can be extended to a small open economy, where the acceleration of both investment and net exports (exports minus imports) plays a similar role to that of investment growth. Although Kaldor distinguish savings from wage earners and profit receivers, in this paper we will follow [Pasinetti(1974), p.103-116] more general approach which identifies savings out of profits and savings out of wages.

Defining:GDP (Y); Investment (I); Exports (X); Imports (M); Savings (S); Public Sector Savings (Spu); Private Savings (Spr); External Savings (Sex), it can be stated the investment-savings equilibrium in an open economy:

$$I = S = Spu + Spr + Sex \qquad (1)$$

Where: $Sex = M-X$

Regrouping terms in (1):

I - Spu – Sex = Spr(1.1)

The hypothesis of this paper is that Private Savings (Spr) in Peru in 1990-2010 were essentially determined by enterprise profits and rents. That was true not only for firm's savings. It was also true for family savings, whose main component accrued from profits and rents, while the component of private savings accruing from labor income was not significant. (It became significant lately in 2008-10 with the growth of private pension funds or AFP's funds).

Hence, when we consolidate family savings with enterprise savings, that consolidated component called Private Savings (Spr) is essentially determined by profits and rents. In such a context, the people that mainly depend of labor incomes have a much lower savings propensity than those whose income depends of profits and rents.

This can be explained by two issues. The first one is that the consumption propensity is higher in the lower income brackets. This is particularly true in low income countries. The second one is that in experiences where public sector savings are very low, family savings are negligible except for those accruing from profits, and external savings are negative, the main component of savings is enterprise savings - not distributed profits. In such a case, the increase in total savings depends crucially on the increase in total profits.

One way to model that situation is through Pasinetti's previously quoted approach that concludes that for equilibrium purposes it only matters the savings propensity out of profits – a result similar to assuming that the savings propensity out of labor incomes is zero (sw=0), while the opposite is true for savings out of profits (sp>0). In such a context, defining Private Savings (Spr), savings propensity out of profits (sp) and Gross Profits (P), it can be stated[4]/:

[4]/Pasinetti(1974) demonstrated that the same is true accepting that sp>sw>0 if Sp and Sw are defined as savings out of profit and wages respectively.

Spr = sp* P(2)

Replacing (2) in (1.1):

I+ X-M - Spu = sp*P(3)

Dividing each side of (3) by (Y):

sp * (P/Y) = (I+X-M)/Y– (Spu)/Y (4)

The causality of post Keynesian growth models state that investment and exportsperformance determine profits and savings and given a certain capital-output ratio (k) the rate of economic growth – such as it was refreshed in equation (viii.a.).Hence, for a given fiscal deficit or surplus (Spu/Y), the right hand side of equation (4)determines (P/Y) for a given (sp). This equation can also be use – as we shall see – in a comparative static exercise, measuring how the increase of (I+X-M)/Y and (Spu)/Y determines a larger (P/Y). The causality in Neoclassical and Marxian models is exactly the opposite: The share of profits determined the investment plus net export coefficient to GDP.

The gross surplus (SUR) of Peru's National Income Accounts can be disaggregated in Gross Profits (P), Taxes on Production and Foreign Trade (IMP) and incomes of independent workers (ITI). The National Statistical Office (INE) does not present in the Income Tables of the National Account the estimates for incomes of independent workers (ITI). However, the Ministry of Labor Research Direction ofSocio Economic Labor Studies (DISEL) has an estimate of (ITI) that is used in this paper. Hence we can write:

P = SUR – IMP – ITI (5)

But (SUR) is by definition (Y) minus total wages (W):

SUR = Y –W (5.1)

Replacing (5.1) in (5) and dividing each side of by (Y):

(P/Y)= 1 – (IMP/Y) – (ITI/Y) - (W/Y) (6)

As we shall see in section 5.2in 1990-2010 the behavior of (IMP/Y) and (ITI/Y) was fairly stable. Hence, for the sake of simplifying the analysis, they can be replaced by the constants α andβrespectively – both positive and lower than one. Thus (6) can be replaced by:

$(P/Y) = 1 – \alpha – \beta - (W/Y)$ (7)

Replacing (7) in (4) we obtain:

$sp\ (1 - \alpha - \beta – W/Y) = (I+ X- M)/Y – (Spu/Y)$ (8)

Or what it is the same:

$sp*(P/Y) = (I+X-M)/Y – (Spu/Y)$ (8.a)

From (8.a) and (8) we can inferred that when growth policy focuses on increasing the Investment plus Net Exports /GDP coefficient[↑ (I+X-M)/Y)]this will rise the profits share(↑P/Y) and reduce the wage share (↓W/Y) even when a part of this adjustment is absorbed by an increase in the coefficient of Public Savings (Spu/Y),through a reduction of the fiscal deficit.According to (8), this implies a worsening of the functional income distribution measured by (W/Y).

The medium term rise of the investment and net exports coefficient, requires a higher internal savings coefficient, through an increase in enterprise savings, which is attained through a rise in (P/Y) and a decrease in (W/Y). Thus, the adjustment variable is the worsening of the functional income distribution. This change generates what Kaldor[(1956), p. 83-100] called “forced savings”. However, causality may be different as is explained in a following section.

Although with less empirical importance, an increase in the Public Savings coefficient (Spu/Y) reduces the amount of the fall of (W/Y).

From (8.a) two main conclusions should be underlined: (i) the fast rise in the investment and net export coefficient (I+X-M/Y) will require higher savings - and thus an increase in

the share of Gross Profits in GDP (P/Y);(ii) a small part of such trend can be supplied by the increase of the public sector savings coefficient (Spu/Y) – reducing the fiscal deficit or increasing fiscal surplus.

The adjustment process to attain "forced savings" can be resisted if labor unions and a strong institutional setting in the labor market oppose such process. The process can become much more viable if a labor reform weakens the labor market institutions and labor unions power – such as it happened in Peru in the 1990's.

This does not mean that the growth strategy emphasis is wrong, but that more attention should be devoted to its consequences and policies must be implemented to balance the impact on both the wage bill share andthe household income distribution.

4. Competitiveness, the rate of profits and the labor market.

4.1. Rate of profits, total productivity and (U/Y).

Defining the macroeconomic rate of profit as (r=P/K)[5]/, Gross Profits as (P), the fixed capital stock as (K), the Tax coefficient as (α),the Independent Workers Income coefficient as (β), (such as they were defined in the previous section) and the capital/output ratio as (k), it can be stated:

$$r = P/K \qquad (9)$$

Thus:

$$r = 1/k*(P/Y) \qquad (10)$$

If we replace (P/Y) by (1- α - β -W/Y):

[5]/ The so called "Cambridge equation" establishes the rate of profit as: [(P/K) = (1/sp)*gr]. As we shall see, it is also relevant the definition explained in this section, since there is a discussion on which is the long run full employment rate of economic growth (gr) in a dual economy such as Peru. In Section 6 we shall see that the empirical estimates render similar results when is used as (gr) one of the higher rates of growth of the period 2007-2010.

$$r = (1/k)^* (1 - \alpha - \beta - W/Y) \qquad (11)$$

Equation (11) points out that a significant increase in the profit rate (r) implies a reduction of (W/Y) unless deliberated policies towards increasing total productivity are enforced and a reduction in (k) attained. With a decrease in (k) it will be needed a lighter reduction in (W/Y) in order to rise the profits rate (r). With high intensity policies towards rising total productivity, the increase in the rate of profit may be absorbed by a rapid decrease of (k).

Equation (11) reminds us that on experiences and periods where an increase of competitiveness is obtained through labor market deregulation and reduction of average labor costs – such as the neoliberal approach sustains - the required rise in the profit rate will generate an increase in (P/Y) and a reduction in (W/Y). That will happen even if the focus is on the reduction of average notwage labor costs, because the competitiveness policy pays no attention to increasing total productivity –and hence to reducing (k). The issue here is if we accept productivity growth as a spontaneous result of free market adjustment, or if following a different approach we believe that deliberate active policies towards productivity growth can improve results on this matter.

During the first decade following the opening of the economy in the early 1990's, the increase of competitiveness of the Peruvian economy rested on the deregulation of the labor market and the reduction of average labor costs, ignoring that there was a large field of action through policies oriented to the increase of total productivity. Forgetting that the increase in total productivity causes a reduction in unit total costs, which is the key variable for competitiveness. Productivity growth required not only improvements in innovation, education and training, but mainly a significant increase in productive infrastructure – ports, airports, highways, rural roads, energy, gas and oil, water supply, etc. This was crucial since in 1970-90 total productivity growth was negligible in Peru.

Hence, during 1990-2000 the reduction of (k) was very small and the functional income distribution took the brunt of the adjustment. Most economists will agree that a more flexible labor market is needed to enhance competitiveness. But this is not equal to a

complete labor market deregulation and, more important, should be coupled with active policies to increase total productivity if one wants to avoid a major blow on the functional income distribution.

As we shall see afterwards, the rate of profit registers an upward trend in Peru in 1990-2010 – an issue that is also present in the early stage of economic opening in various Latin American experiences. There are several reasons for this fact:

i).The trade opening reduced tariffs and erased import's controls in a very short period of time. But that shock was not compensated through an adjustment of the real exchange rate. The real exchange policy prioritized theinflation targetand play a small role in the change of the growth strategy[6]/. Hence effective protection was drastically reduced and the profit rate initially decreased. As a result, the Government and the firms used the deregulation of the labor market to regain competitiveness and to pave the way for the recovery of the rate of profit.

ii). Once growth policy focused on the private investment promotion, it was important an increase in the rate of profit for inducing higher investment growth.

iii). In the context of a newly open economy, the expected rate of profit became more uncertain. Consequently, the requirement of a higher rate acted as a safeguard against such uncertainty.

iv). A rise in the internal rate of profit was required in order to make room for a reduction of prices in tradeables under the increasing pressure of external competitiveness.

v). The rate of profit needed also to rise due to the higher interest rate that affected the Peruvian economy in the 1980's and the beginning of the 1990's.

[6]/ This is a great difference with the Chilean reforms and growth strategy, were after the failure of the "Chicago Boys" attempt, a more pragmatic economic management introduced several major devaluations and the consequent relative prices alignment for fostering a rapid transfer of resources towards tradeables, which induced higher productivity growth rates in those activities.

4.2. Causality, the share of profits and the rate of profit.

Looking at equations (8) and (11) which are reproduced below, it is worthwhile to remember that for post Keynesian analysis causality run from the acceleration of investment and net exports to the rise in (P/Y) and reduction of (W/Y) in order to "force" an increase in savings – as it is stated by equation (8). Observing equation (11) it becomes clear that in the post Keynesian approach the rise in (P/Y) and reduction in (W/Y) generates the increase of the rate of profit (r) needed to induce the rise in the investment coefficient. Hence, in a post Keynesian approach, both the rise in the share of profit and in the rate of profit is a consequence of the increase in (I+X-M)/Y.

$$sp\ (1 - \alpha - \beta - W/Y) = (I+X-M)/Y - (Spu/Y) \quad (8)$$

$$r = (1/k)^* (1 - \alpha - \beta - W/Y) \quad (11)$$

For both Neoclassical and Marxist theory, causality runs in the opposite way. In order to accelerate investment and exports it is first necessary to reduce the share of wages (W/Y) in order to increase the profit share (P/Y), obtain highersavings (s*P/Y) and raise the rate of profit (r).

During a period of several decades it may be possible that one sub-period exhibits a Neoclassical or Marxist causality while other a post-Keynesian one. Hence, the empirical analysis must pay attention to which is the direction of causality.

5. The empirical evidence: impact of the rise in the investment and net export coefficient on the functional income distribution.

There are a few studies that analyze the empirical validation of a forced savings hypothesis in Latin American experiences during the process of reforms and economic opening. Two of them are [Frenkel, R. y Rozenwurcel, G.(1990),p.331-342] and [García, N. (1993),p.35-230].The latter includes an analysis for Costa Rica (1980-90); Chile (1973-92) y México (1981-91). The empirical evidence that corroborates the hypothesis raised in this

paper will be presented in two stages. First the regression analysis tests of the time series involved. Second a detailed analysis of the raw data from National Accounts and other sources.

In both cases, the key issue with regard to the hypothesis raised in this paper, is the relationship between the rise in the investment and net exports coefficient (I+X-M)/Y, the increase of the profits share (P/Y) and reduction in (W/Y) during the period 1990-2010 – such as it is establish in equation (8.a.) – with causality going from one variable to the other depending of the sub-period under analysis.

5.1. Statistical regression analysis.

Following equation (8.a.) the regression analysis considers the Profit Share (P/Y) as dependent variable, and the Investment and Net Exports Coefficient (I+X-M)/Y and the Public Savings Coefficient (Spu/Y) as Independent Variables The time series for statistical regression analysis are presented in Table 2 and Section 5.2.explains in detail how they were estimated.

Figure 1 shows the behavior of the three variables in 1990-2010. It was found a breaking point in the time series for (I+X-M)/Y in 1999. In 1997-98 Peru suffers an external shock originated in the rebound of the 1997-98 Asian and Russian crises. The shock and the errors made in economic policy management caused a serious recession in 1998-99. Investment decisions were severely hit and started to recover only from 2003 onwards. This fact coincides also with a similar trend in Net Exports. Hence, there is a breaking point in the time series in 1999. In order to deal with such issue, a dummy variable was introduced from 2000 onwards. The Zivot-Andrews test was used to confirm such breaking point. Figure 2 shows graphically the break point.

The regression's results are summarized in Table 1. The results suggest that there is a high correlation between the behavior of Profit Share (P/Y) and the variables (I+ X- M)/Y and (Spu/Y) – with R^2 in the range of 0.79 to 0.99 and high "t" values. The correlation is

positive with (I+X-M)/Y and negative with (Spu/Y) as the equation (8.a.) predicts. The equations in Columns 6 and 11 present the higher R^2 and highly reliable "t" values. But the one in column (11) is more close to equation (8.a). The estimated coefficients seem sensible to the function specifications.

Figure 1. The three variables in 1990-2010

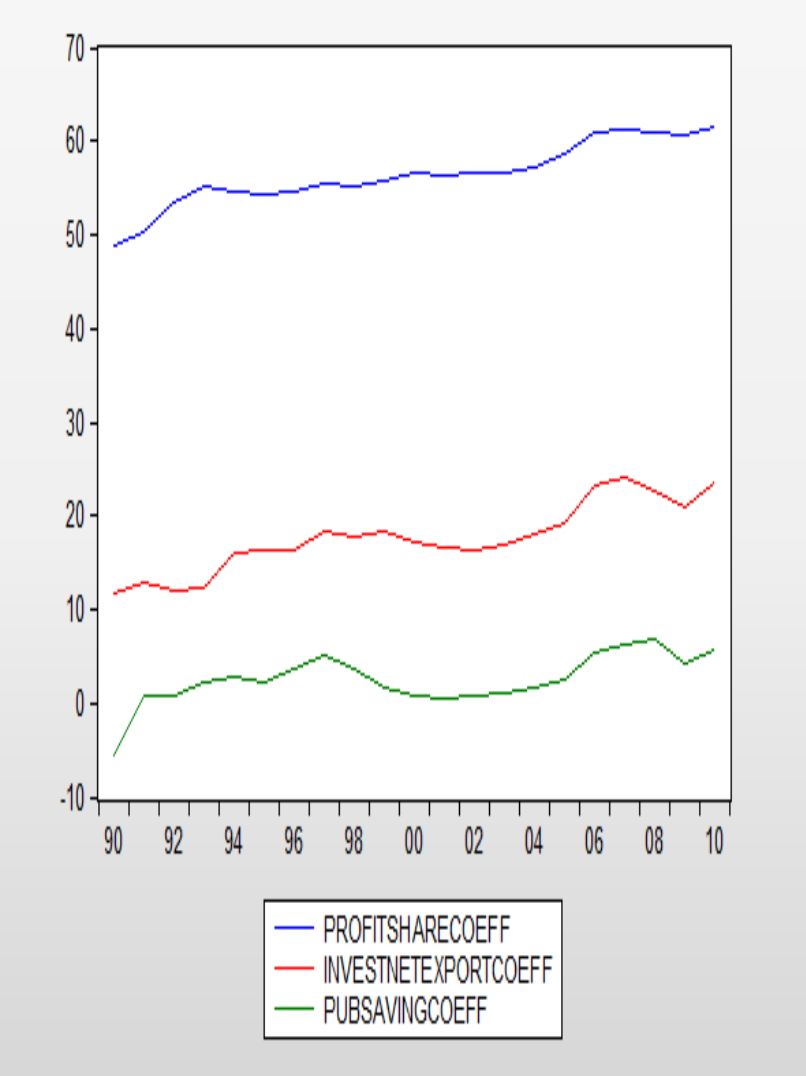

Figure 2.The Breaking Point in 1999.

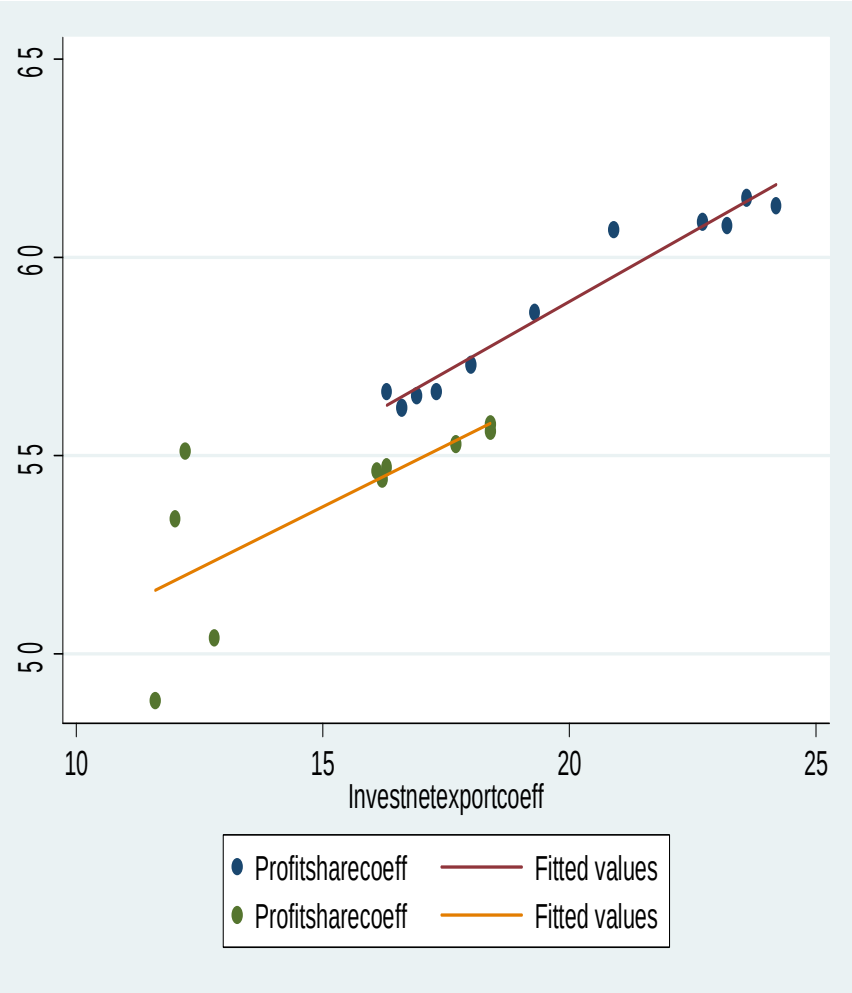

Table 1.Summary of Main Regressions.

	N° 1 (P/Y)	N° 2 (P/Y)	N° 3 (P/Y)	N° 4 (P/Y)	N° 5 (P/Y)	N° 6 (P/Y)	N° 7 (P/Y)	N° 8 (P/Y)	N° 9 Log(/Y)	N° 10 Log(P/Y)
(I+X-M)/Y	3.509***	0.717***	0.258***	0.012***	0.001					
	(0.135)	(0.137)	(0.012)	(0.003)	(0.003)					
(Spu)/Y	-2.518***	0.196	-0.234***	0.004	0.013***					
	(0.658)	(0.188)	(0.057)	(0.003)	(0.003)					
Log(I+X-M)/Y						20.096***	13.163***	-1.462	0.232***	-0.028
						(0.196)	(2.243)	(3.444)	(0.040)	(0.061)
Log(Spu)/Y						-1.119**	-0.023	2.387***	-0.001	0.042***
						(0.493)	(0.538)	(0.625)	(0.010)	(0.011)
Dum					0.065***			4.725***		0.084***
					(0.013)			(1.002)		(0.018)
_cons		43.275***		3.802***	3.940***		19.073***	56.291***	3.373***	4.035***
		(2.078)		(0.039)	(0.037)		(6.155)	(8.899)	(0.109)	(0.158)
Number of observations	21	21	21	21	21	20	20	20	20	20
R2	0.987	0.849	0.981	0.839	0.937	0.999	0.795	0.914	0.791	0.913
t_Statistic	26.028	5.239	22.183	4.886	0.412	102.582	5.869	-0.424	5.829	-0.461
	-3.826	1.043	-4.132	1.173	4.627	-2.268	-0.042	3.821	-0.081	3.808
		20.826		98.605	5.130			4.714		4.739
								6.326	30.829	25.593

note: *** p<0.01, ** p<0.05, * p<0.1

	N° 11 (P/Y)	N° 12 (P/Y)	N° 13 (P/Y)	N° 14 (P/Y)	N° 15 Log(P/Y)	N° 16 Log(P/Y)
(I+X-M)/Y	3.850***	0.123***				
	(0.149)	(0.153)				
(Spu)/Y	-2.597***	0.681***	0.223	0.747***	0.004	0.014***
	(0.532)	(0.160)	(0.192)	(0.164)	(0.003)	(0.003)
Log(I+X-M)/Y			11.953***	0.889	0.210***	0.005
			(2.410)	(2.726)	(0.044)	(0.048)
Dum	-9.441***	3.428***		3.689***		0.068***
	(2.833)	(0.708)		(0.740)		(0.013)

_cons		50.560***	21.815***	49.886***	3.423***	3.942***
		(2.046)	(6.492)	(7.062)	(0.118)	(0.125)
Number of observations		21	21	21	21	21
R2	0.992	0.937	0.839	0.935	0.835	0.936
t_Statistic	-4.878	4.247	4.959	0.326	4.781	0.104
	-3.332	4.842	1.157	4.547	1.251	4.829
	25.754	24.713		4.983		5.194
		0.806		7.064	28.997	31.478

note: *** p<0.01, ** p<0.05, * p<0.1

A closer look suggests a unit root problem. The Statistical Annex to this paper explains the tests applied to deal with it. After applying the unit root test the findings presented in the Statistical Annex suggests that the three variables in the statistical model are 1st order co-integrated variables. Using Johansen approach, it was developed an analysis under the co-integration methodology. The Trace and Max Eigen Value testsrendered opposite results, suggesting that in this caseeconomic theorydefines. The Vector Correction Estimateshows a convergent long run relationship among the variables in 1990-2010. Hence the statistical analysis validates the hypothesis developed in section 3. However, as it is explained later on, it is important to distinguish the direction of causality in 1990-2000 from the one registered in 2001-2010 – since correlation does not imply causality.

5.2. Statistical Data from National Accounts.

The National Accounts are produced by the National Statistical Institute (INE). We shall use particularly their chapter on Income Accounts. Table 2 was built with the National Account data, using the same definitions applied in previous sections. Since the National Accounts do not include an estimate of the Independent Workers Income share in GDP (ITI/PIB), it was used and included in Table 2 an estimate produced by the Ministry of Labor, complemented by estimates for this paper[7]/ described in the Table A-7 of the

[7]/ The estimates are produced by the Ministry of Labor/DISEL "Dirección de Investigaciones Socio Economicas y Laborales", based on the annual household surveys data and the GDP at current prices. They do not cover all the period under study, so in Table A-7 of the Statistical Annex can be

Statistical Annex.The estimates of (ITI/Y), included in Table 2, completed the information required to obtain (P/Y) using equation (6).

Table 2 shows the 1990-2010 figures for (I/Y), (X-M)/Y, (I+X-M)/Y, (P/Y), (IMP/Y), (ITI/Y), (W/Y) and (Spu/Y). Table 2 figures show that between 1990 and 2010, the investment and net export coefficient (I+X-M)/Y rises en 12.1 points of percent of GDP. The share of Profits in GDP (P/Y) also rises in 12.8 points of percent. Consequently, the raw data confirms the regression analysis presented in this paper. The wage share (W/Y) decreases in almost 12 points of percent of the GDP in the same period.

Following equation (8.a), it is also clear from Table 2 that the negative impact on the functional income distribution would have been even larger without the increase in the Public Sector Savings Coefficient (Spu/Y) in 1990-2010, of 11.3 points of percent of GDP.

Table 2 shows that as a consequence of the labor reform and the shock stabilization program in (1992) takes place a shock on the functional income distribution. That shock shifted downwards the share of wages (W/Y) from 1992 onwards.

Coupled with the previously explained shift, Table 3 shows that in (1990-97) there is an increase in (I+X-M)/Y equivalent to 6.8 points of percent of GDP that is associated with the rise of 6.8 points in the share of profits (P/Y) and the contraction of (W/Y) in 7.9 points of percent in GDP. The contraction of (W/Y) is larger than the rise in (P/Y) because in that period there is a rise in the tax coefficient (IMP)/Y of 1.1 points of GDP. Since in this period the large downward shift in the share of wages in GDP precedes the increase of the investment plus net export coefficient, causality in 1990-97 ran from the decrease of the wage bill share towards the rise of the investment and export coefficient.

Table 3 shows that in 1997-99, as a result of the external shock explained in section 5.1., there is no increase in (I+X-M)/Y, issue that explains why in that period (P/Y) and (W/Y) areconstants.

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seen both the equation and figures of the estimates prepared for this paper that cover the rest of the period under study.

Table 2. Peru.Investment, Net Exports, Profits and Wages Share.

1990-2010

(In percentage of GDP at current prices)

Year	(I/Y)	(X-M)/Y	(I+X-M)/Y	P/Y (a)	IMP/Y	ITI/Yb/	W/Y	Spu/Y
1990	16.5	-4.9	11.6	48.8	9.3	9.8	32.1	-5.5
1991	17.3	-4.5	12.8	50.4	9.9	9.7	30.1	0.7
1992	17.3	-5.3	12	53.4	10.6	9.5	26.4	0.7
1993	19.3	-7.1	12.2	55.1	10.3	9.6	25.1	2.1
1994	22.2	-6.1	16.1	54.6	10.9	9.5	25.1	2.9
1995	24.8	-8.6	16.2	54.4	11	9.4	25.2	2.3
1996	22.8	-6.5	16.3	54.7	10.6	9.8	24.9	3.8
1997	24.1	-5.7	18.4	55.6	10.4	9.8	24.2	5.1
1998	23.6	-5.9	17.7	55.3	10.3	9.9	24.5	3.8
1999	21.1	-2.7	18.4	55.8	9.7	9.7	24.9	1.7
2000	20.2	-2.9	17.3	56.6	9.5	9.5	24.4	0.8
2001	18.8	-2.2	16.6	56.2	9	9.6	25.1	0.5
2002	18.4	-2.1	16.3	56.6	8.8	9.5	25.1	0.7
2003	18.4	-1.5	16.9	56.5	9.1	9.4	25.1	1.2
2004	17.9	0.1	18	57.3	9.3	9.4 c/	23.9	1.7
2005	17.9	1.4	19.3	58.6	9.5	8.9 c/	23.1	2.5
2006	20.1	3.1	23.2	60.8	9.2	8.0 c/	21.9	5.4
2007	22.8	1.4	24.2	61.3	9.1	8.0 c/	21.7	6.4
2008	26.9	-4.2	22.7	60.9	9.4	8.8 c/	20.9	6.7
2009	20.7	0.2	20.9	60.7	8.3	9.0 c/	22.1	4.3
2010	25.1	-1.5	23.6	61.5	9.1	8.2 c/	21.2	5.8

Source: Banco Central de la Reserva, INEI y MEF

a/ Gross profits defined as national account surplus minus production and import taxes, minus independent workers income.

b/ See Table A-7 of the Statistical Annex for the estimation procedure.

c/ Ministerio de Trabajo / DISEL

Table 3. Peru 1990-2010. Increases in (I+X-M)Y, (P/Y), (W/Y) and (Spu)/Y.

(In percentage of GDP at current prices)

	Δ(I+X-M)/Y	Δ (P/Y)	Δ (Spu)/Y	Δ(W/Y)	Δ(IMP/Y)
1990-97	6.8	6.8	10.6	-7.9	1.1
1997-99	0	0.2	-3.4	0.7	-0.7
2002-10	7.3	4.9	5.1	-4.9	1.1
1990-2010	12.1	12.8	11.3	-11.9	0.6

Source: Table 2

It is useful to analyze three sub-periods in 1990-2010, taking into account the differences in both events and the growth policies implemented in 2002-10 versus 1990-2000, which explain a different direction of causality.

In 1990-97 took place both the shock stabilization program for facing hyperinflation and the major reforms: labor reform and deregulation of the labor market, trade and financial opening, privatizations, drastic reduction of the Government intervention in the economy, etc. While on 2002-10 the emphasis was on export and private investment promotion, and rising competitiveness through measures that increased total productivity growth.

In 1998-99 Peru suffers the rebound of both the Asian and Russian crisis and goes through a recession. Both (I+X+M)/Y and (P/Y) remained constant – a fact that corroborates the hypothesis of this paper.

The recovery from the recession of 1998-99 is quite slow –since as it was explained in Section 5.1 investment decisions were severely damaged. From 2002 onwards policies oriented to accelerate exports and investment started to be felt. Investment plus Net Exports starts a rapid recovery in 2003. Export acceleration isa result of the international boom in commodities markets, the opening of new markets for not traditional exports and new policies for promoting exports.

In 2002-10 takes place the faster growth in exports, investment and GDP in the Peruvian registered economic history –GDP accelerates and reaches record rates in the range of 7 to 10 percent per year in 2006-10 interrupted only with a temporary de-acceleration in 2009 caused by the Great Global Recession of 2007-09.

Table 3 confirms that in 2002-10 the (I+X-M)/Y coefficient rises in 7.3 points of percent of GDP. This causes an increase of 4.8 points of percent in (P/Y). The latter was quite smaller than the rise of (I+X-M)/Y because of the large increase of 5.9 points of percent in GDP in the public savings coefficient (Spu) which contributes to finance the rise in investment and net exports. The increase of 4.8 points in (P/Y) explains a reduction of 4.9 points in (W/Y).

Hence, in 2002-2010 causality ran from the rise in investment plus net exports coefficient, towards the increase in the profit share and the decrease of the wage bill share.

It seems relevant to underline that a higher investment and export growth in 2002-10 resulted on a lower impact in the functional income distribution than the one registered in 1990-97, because of the rise of Public Savings – and probably because in 2008-10 the increase of labor incomes and pension funds generated for the first time a rise of savings from labor incomes. In the following section we shall see that a rapid increase in total productivity in 2002-10 contributes to the previous explanation.

6. Empirical evidence: the rise of the rate of profit and income distribution.

Table 4 presents the estimates of the macroeconomic profit rate (r) for selected years within 1990-2010. Such estimates were obtained using equation (10), with the (P/Y) data of Table 1 and estimates of the capital-output ratio (k).The annual capital–output ratio was obtained using the GDP figures of National Accounts and the fixed capital estimates methodology developed for Peru by [Carranza, E., Fernandez Baca, J. and Moron, E. (2003),p.14-23]. The latter uses the perpetual inventory method for 1950-2002 [8]/.These estimates were extended in this paper for 2003-10 using the same methodology.

Table 4. Peru 1990-2010.The Rate of Profit and the Capital-Output Ratio.

	k	(P/Y)	r
1990	3.2	0.488	0.153
1997	2.9	0.556	0.197
1999	2.9	0.558	0.192
2000	2.8	0.566	0.202
2002	3.0	0.566	0.190
2010	2.5	0.615	0.246

Source: GDP figures are from National Accounts, INEI www.inei.gob.pe , BCRP y MEF. Capital-Output ratios were estimated as it is explained in this paper, using [Carranza et al

[8] / The fixed capital stock of each year is obtained applying a 4.5 % of depreciation to the stock of the previous year and then adding the fixed gross investment of the current year.

(2003)] method for estimating the annual stock of fixed capital. (P/Y) was obtained from Table 1. The rate of profit (r) was obtained from equation (10): [r = (1/k)* (P/Y)].

Table 4 shows that the rate of profit (r) follows the trend analytically suggested in Section 4. It rises from 15.3 percent in 1990 up to 24.6 percent in 2010. This rise is explained by both the increase in the profits share (P/Y) and the reduction of the capital-output ratio(k).[9]/

However, the increase in the profit share was larger in 1990-97 than in 2002-10 and the reduction of the capital-output ratio quite lower. While in 2002-10 the reverse is true: the rise in the profit share was lower than in 1990-97 and the reduction in the capital-output ratio higher. In 2002-10 takes place for the first time in many years, a sustainable growth in total productivity, in the range of 2 to 3 percent per year, which explains the reduction of the capital-output ratio registered in Table 4 for 2002-10.

Validating the analytical approach developed in sections 3 and 4 of this paper, empirical estimates show that in 1990-97 the reduction in the wage bill share explains the rise in the profit share and profit rate and the increase in the investment plus net exports coefficient. While the rise of the investment plus net export coefficient to GDP, (I+X–M)/Y in 2002-10 generated an increase in (P/Y) required both for the rise in savings (sp*P)/Y and the increase of the rate of profit (r).

7. Conclusions.

1. The analytical approach developed in sections 3 and 4 suggests that in the context of the Peruvian economy in 1990-2010, there was a relationship between the functional income distribution and the acceleration of investment and net exports. The reasons for

[9] / Using for 2007-10 the so called "Cambridge Equation"[P/K = gr/sp], P/K = 0.244 when gr = 0.086 and sp = 0.352.These figures correspond to the annual average of the years 2007-10 if 2009, a year that suffers the impact of external Great Recession, is not considered. This confirms the previous empirical findings.

that are twofold. First, such acceleration process requires an increase in savings that demanded a rise in the profits share in GDP. Second, it also demanded a rise in the rate of profit that also requires an increase in the same share. However the direction of causality in 1990-2007 was from a serious downward shift in the wage bill share in GDP towards an increase in the investment plus net exports coefficient. While in 2002-2010, the period of faster growth, the direction of causality ran from the increase in the investment plus export coefficient to the increase in the profit share and thus the decrease in the wage bill share. Thus, in the period of fast growth, the rise in the Investment plus Net Exports share in GDP forced a rise on savings and an increaseof the rate of profit – and a worsening in functional income distribution.

2. In such a context of fast growth, a significant increase in the public savings ratio to GDP partially eased up the amount of "forced savings" demanded through the adjustment of the functional income distribution. Similarly, the acceleration of total productivity growth reduced the capital-output ratio and, other things equal, allowed a higher rate of profit with a lower negative impact in the functional income distribution. Finally, the increase in labor incomes plus the new pension system (AFP's) generatedin 2008-10 savings from wages, which contributed to private savings formation and eased up the "forced savings" process.

3. The empirical evidence validates the previous approach for Peru 1990-2010. Regression analysis and raw statistical data, confirm it. Thus, in 1990-2010, the investment plus net exports coefficient rises in 12. 1 points of percent of GDP and is associated to an increase of 12.9 points of percent in the profit share to GDP and fall of 12 points of percent in the share of the wage bill in GDP.

4. The previous trend also explains the rise of the rate of profit on fixed capital, from 15.3 percent in 1990 to 24.6 percent in 2010.

5. It is useful to distinguish three periods from a growth policy point of view. During the first one, 1990-97, the stabilization program, the economic reforms and the neoliberal

deregulation of the labor market, caused a reduction of the wage bill share of 7 points of percent of GDP and an increase of the profits share of 6.8 points of percent. The latter explains the increase in savings needed to finance the increase in the investment plus net exports coefficient of 6.8 points of percent of GDP during this period. In this period, the rate of profit grew from 15.3 percent to 19.7, mainly because the reduction of average labor costs – while all deliberate policies for improving productivity growth that could ease up such process were ignored because of the free market adjustment ideology.

6. The second period, 1997-99, showed the impact of an external shock originated in the rebound on Peru of the Asian and Russian financial crisis that due to economic policy flaws grew up into a serious recession. During this period both the investment plus export coefficient and the share of profits in GDP remained constant and the same happened with the wage bill share – validating once again the analytical approach. The rate of profit showed a decline in this period. The recovery from this recession was slow and economic growth was felt only from 2002 onwards.

7.The recovery starts from 2002 onwards. Export and Investment promotion policies were initiated in 2002. In the same year started the boom in international commodities markets that increased demand and prices of Peruvian traditional exports. Thus, the main feature of the third period (2002-10) is a strong acceleration of the investment plus net exports coefficient, that explains the higher rates of economic growth achieved in Peru's economic history. (The GDP growth rate accelerated from 2 percent in 2001 up to 7 percent per year in 2007 and 9.8 percent in 2010). The investment and net exports coefficient rose 7.3 points of percent of GDP. However, due to a sharp increase in the public savings coefficient, the previous trend caused a lower rise in the profits share in GDP of 4.8 points of percent of GDP and a contraction of also 4.8 points of percent in the wage bill share in GDP.

8. Another important change that takes place in the third period is the implementation of active policies towards accelerating total productivity growth. The result is a significant

decrease in the capital-output ratio, which allows for a rise in the rate of profit –that grows up to 24.6 percent- with a weaker negative impact in the wage bill share in GDP. As a matter of fact, the increase in the rate of profit in this period is explained more by the reduction of the capital-output ratio than by decrease of the wage bill share in GDP.

9. Two corollaries emerge from the previous conclusions. Within the context of a fast growing economy, higher contributions to savings from other sources such as public savings and savings from labor incomes, would allow a weaker impact of a certain rise in the investment plus net exports coefficient on the wage bill share. Similarly, a significant reduction of the capital-output ratio through active policies towards accelerating total productivity would induce a higher rate of profit with a lower reduction in the wage bill share in GDP.

10. As it was explained, in 1990-97 causality ran from a downward shift in the wage bill share to a higher profit share providing the savings needed by the increase in the investment plus net export coefficient were. But in 2002-2010, the years of fast growth, causality ran from an upward shift in the investment plus net export coefficient to an increase in the profit share, decrease in the wage bill share and rise in savings. Hence one could conclude that a Neo-classical or Marxian causality dominated in 1990-97, while Post-Keynesian causality was present in 2002-2010, the period of faster growth.

11. Although the target should be an improvement in the household income distribution, it seems obvious that a severe worsening of the functional income distribution demands larger efforts and resources in attaining such target. Resources are needed to compensate for the damage in the functional income distribution and improve the household income distribution – particularly in terms of taxes, transfer schemes and social public expenditure.

12. The challenge seems to be how to maintain a high rate of economic growth in order to secure employment creation and poverty reduction while at the same time, improve the household income distribution. This might require a combination of new sources of

savings, aggressive active policies towards accelerating productivity and a significant effort in income redistribution policies.

13. The income redistribution policies would require an improvement in the present low tax pressure (15.7 percent of GDP in 2012), mainly reducing the large tax evasion and increasingdirect tax rates for distributed profits and rents – maintaining lower tax rates in not distributed profits. It will also require a more efficient approach in social policies.

14. Social policies are built in Peru on programs that are today insufficiently coordinated and have large leakages. Moreover, those programs were developed with the ideaof alleviating poverty while productive improvements for poor familieswere assume to arise automatically from the free markets resource allocation. The market automatic productive improvement of the poor families did not take place. Then, it is worthwhile to explore a shift towards a higher efficient management of those programs and a more productive bias in policies towards poverty, with more emphasis on access to resources for poor families for increasing productivity, such as credit, training, simple technologies, infrastructure and particularly roads and connectivity to markets – instead of the emphasis on poverty alleviation programs. Perhaps this shift may simultaneously increase the productivity and income of poor families, improve poverty reduction and attain a better household income distribution.

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Statistical Annex

A. Regression Tests.

1.**Unit Root.**Table A-1 summarizes the main results of the unit root tests, including the Augmented Dickey-Fuller (DFA).

Table A-1 shows that there is a unit root problem in the (P/Y) series. Table 2 reports the Ng-Perron Statistical Test. The same tests are used for the (I+X-M)/Y series and are summarized in Tables A-3 and A-4 below. The conclusion is that it is not possible to reject the hypothesis that the series presents a unit root. The same is found for the (Spu/Y) series.

Using the Zivot-Andrews test it is found a breaking point in the (P/Y) series in period 10 (year 2000), and in the (I+X-M)/Y and (Spu/Y) series in period 9, (year 1999). These results justify the inclusion of a Dummy variable starting in 1999.

TableN° A-1

Nivel de Significancia	DFA	DF-GLS	Phillips-Perron	ERS Punto Óptimo
	-4.478651	-3.89141	-2.931477	8.59323
1%	-4.532598	-3.77000	-4.498307	4.22000
5%	-3.673616	-3.19000	-3.658446	5.72000
10%	-3.277364	-2.89000	-3.268973	6.77000

Table N° A -2

		MZa	MZt	MSB	MPT
Ng-Perron test statistics		-18.10730	-3.00705	0.16607	5.04345
Asymptotic critical values*:	1%	-23.80000	-3.42000	0.14300	4.03000
	5%	-17.30000	-2.91000	0.16800	5.48000
	10%	-14.20000	-2.62000	0.18500	6.67000

Nivel de Significancia	DFA	DF-GLS	Phillips-Perron	ERS Punto Óptimo
	-2.279082	-2.400376	-2.398507	11.76057
1%	-4.498307	-3.770000	-4.498307	4.22000
5%	-3.658446	-3.190000	-3.658446	5.72000
10%	-3.268973	-2.890000	-3.268973	6.77000

		MZa	MZt	MSB	MPT
Ng-Perron test statistics		-7.08488	-1.87764	0.26502	12.86640
Asymptotic critical values*:	1%	-23.80000	-3.42000	0.14300	4.03000
	5%	-17.30000	-2.91000	0.16800	5.48000
	10%	-14.20000	-2.62000	0.18500	6.67000

Table N° A- 3

Nivel de Significancia	DFA	DF-GLS	Phillips-Perron	ERS Punto Óptimo
	-3.408062	-2.86084	-3.361443	25.86096
1%	-4.498307	-3.77000	-4.498307	4.22000
5%	-3.658446	-3.19000	-3.658446	5.72000
10%	-3.268973	-2.89000	-3.268973	6.77000

		MZa	MZt	MSB	MPT
Ng-Perron test statistics		-4.87312	-1.56075	0.32028	18.69830
Asymptotic critical values*:	1%	-23.80000	-3.42000	0.14300	4.03000
	5%	-17.30000	-2.91000	0.16800	5.48000
	10%	-14.20000	-2.62000	0.18500	6.67000

2. Co-integration analysis.

The first step is the test "*VAR Lag Order Selection Criteria"* in order to obtain the number of lags to be included in the analysis. This is shown in Table A-4.

Following the lag number criteria of Akaike (AIC), Schwartz (SC), and Hannan Quinn(HQ), the number should be at most one (1).It is now possible to apply the Johansen test in order to know if there is a co-integration vector – and how many integration vectors. Tests in the following Table A -5 shows mixed results, since one test (Trace) establish that there is no co-integration, while the second test (Max Eigen Value) establish that there is at most one co-integration vector. These results suggest that one must pay attention to what economic theory says on this subject – and economic theory says that one must expect a a medium and long run relationship among the studied variables. The next step is to estimate the error correction model (VEC). This is presented in Table A-6 .

The Vector Correction Estimates in Table 6 show that there is a convergence since a negative value equal to – 0.234021 is found and its "t" statistics is – 2.025 (higher than 2 in absolute values). Hence there is a long term relationship among the analyzed variables. The Vector Correction Estimates allow us to measure the relationship between (P/Y), (I+X-M)/Y and (Spu/Y). The conclusion is that there is a positive relationship between (P/Y) and (I+X-M)/Y and a negative relationship between (P/Y) and (Spu/Y), with a coefficient equal to 1.814618 con t- Statistic equal to 7.6483 for the first independent variable and a coefficient of -1.368214 and t-Statistic equal to 4.74058 for the second independent variable – and a relevant constant. This validates the tested theoretical equation.

Table N° A- 4."Var Lag Order Selection Criteria".

VAR Lag Order Selection Criteria
Endogenous variables: Y X
Exogenous variables: C
Date: 02/02/12 Time: 20:31
Sample: 1990 2010
Included observations: 16

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-59.85635	NA	7.819463	7.732044	7.828617	7.736989
1	-35.18393	40.09268*	0.595244*	5.147991*	5.437712*	5.162827*
2	-33.48375	2.337749	0.821165	5.435469	5.918337	5.460195
3	-32.92818	0.62501	1.372739	5.866023	6.542038	5.900641
4	-28.80096	3.611323	1.600469	5.85012	6.719282	5.894628
5	-20.14955	5.407132	1.240776	5.268693	6.331003	5.323092

* indicates lag order selected by the criterion
LR: sequential modified LR test statistic (each test at 5% level)
FPE: Final prediction error
AIC: Akaike information criterion
SC: Schwarz information criterion
HQ: Hannan-Quinn information criterion

VAR Lag Order Selection Criteria
Endogenous variables: Y X Z
Exogenous variables: C
Date: 02/04/12 Time: 20:44
Sample: 1990 2010
Included observations: 19

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-109.0643	NA	26.65306	11.79624	11.94536	11.82148
1	-75.95580	52.27659*	2.146951*	9.258506*	9.854993*	9.359455*
2	-68.14833	9.862068	2.662984	9.384035	10.42789	9.560697

* indicates lag order selected by the criterion
LR: sequential modified LR test statistic (each test at 5% level)
FPE: Final prediction error
AIC: Akaike information criterion
SC: Schwarz information criterion
HQ: Hannan-Quinn information criterion

VAR Lag Order Selection Criteria
Endogenous variables: Y X Z
Exogenous variables: C
Date: 02/04/12 Time: 20:44
Sample: 1990 2010
Included observations: 19

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-109.0643	NA	26.65306	11.79624	11.94536	11.82148
1	-75.95580	52.27659*	2.146951*	9.258506*	9.854993*	9.359455*
2	-68.14833	9.862068	2.662984	9.384035	10.42789	9.560697

* indicates lag order selected by the criterion
LR: sequential modified LR test statistic (each test at 5% level)
FPE: Final prediction error
AIC: Akaike information criterion
SC: Schwarz information criterion
HQ: Hannan-Quinn information criterion

Table A-5. Trace and Max Eigen Value Tests

Date: 02/06/12 Time: 13:54
Sample (adjusted): 3 21
Included observations: 19 after adjustments
Trend assumption: Linear deterministic trend
Series: Y X1 X2
Lags interval (in first differences): 1 to 1

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None	0.673736	26.96513	29.79707	0.1025
At most 1	0.212393	5.684230	15.49471	0.7325
At most 2	0.058625	1.147857	3.841466	0.2840

Trace test indicates no cointegration at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.673736	21.28090	21.13162	0.0476
At most 1	0.212393	4.536373	14.26460	0.7988
At most 2	0.058625	1.147857	3.841466	0.2840

Max-eigenvalue test indicates 1 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Table A-6. Vector Error Correction Estimates

Vector Error Correction Estimates
Date: 02/06/12 Time: 13:59
Sample (adjusted): 3 21
Included observations: 19 after adjustments
Standard errors in ( ) & t-statistics in [ ]

Cointegrating Eq:	CointEq1
Y(-1)	1.000000
X1(-1)	-1.814618 (0.23726) [-7.64830]
X2(-1)	1.368214 (0.28862) [4.74058]
C	-28.36428

Error Correction:	D(Y)	D(X1)	D(X2)
CointEq1	-0.234021 (0.11582) [-2.02052]	0.396596 (0.23042) [1.72120]	-0.135310 (0.18664) [-0.72499]
D(Y(-1))	0.402898 (0.24074) [1.67359]	0.182035 (0.47893) [0.38008]	0.645437 (0.38793) [1.66380]
D(X1(-1))	-0.228959 (0.15491) [-1.47802]	0.220459 (0.30818) [0.71536]	-0.011594 (0.24962) [-0.04645]
D(X2(-1))	0.162038 (0.14224) [1.13921]	-0.167792 (0.28297) [-0.59297]	-0.158104 (0.22920) [-0.68980]
C	0.951966 (0.49081) [1.93957]	-0.095947 (0.97643) [-0.09826]	0.672706 (0.79090) [0.85055]
DUM2	-0.864654 (0.60798) [-1.42216]	0.773143 (1.20954) [0.63921]	-1.054221 (0.97971) [-1.07605]

B. Estimation of (ITI/Y).

The following estimates rest on what is available in the statistic data of Peru. The Household Surveys have suffered several changes in 1990-2010, both in coverage and definitions. The figures of this section are an attempt to overcome the problems of coverage and definitional change and have been built on previews researches on the subject. Table A-7 summarizes the estimation of (ITI/GDP). Defining Independent Workers Average Annual Income (IMTI); GDP per employed worker (GDP/ETOT) and the share of Independent Worker Employment in Total Employment (EMIN/ETOT), it follows that (ITI/GDP) can be obtained from:

(ITI/GDP) = [IMTI * (EMIN/ETOT)/(GDP/ETOT)]

This is the procedure used in Table A-7. (IMTI) estimates for 2004- 2011 are produced by DISEL/Ministerio de Trabajo. For 1990-2003 there are estimates of (IMTI) for Lima only, published in [Ministerio de Trabajo.(2003) p.32-47]. Hence, the methodology used in this paper was to track backwards the aggregate estimates of 2004-11, at the annual rates implicit in the Lima (IMTI) estimates in 1990-2003. The relative stability of (ITI/GDP) along time is explained by the following trends.The main component of Independent Workers employment and income is largely the one that corresponds to unqualified independent workers. This variable tends to move with the GDP at current prices because it always registers a price adjustment of an opposite sign to the one registered by the employment adjustment. When the economy grows faster the independent employment is reduced because it is absorbed by wage employment and its income tends to grow up. When the economy de-accelerates independent workers income tend to shrink and independent worker employment tends to increase. Hence the trend towards a stable coefficient (ITI/GDP) is explained by that pattern of adjustment to the changes in GDP performance.

Table A-7 includes in column (5) an estimate for the Independent Workers Income Share in GDP for Lima. In Column (6) the reader can find the ratio of (ITI/GDP) to the estimates for Lima. This ratio is above 2 and shows an upward trend. This is explained by the fact that a higher proportion of Independent Workers Employment and Income is outside Lima and this fact has been increasing along time. This increase is the product of several trends, one of them, the rapid growth of several cities employment outside Lima caused by the fact that not traditional and traditional exports growth took place outside Lima.

The second feature is the slight long term downward trend in (ITI/GDP). This is explained because both the share of independent employment in total employment and the share of average independent income in GDP tend to decrease –see column (1). The downward trend of the share of Average Income of Independent Workers in GDP is not new, it has been underlined in [Ministerio de Trabajo. (2003), p.32-47]. The more relevant issue is that since (ITI/GDP) figures are a rather small aggregate in the Income Chapter of National Accounts, eventual differences from the real figures are even smaller and cannot change the direction of the trend in (P/Y) stated in this paper.

Table A-7. Peru 1990-2010. Estimates of ITI/Y at current prices

	EMIN/ETOT (1) a/	IMTI S/.corr. (2) b/	GDP/ETOT (3) c/	ITI/GDP (4) d/	ITILI/GDP (5) e/	Ratio (4)/(5) (6) f/
1990	0.353	494.4	1780.9	0.098	0.0469	2.131
1991	0.349	852.1	3067.8	0.097	0.0461	2.114
1992	0.361	1077.1	4092.7	0.095	0.0444	2.136
1993	0.347	1995.7	7395.6	0.096	0.0412	2.337
1994	0.351	2761.5	10203.6	0.095	0.0371	2.568
1995	0.331	3488.7	12284.6	0.094	0.0355	2.647
1996	0.361	3987.1	13467.1	0.098	0.0359	2.723
1997	0.331	4451.4	15034.5	0.098	0.0329	2.978
1998	0.302	5024.1	15326.8	0.099	0.0321	3.084
1999	0.312	4838.7	15563.8	0.097	0.0332	2.927
2000	0.359	4393.8	16604.5	0.095	0.0331	2.879
2001	0.361	4207.7	15820.6	0.096	0.0317	3.028
2002	0.365	4223.5	16227.8	0.095	0.0309	3.074
2003	0.345	4594.4	16862.5	0.094	0.0301	3.123
2004	0.339	5223.4	18838.9	0.094	0.0295	3.186
2005	0.334	5221.5	19596.6	0.089	0.0285	3.128
2006	0.332	5302.7	22004.1	0.08	0.0278	2.877
2007	0.328	5807.5	23811.9	0.08	0.0278	2.877
2008	0.334	6849.7	25997.6	0.088	0.0279	3.154
2009	0.334	7087.8	26302.5	0.09	0.0281	3.203
2010	0.325	7316.5	28996.5	0.082	0.0278	2.949

Source: Estimates based on data of DESIL/MINTRA, ILO-LIMA, PEEL/MINTRA; INEI/ENAHO's and INEI Cuentas Nacionales.

a/ ILO Panorama Laboral (Various Numbers).
b/DESIL/MINTRA for 2004-10 and author estimates for 1990-2003 based on PEEL/MINTRA data, Boletin de Economía Laboral Nº 25, 2003.

c/ INEI Cuentas Nacionales and INEI ENAHO's plus author estimates

d/Desil/MINTRA for 2004-10; author estimates for 1990-2003.

e/ author estimates based on Household surveys for 2003-10 and PEEL/Min Tra Boletin Economico Laboral Nº25 2003 for 1990-2002.
f/ simple ratio.