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The Global Crisis and the Peruvian Labor Market: Impact and Policy Options[1]

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Abstract

After almost 20 years of prudent macro policies, Peru seems in better shape than before to withstand the effects of a financial crisis. Progress, however, has left some policy areas unscathed and the labor market is one of them. In this paper we analyze the potential effects of the crisis on labor market outcomes, and discuss policy options to address short run and structural considerations. We review stylized facts from this and previous crisis to account for potential transmission mechanisms, review policy options and results from past and existing labor market interventions, and build a DSGE model to provide further insight regarding labor market outcomes and the effects of transitory and permanent policy measures. On the countercyclical front, our analysis reveals that the main risk that the policymaker should aim to mitigate is a surge in informality and underemployment. For this, job protection alternatives (as temporary payroll tax holidays already implemented) have to be accompanied by a strengthened and better focalized reemployment service, especially if the shock transpires into the non-tradable sector. On the more structural side, policy should aim at the prime drivers of informality in our country: low productivity and high formal labor costs. For the latter, progressive access to labor benefits for small firms (already introduced via a special labor regime) could be complemented by introducing different minimum wage levels according to firm size and a generalized reduction in firing costs. Low productivity issues, on the other hand, can be addressed by strengthening and integrating existing training programs and information networks which have already proven successful in terms of formal job creation. Simulations reveal that permanent non-wage cost reductions (like those introduced via the special labor regime) can increase formal employment and formal GDP participation by 2 percentage points. Structural policy interventions also exhibit a large countercyclical potential due to their permanent nature. This implies that we should not wait for the crisis to be over to start their implementation.

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1. Introduction and motivation

Before the global crisis hit the Peruvian economy, the common wisdom was that Peru will be able to forestall it in much better shape than before. The basis for that widespread belief was the recent progress in terms of macroeconomic policy outcomes. GDP per capita has increased –in real terms- by 44.5 percent in the last decade. Poverty rates have come down from 48.6 percent in 2004 to 36.2 percent in 2008.

Peru has achieved monetary stability and is much better prepared to withstand foreign shocks with an amount of foreign reserves that is equivalent to more than 25 percent of GDP, compared to Chile that has 14 percent or Brazil with 12 percent. Twenty years before, the Peruvian economy escaped out of a hyperinflation process with persistent and more disciplined monetary and fiscal policies, and with the unusual choice of a dirty floating exchange rate regime. The financial system endured several banking crisis in the 80s and 90s and now it looks fortified, after several mergers and with a larger share (12 out of 15) of foreign banks. Perhaps, the fact that depicts more clearly this change is that Peru now has investment grade for its sovereign debt after being a pariah in the international financial markets. Public external debt went from 70 percent of GDP in 1988 to only 15 percent in 2008. These remarkable outcomes have been the consequence of good policies, and also good luck. Prudent macroeconomic policies have been followed in the last twenty years under different administrations, and the recent surge in commodity prices has helped to consolidate much of the work of policymakers.

However, progress has left some policy areas unscathed in the last decade. One of those is the labor market. The political willingness to reduce the rigidity of the labor market was gone by the end of the 90s. Only in the last years there was a timid attempt to modify this situation with the new small and medium enterprise law that offered a less costly labor regime. In that sense, it is valid to question if our labor market is ready to withstand a major external shock and if the tools to deal with a sudden drop in external demand will suffice, as the benefits of formal employment are in place only for half of the workforce according to the latest household survey (ENAHO 2008).

As usual, the crisis created an opportunity to suggest many action plans. Some are old (increase the minimum wage, income support programs, among others) and some are new (e.g. training targeted on the unemployed), some seem promising and others seem dangerous. For example, increasing the minimum wage might be an easy way to expand workers incomes but at the potential cost of increasing informality (Jaramillo, 2005). On the promising side, we have evidence supporting that demand driven training programs can have a significant impact on workers productivity (Díaz and Jaramillo (2006) and Yamada (2008a)). Moreover, policymakers face the trade off of solving current problems but creating more in the future, as some policy options could be too fiscally expensive in terms of how much is gained in jobs protected. The road of good intentions is filled with bad outcomes.

In this paper, we address the impact of the global financial crisis in the Peruvian economy with a special focus on the labor market and we suggest how to evaluate different policy choices. For this, we start from the fact that the adequacy of alternative policy measures will depend on the policy objectives, the magnitude and duration of the external shock, and which sectors are most affected. Once we have identified the most relevant policy options, we also review the literature on past and existing interventions in order to avoid making the same mistakes, and to improve our policy recommendations. To help evaluate policy alternatives, we present a quantitative exercise based on a general equilibrium model. We believe this is the most appropriate approach since it will not only capture the most significant transmission mechanisms of the global crisis, but will also allow to simulate the effects of both transitory and permanent policy interventions. All this analysis will need to include the uncertainty about the pace of the global economy recovery, since it is still unclear if the world economy will go back to normal in a short period of time or if it will take longer to resume growing steadily.

Our analysis does not focus on the standard countercyclical stimulus package that could be engineered combining fiscal and monetary policies. Since the wake of the crisis the Peruvian Central Bank has continuously cut down short term interest rates, and the Finance Ministry has launched a fiscal stimulus plan, and one could expect that these will exert an impact on the labor market. Their main transmission mechanism, however, can only be tracked down at the aggregate level via an expansion in domestic demand.

Instead, our objective is to focus on and assess the convenience of alternative policy interventions within the labor market, something that, in fact, has not been sufficiently addressed in the current countercyclical effort[2].

The rest of the paper is organized as follows. In section 2, we discuss the potential transmission mechanisms of the crisis, presenting some stylized facts to characterize how it is affecting the performance of the domestic economy and the labor market so far. In section 3, we present alternative policy objectives, describe policy options available, and discuss their adequacy under different crisis scenarios. In section 4, we present the main features and discuss the results of our model. Finally, in the last section we summarize the policy recommendations that stem from the analysis in section 3 and the quantitative scenarios portrayed in section 4.

2. Potential transmission mechanisms and labor market outcomes: the stylized facts

After posting a 9.8% annual growth rate in 2008, Peruvian real GDP grew only 1.8% in the first quarter of this year. While some argue that this is as low as it will get in terms of aggregate output growth, the truth is that the manufacturing sector has already been severely hit and its real output has dropped more than 5% during the first quarter of 2009. Not surprisingly, during this same period, urban employment in this sector also fell by a figure close to 5%, while total urban employment annual growth fell from 6.9% to 3.4% between the last quarter of 2008 and the first quarter of this year (see Figure 1).

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[2] The 2009-2010 Economic Stimulus Plan has a total budget of S/.12,561 million (3.2% of GDP). Only 1.4% of its total budget has been allocated to policy interventions that can be regarded as directly focused on the labor market.

**Figure 1: Urban employment growth in firms with 10 or more workers
(annual percentage change of a 3-month rolling index)**
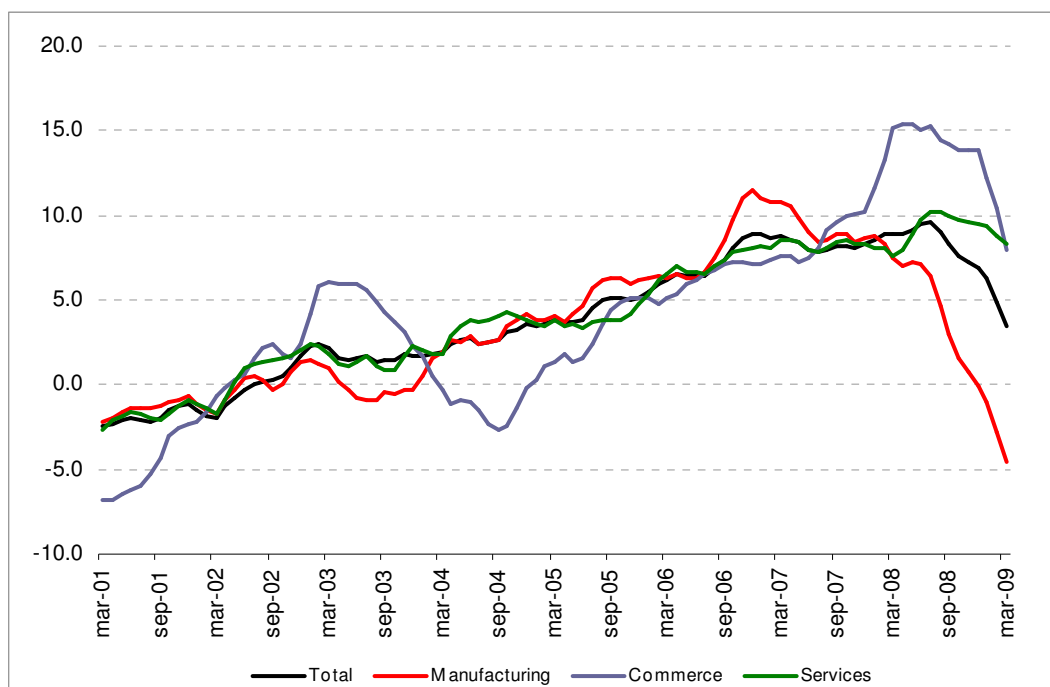
Source: Peruvian Central Bank and Labor Ministry.

Using an alternative classification of the MINTRA data set we can have a clearer picture of which sectors have been the most affected by the external shock and the ongoing slowdown. In Figure 2 we plot the behavior of urban employment in five sectors of the economy. As expected, the manufacturing sector has taken the largest toll, followed by the extractive sector. Both sectors are the ones with tighter links to external demand. In fact, by September 2008, these were already growing below their 2008-2009 average. Commerce, services, and transportation, which are more linked with domestic demand, have suffered a slowdown but not a contraction, and their response has taken more time to materialize (they are growing below their 2008-2009 average since January 2009).

During the previous crisis (1998-2001), all five sectors experienced negative growth rates. By that time, the external shock triggered a domestic financial market crisis which affected aggregate investment and job creation rates throughout the economy.

Figure 2: Urban Employment
**Firms with 10 or more workers, annual growth rate**
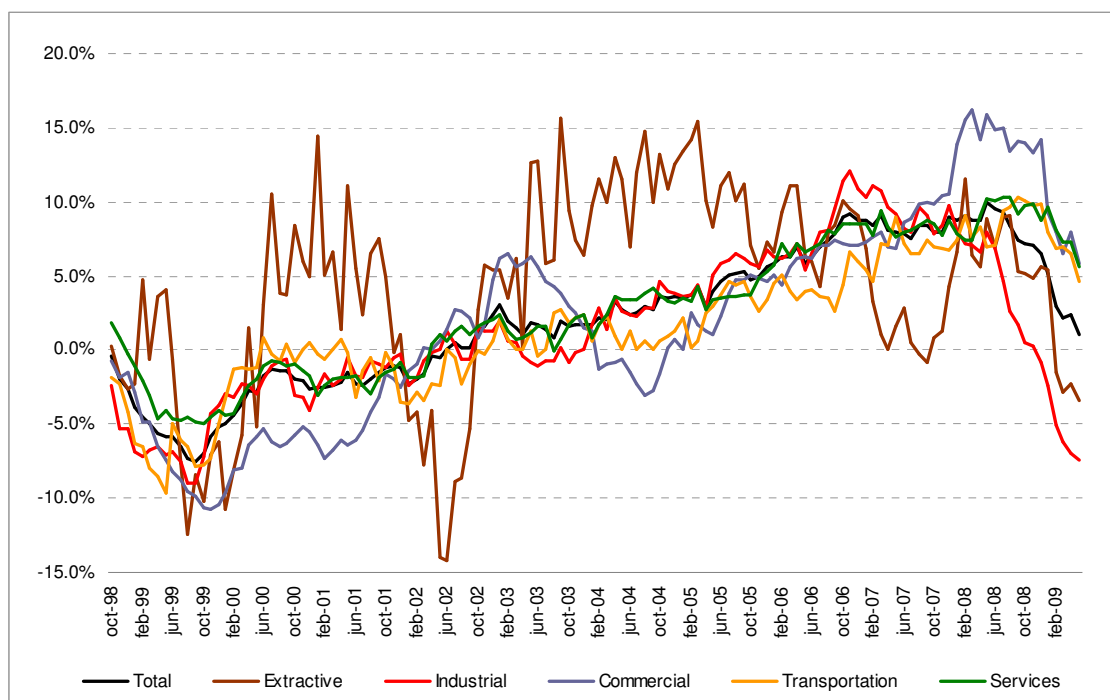
Source: Labor Ministry (Informe Estadístico Mensual), INEI.

The above symptoms are consistent with an external crisis which is hitting the economy mainly through a commercial channel. In fact, total exports exhibit a 32% drop in dollar terms if we compare the first quarters of 2008 and 2009[3], while mining and textile exports report dramatic cutbacks of 35% and 27%, respectively. Terms of trade, on the other hand, have deteriorated more than 22% during the same period (see Figure 3). As consumption and investment flows drop in the rest of the world (and especially in the larger economies), external aggregate demand for our tradable goods falls and this translates into a reduction in their prices.

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[3] Most of this 32% drop is explained by a decline in prices (-28%). Quantities have only dropped 5% during this period.

Figure 3: Exports growth and terms of trade
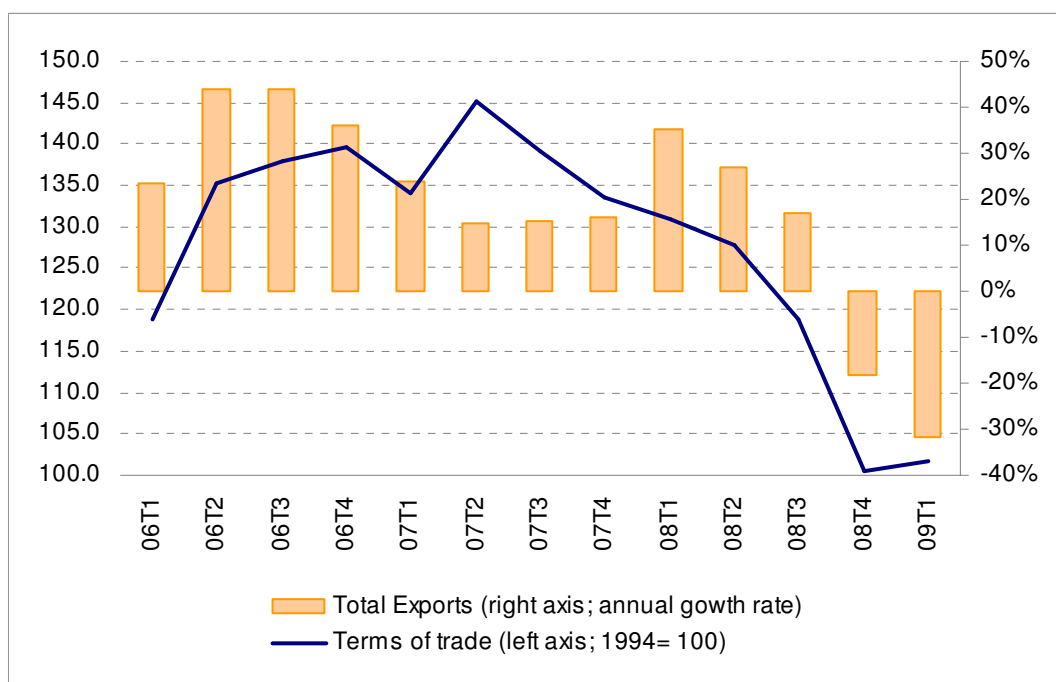
Source: Peruvian Central Bank.

The way this transpires into the domestic economy can be summarized as follows: a reduction in external demand (which implies a reduction in both export prices and quantities), reduces the real return to labor in the tradable sector. As the demand for this factor drops, tradable output, employment and wages will be negatively affected. In the short run, wage rigidities and job protection legislation can slowdown this adjustment process. In Peru, however, these constraints can be easily bypassed switching to informal contracts. The ultimate consequence is the job post can be maintained but with less benefits for the worker. Moreover, and as will be analyzed later, underemployment (rather than unemployment) is the variable that grows during recessions.

The exact combination in which employment and wages will adjust will depend on labor supply and demand elasticities, as well as on the presence of rigidities discussed above. In any case, real incomes of families supplying labor to the tradable sector will be negatively affected. In some cases, this will be the consequence of a wage cut, in others it will be the consequence of a transition to an underpaid job or unemployment.

This income effect is one the main channels through which the initial shock can leak into the rest of the economy and its strength will depend, crucially, on the size of the

tradable sector. If a significant number of families are affected by wage cuts and/or job losses, consumption and investment flows will drop, aggregate demand will contract and this will end up hitting non-tradable output which, by definition, is determined by domestic demand.

Together with the commercial channel summarized above, there is another potential mechanism which can end up hitting domestic consumption and investment, and this time more directly: the financial channel. In fact, this channel was the main transmission mechanism during the 1998-99 crisis. As international investors cutback savings flows, small open economies (emerging markets) are the first to get hit, mainly because of risk considerations. If the domestic financial sector is heavily dependant on these flows to finance private investment, a credit crunch could follow and domestic firms will be rationed. Under these circumstances, a flexible exchange rate could act as a shock absorber: it should raise, mitigate the effect on domestic interest rates and help close any external imbalances on the commercial front. In emerging markets, bad news in the rest of the (financial) world typically translate into large nominal exchange rate depreciations, and this price adjustment should help the domestic economy accommodate the scarcity of foreign funds.

However, problems on the real side can arise with this adjustment mechanism if the domestic economy exhibits large currency mismatches in the balance sheet of either banks, firms, households or the government. Under these circumstances, and as described by the financial accelerator literature (Bernanke, Gertler and Gilchrist, 1999), a large depreciation will increase the real burden of debt, reduce firms' net worth and lead to an increase in interest rate risk premium. The latter will end up reducing investment flows, thus magnifying the real effect of the external shock and also making it more persistent.

While the above was the prevailing story to account for the 1998-2001 recession, several stylized facts suggest that we now have a much stronger financial front. While it is true that foreign currency credit to the private sector has stopped growing due to the external turmoil, it is also true that total credit keeps growing although at a slower pace (20 percent in April 2009 instead of 30 percent in October 2008). Moreover, liability dollarization ratios have dropped more than 25 percentage points in the last 10 years

(from 80% in 1998 to 55% by the end of 2008) reducing the threat to the economy of a balance sheet effect. As in the 1998-99 crisis, short term capital flows have experienced an important downfall in the past months. However, foreign currency credit is now less dependent on volatile external short term liabilities (see Figure 4). Moreover, the ability of the Peruvian Central Bank to smooth out pressures on the exchange rate market has been an element that had helped to avoid larger problems in financial markets. The Peruvian exchange rate has fluctuated less than the rest of their Latin American counterparts.

Figure 4: Short term capital flows (% GDP) and funding sources of foreign currency credit (1998-99 crisis vs. current scenario)
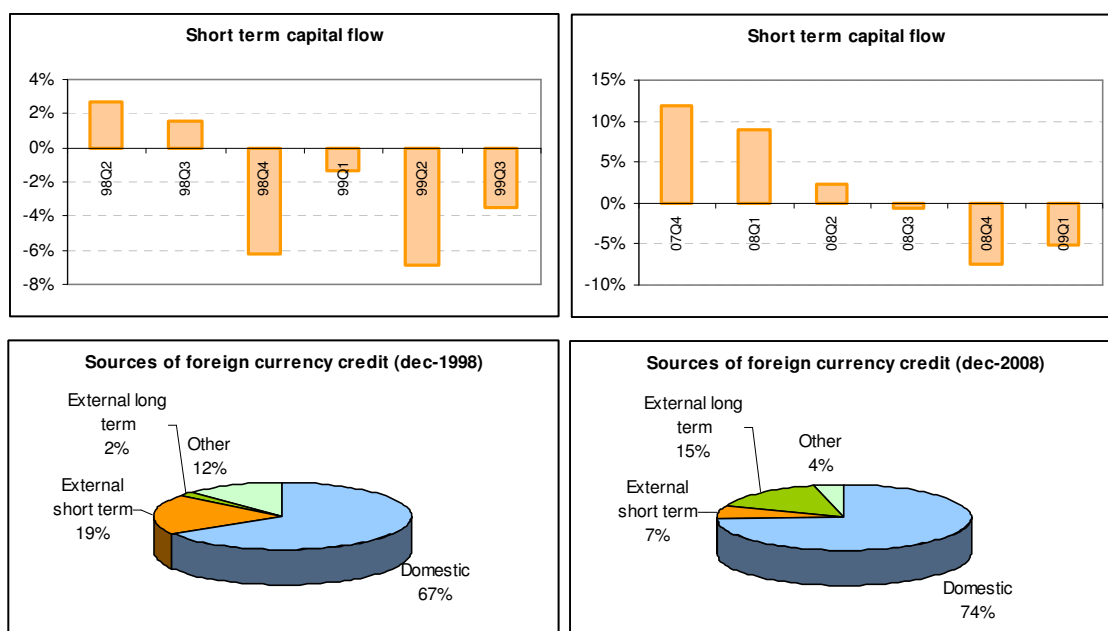
Source: Peruvian Central Bank.

An additional transmission mechanism of the crisis has to do with firms' expectations about the future behavior of the economy. Investment decisions today are linked not only to the cost of financial funds but also to potential demand. Investment flows tend to be more volatile than consumption or GDP as they are more heavily influenced by the business cycle dynamics. When there is a boom in consumption, firms will phase in their process of buying imported inputs to have enough stocks to sustain the growing demand. If the expectations about the economy are shattered by any type of news or shock, investment flows will become smaller. If the reversal is drastic, firms will be forced to reduce stocks heavily to counteract the slowdown in sales. In fact, this

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mechanism will create a large (but temporary) drop in investment. In Figure 5 we plot this reversal in expectations about the growth rate of GDP in 2009. The positive outlook about the economy lasted only up to September 2008 when the Lehman Brothers collapse prompted a major revision of growth expectations. The ensuing global crisis has been the major factor in the downward trend in expectations in the following months. Instead of a 7.5% growth rate, now the revised market expectations are more close to 2.5% growth rate. As second quarter figures were worse than expected, those expectations might be reduced even further.

Private investment was growing more than 15 percent (quarter-over-quarter) since the last quarter of 2005. At the height of the boom, private investment grew up to 34 percent in the second quarter of 2008. But, once expectations about GDP growth reversed, investment growth rates fell to 1.8% (2009Q1). Some of that fall is due to the rapid decrease of stocks. According to Central Bank estimates the slight fall (-1.1%) of aggregate demand in 2009Q1 would have been a 4.1% positive growth rate if we exclude the fall in inventories.

Figure 5: Expectations about Peruvian GDP 2009 growth rate
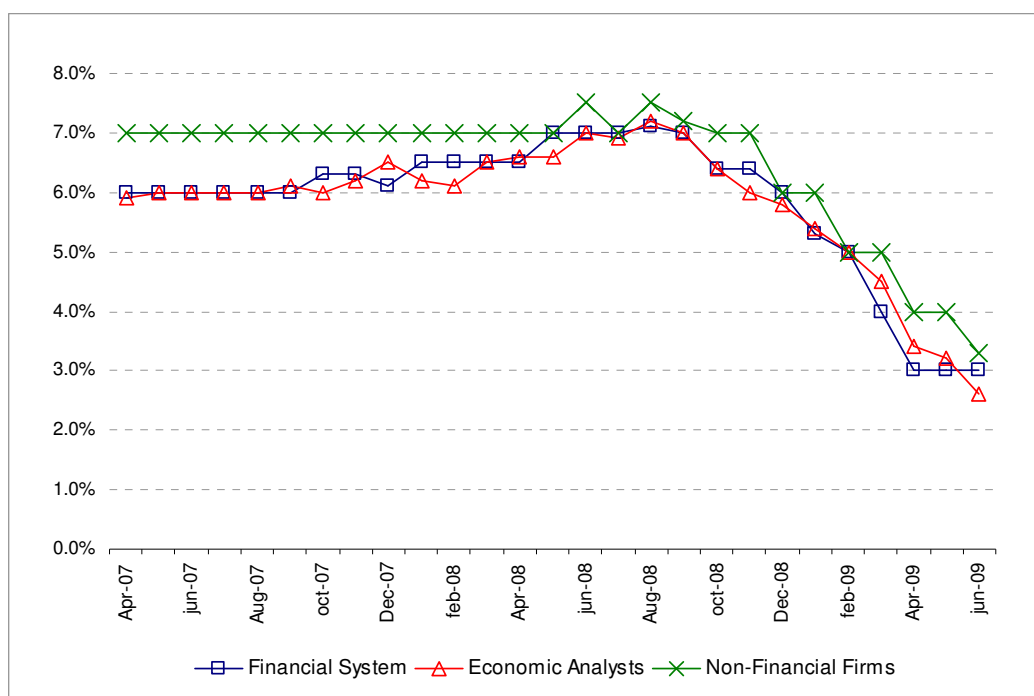
Source: Peruvian Central Bank.

Booms and busts are part of business cycles and cannot be avoided. The latter are accompanied by a reduction in employment growth rates (as already shown) and by a decline in earnings. In our case, average real labor income in Lima has experienced a slowdown, falling from a 9.4 percent annual growth rate in 2008 Q2 to a 3.1 percent growth in 2009 Q2 (see Figure 6). Falling labor incomes can, in fact, become one of the major concerns related to recession periods, as experiences reveal that adequate employment might easily turn into underemployment[4] when the economy is in the downturn.

Figure 6: Average real income in Metropolitan Lima (annual growth)
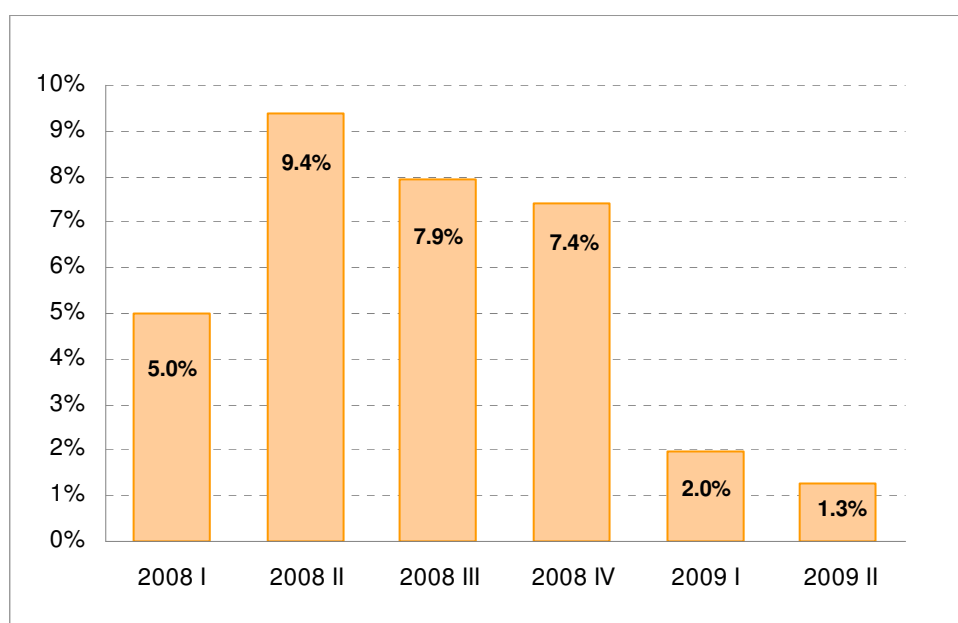
Source: Encuesta Permanente de Empleo EPE.

Thus, it is important to have some sense of how different the labor market might behave in boom and bust periods. Given the lack of comparable data across a larger sample we constructed a transition matrix for a bust period (1998-1999) and another for a boom period (2007-2008)[5]. Table 1 allows us to have a much better idea of how fast adequate

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[4] Underemployment refers to underemployment by income. That is, the share of the labor force working full-time but earning less than its corresponding household basic consumption basket (defined with the appropriate poverty line) divided by the average number of income earning household members in its corresponding geographic zone.

[5] The ideal analysis would have comprised the period 1997-2002 for the bust scenario and the period 2002-2008 for the boom. In addition, this analysis should be done using a single panel for the whole sample in order to track the same group of workers. We have privileged the use of a panel data set and, thus, data limitations force us to shorten the bust and boom periods to the ones shown in Table 1. We also tried with a longer panel for the bust period using a1998-2002 panel data set. However, there is a

employment might turn into underemployment or unemployment when the economy is in the downturn of the business cycle. Each cell in both panels of Table 1 show the probability of moving from a certain employment status (identified in the rows) to another one (identified in the columns). For example, panel A reveals that during a boom period, a worker with an adequate job has a high probability (69.4%) of keeping the same type of job. Panel B, on the other hand, shows that during a recession this probability falls nearly 10 percentage points. Workers who are not able to keep an adequate job move to underemployment status instead of moving to unemployment. In fact, during a recession, the probability of switching from adequate to underemployment raises from 23.2% to 32.1%, while the probability of losing an adequate job to unemployment only grows from 1.2% to 2.5%. As will be discussed later, this is consistent with the existence of a limited unemployment insurance mechanism that forces workers to rapidly switch to underpaid jobs.

Table 1: Transition matrix between different employment status and inactivity 2007-2008 (boom) vs. 1998-1999 (bust)

Panel A: Boom 2007/2008

T → T +1	Adequately Employed	Under employed	Unpaid family worker	Unemployed	Inactive	Total 2007
Adequately Employed	69.4%	23.2%	2.3%	1.2%	3.9%	100.0%
Underemployed	19.8%	61.0%	7.6%	1.7%	10.0%	100.0%
Unpaid family worker	5.0%	19.7%	59.0%	1.5%	15.0%	100.0%
Unemployed	16.9%	28.8%	8.5%	11.9%	33.9%	100.0%
Inactive	6.1%	19.3%	10.7%	3.1%	60.8%	100.0%

Panel B: Bust 1998/1999

T → T +1	Adequately Employed	Under employed	Unpaid family worker	Unemployed	Inactive	Total 2007
Adequately Employed	59.0%	32.1%	2.5%	2.5%	3.9%	100.0%
Underemployed	17.5%	61.3%	7.5%	1.9%	11.9%	100.0%
Unpaid family worker	4.8%	20.2%	58.2%	1.1%	15.7%	100.0%
Unemployed	16.3%	41.5%	6.6%	11.8%	23.9%	100.0%
Inactive	4.0%	18.5%	12.0%	3.5%	62.1%	100.0%

Source: ENAHO 1998, 1999, 2007, 2008.

significant loss in the number of observations available, so the results are not statistically significant. The main messages shown in Panel A, however, still hold.

3. Alternative policy options to deal with the crisis and beyond

In the previous section, we have described the effects of the crisis on the pace of job creation in the aggregate economy, and showed how employment loss is affecting sectors with a strong tradable component, like manufacturing and extractive activities. Confronted with this scenario, policymakers face a relatively ample array of potential interventions. Thus, our objective in this section is to provide a clearer view of the policy options available and discuss their appropriateness given particular objectives, crisis scenarios and lessons already learned from existing interventions.

Let us start by clarifying policy objectives. For this, we propose three dimensions based on the characteristics of the Peruvian labor market and its previous responses to economic downturns. In the first place, and as already discussed, it should be noticed that transitions to unemployment do not correlate with the business cycle. Thus, a surge in this status should not be the prime concern of policymaking. Instead, one can argue that welfare losses during recessions are mainly driven by movements towards underemployment. Concerns related to this phenomenon are based on the fact that losing an adequate job to underemployment implies moving to a consumption bundle below the poverty line. As discussed in World Bank (2009b), we can expect unskilled workers and those with little experience (such as women and young people) to be particularly vulnerable to a reduction in labor demand.

Along with this, policymakers should also address more structural welfare issues related to workers' access to social protection mechanisms such as pensions, social security and unemployment insurance. This implies providing incentives for the creation of formal jobs which, in our country, only reach half of the workforce.

Given the above, in what follows our discussion will focus on policies' potential for: (i) preventing adequate employment loss in the aggregate economy; (ii) preventing real income loss in particularly vulnerable groups (young, unskilled workers, women); and (iii) extending formal job benefits to a larger proportion of the employed population. All of these, balanced against the fiscal sustainability of the intervention.

The first two objectives listed above are closely related with the business cycle and, thus, will call for interventions of countercyclical nature. The third objective, on the other hand, has more to do with the structural phenomena that explain why our labor market exhibits a large informal sector as an equilibrium outcome. Therefore, policy options' adequacy to tackle the first two objectives will depend on the magnitude of the shock and the way it transpires into the aggregate economy (which sectors are being hit and its duration). To deal with the third objective, on the other hand, we will need to address the determinants of equilibrium labor market outcomes in our country (labor productivity and labor market regulations in place). In both cases, we will need to take stock of our specific country circumstances and what has already proved effective.

3.1 Coping with the cycle

Let us now turn to the array of policy options available. On the more countercyclical (thus transitory) side of the spectrum, we can distinguish two subsets: (i) those aimed directly at the labor market; and (ii) those that seek to provide income support for the unemployed. The first subset, in turn, can be divided between job protection and worker protection programs.

Protecting failing firms has, in general, the potential of generating moral hazard problems and unclear redistributive effects which can end up being markedly regressive. As mentioned in Ikenson (2008), taxpayers should not be forced to subsidize a company, specially an inefficient one. Stiglitz (2008), on the other hand, argues that the trickle down focus of the bailout (hoping that public funds given to the companies will eventually benefit workers) almost never works. Moreover, the author argues that even if they do work, bailouts fail to solve the problem in the most efficient or fairest way. We can always, however, invoke political economy considerations: if massive layoffs threaten to spur social unrest, one could be willing to set efficiency considerations aside, at least temporarily. Given the stylized facts already discussed, however, we do not think a protracted recession with the risk of massive job losses portrays the way the crisis will unravel in our country, and this should help dismiss the possibility of protecting jobs via bailouts.

Other job protection mechanisms such as voluntary "work sharing" schemes, wage subsidies or temporary payroll tax holidays can end up providing an extra dose of

flexibility and alleviating firms' labor cost. The external shock has led to a contraction in the demand for labor which, in the absence of any of these policy measures, would imply that firms will hire fewer workers at a lower equilibrium wage rate. Under this scenario, the implementation of a wage subsidy or a temporary payroll tax holiday could allow firms to hire the same amount of labor as before the shock keeping workers' income intact. Thus, these job protection alternatives can effectively dampen job separations as the burden of keeping the post would be shared with the government.

According to the Peruvian legislation, social security contributions are paid by the employer and are equivalent to 9% of workers' salary. Employees, on the other hand, must pay between 12% and 13% to their pension fund administrator and between 10%-30% to the government as income tax. In addition, firms are required to pay mid-year and end-of-year bonuses each equivalent to a complete monthly wage. These bonuses are part of the salary base used to calculate social security and pension contributions as well as income taxes.

Under this framework, the Peruvian Congress has recently exonerated Independence Day (July) and Christmas wage bonuses from social security and pension contributions until 2010. Workers, however, have to pay income tax on the extra money they are receiving out of this income relief. From the workers point of view, this extra money is equivalent to a 3.7% increase in their annual pre-tax income. There is also a cost relief from the point of view of the firm as they are no longer required to pay social security contributions on these bonuses. This part of the policy measure is, thus, more along the lines of a temporary tax holiday described above.

According to Reflexión Democratica (2009), the cost of this policy decision will be as follows: the social security administration (EsSalud) will receive US$ 150 million less each year and the public pension system (ONP) will receive around US$ 62 million less each year. It is expected that both institutions will ask the Finance Ministry to compensate this budget cut. In addition, we should also factor in that private pension fund administrators (AFPs) will receive lower fees as workers will contribute less to their pension funds. To compensate, AFPs might react by increasing fees' rates and this will ultimately affect workers disposable income. Finally, an additional cost will come in terms of reduced future consumption as workers are choosing to save less today.

Other countries in the region have adopted similar job protection measures. According to World Bank (2009a), Chile has launched a 30% wage subsidy for low income (less than US$ 600 per month) youngsters who have finished high school and a temporary income tax reduction for firms that engage in training activities for their workers. Colombia, on the other hand, has reduced parafiscal contributions for new (less than 4 years) enterprises, while Mexico has approved wage subsidies for exporting firms.

One of the main caveats of this type of job protection policy is that it could be protecting the wrong post. In fact, these interventions can only affect formal jobs and this is why some authors doubt their countercyclical potential. In fact, Bosch and Maloney (2008), working with data from Mexico and Brazil, find evidence to support that the countercyclical nature of unemployment is explained mainly because of job separations from the informal sector.

As stressed above, however, the adequacy of countercyclical policy interventions will depend on which sectors are being hit by the shock, and its potential to transpire into the rest of the economy. In this regard, Peruvian evidence discussed in the previous section shows that, in this particular recession, job separations are occurring mainly in tradable activities (like manufacturing), and these concentrate formal jobs. In fact, those concentrating informal jobs (like commerce with nearly 60% informality) still exhibit positive growth rates, so we can expect the informal sector to serve its traditional buffer role. Losing a formal job, in turn, implies a greater chance of losing an adequate post[6], and this is consistent with the significant increase in the probability of moving from adequate employment to underemployment exhibited during the 1998-2001 recession.

Within the realm of worker protection alternatives, reemployment services for dislocated workers can prove useful to achieve a greater impact on particularly vulnerable groups (related to our second policy objective). In this regard, the government has recently launched a free retraining program (*Revalora Peru*) for

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[6] According to ENAHO 2008 data, nearly 55% of formal jobs are also adequate jobs. Moreover, this figure could be underestimated since data limitations force to identify formal jobs if the worker is receiving social security benefits. It is important to note that in Peru many formal workers pay income tax but do not receive social security benefits. Thus, formal independent workers (having an adequate job) could be erroneously classified as informal.

workers who have lost their job since the beginning of 2008. The fields in which training is being offered are construction (6 weeks), manufacturing (6 weeks), and tourism (3 weeks). The training is provided by three technical higher education institutes: Sencico (construction), Senati (manufacturing) and Cenfotur (tourism). Unemployed workers can registry themselves in decentralized Labor Ministry offices to access this program.

A larger budget and greater focus, however, will be required if this program is to effectively protect the most vulnerable. Only 0.8% of the Economic Stimulus Plan is devoted to the retraining program. In addition, greater focus on vulnerable groups like women can help enhance the impact of the program. For example, while male workers in the mining sector (one of the tradable activities most severely hit by the crisis) already have similar skills to those required by construction and heavy industry, female workers in other vulnerable sectors (like textiles) are more specialized and could be harder to train and relocate in those activities. In addition, Yamada (2008b) has already found that, even in normal times, relocation comes with larger wage cuts for female workers: while average real wage downgrades for those who have found a new job after an episode of unemployment can be as high as 20%, this figure rises up to 41% for women.

The list of income support programs, on the other hand, is preceded by unemployment insurance schemes and, in principle its benefits could be readily expanded to face a crisis by extending its duration and/or its coverage. In fact, Brazil has already extended its unemployment insurance by two months for all those who lost their job after December 2008.

Our country, however, lacks a proper unemployment insurance mechanism. The closest thing we have to a contingent transfer in the event of unemployment is the *Compensacion por Tiempo de Servicios* (CTS). It consists of an annual payment equivalent to one monthly wage that the employer deposits on the employee's bank account and, in principle, these funds should only be withdrawn when the job relationship is terminated. The CTS has two features that make it unsuitable as a policy instrument aimed at our first two objectives. First, it was not designed as a standard unemployment insurance that works as an automatic stabilizer of business cycles. In

fact, access to this benefit is limited only to formal dependant workers. Thus, and while it is true that the government could make a transfer to households using these accounts, this type of policy would be markedly regressive. Second, more importantly, its insurance nature has been distorted as Congress has repeatedly authorized its use for alternative purposes (to finance house building and transitory expansions in consumption). As a consequence, Yamada (2008b) fails to find evidence that access to CTS have helped workers that lost their jobs to avoid a wage downgrade by the time they found a new one. The author suggests that this may be a consequence of having access to CTS funds before the job is lost: limited funds are not enough to finance a job search long enough to avoid an underpaid new post[7]. Thus, rather than proposing it as a direct countercyclical instrument, policy recommendations related to CTS are more along the lines of ensuring that funds are not used before a minimum level is attained (Yamada suggests 5 monthly wages based on the average duration of unemployment spells).

Given the above, if we seek to prevent large real income losses on those who fall into unemployment, we will need to resort on less sophisticated transfer mechanisms: direct cash transfers and/or public works programs. Regarding the former, direct conditional cash transfers are being used in Peru since 2005 via the *Juntos* program. The beneficiaries of this program are rural households in extreme poverty with children. In the first quarter of 2009, *Juntos* has transferred S/.100 every month to 422,491 families, for a total budget of S/.146 million. Although effective in alleviating immediate needs and fostering access to educational and health services (when these are available), this program is strictly focused on rural districts where focalization is relatively easy and, more importantly, where the effects of the external crisis are not being particularly strong.

Public works, on the other hand, require a minimum set of conditions to create the proper incentives and improve cost-effectiveness, such as setting wages below the market average, choosing projects with a demand-driven approach, and minimizing non-labor costs. Evidence regarding the impact of this type of programs in Peru is

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[7] It should be noticed that low-paid jobs typically force workers to offer longer hours in order to guarantee a minimum consumption level. This prevents workers from keep on looking for a job while having a low-paid one temporarily.

mixed. On one hand, Chacaltana (2003) has found positive effects related to the emergency social productive program *A Trabajar-Urbano* (ATU)[8]. During its first year, participating workers experienced a real income increase of S/.73 (25%), with respect to the control group. In addition, benefits related to the projects developed were estimated to be around 54% of total wage expenses. The author argues that part of this positive effect was because the program financed demand driven projects that were largely awaited by the population. In addition, Chacaltana suggests that the monthly wage was probably too high as workers in the first and second income quintiles had lower average incomes. This probably lured workers with higher opportunity costs and conspired against the program's impact.

On the negative side, Yamada (2008b) found that people who participate had problems to find a well paid job after leaving the program, facing wage cuts when compared to the job prior to ATU. The author suggested that this was the result of a stigma effect that signaled ATU beneficiaries as unproductive because they required government assistance.

3.2 Structural changes for long-run benefits

A thorough analysis and a detailed list of reforms to tackle existing problems with Peruvian labor market institutions, is beyond the scope of this paper. However, we believe is important to address some basic structural issues given our third policy objective, and the fact that changes in regulation can also be an effective alternative to mitigate the effects of the crisis on the pace of adequate-job destruction.

Policy actions aimed at our third objective will need to address more structural obstacles related to low productivity and high formal labor costs. In fact, large non-wage labor costs and severance payments intended as a job protection mechanism, combined with a low average productivity in the labor force, have deterred formal job creation and currently fuel an informal rate that is about 50% of total employment. Thus, we believe

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[8] Now called *Construyendo Peru.* ATU was launched in 2001, with the objective of providing temporal employment to poor people affected by the economic downturn through simple public works that were highly labor intensive. Wage expenses were around 55% of the total budget and the program was able to generate 112,000 four-month jobs or 37,000 yearly jobs. The program paid a monthly wage of S/.300 to every worker.

two key elements of the MILES framework (World Bank (2008)) deserve especial attention: education and skills, and labor market regulations and institutions.

If we talk about raising labor productivity part of the answer, of course, has to do with improving basic education quality and raising higher education coverage (Morón, Castro and Sanborn (2009)). On a short run basis, however, we will need to resort on training programs. In fact, if truly successful, a comprehensive training program could not only serve as a countercyclical measure (reducing unemployment duration) but could also provide a permanent increase in labor productivity thus increasing the benefits of formal job creation. As the promise is larger, however, successful implementation will be harder to achieve. In particular, we require more institutional capacity than in the case of labor tax exonerations, while the type of training provided also plays a crucial role. For the latter, demand driven programs (were firms are responsible for on-the-job training) have better prospects of succeeding as they have better prospects of transferring useful skills to individuals that would otherwise be unemployed or hired in low productivity jobs.

In this regard, Díaz and Jaramillo (2006) have found that the Peruvian youth labor training program *Projoven*[9] can increase the probability of accessing a paid job between 5 and 17 percentage points. This training can also increase the probability of accessing a formal job by 9 to 18 percentage points, and raise real hourly earnings between 30% and 69%. Not surprisingly, part of the success of *Projoven* is that it is demand driven. To promote this, and before public funds are transferred, training institutions must ensure (via an "intention letter") that a firm is willing to offer the beneficiary an internship once training is over.

Yamada (2008a) finds even larger impacts related to the training program financed by the European Union as part of the *Programa de Lucha Contra la Pobreza en Lima Metropolitana* (*Propoli*). This program estimated impact on expected real wages (i.e. the proportion on which real wages are increased as a result of the program, compared to that of the nonparticipants) is around 65%, and almost 100% if the sample is

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[9] This program is managed by the Ministry of Labor, who finances 3-month training rounds focused on poor people between 16 and 24 years of age. Training is provided by a private institution and it must be followed by an internship.

restricted to those who had finished the program at least 6 months ago. *Propoli's* training costs are around three times as much as *Projoven's* due to longer training periods (6 to 12 months) and more selective training institutions. Additionally, *Propoli* restricted access to the program through an IQ test, training only young people who score "normal" or "above normal"[10]. Although *Propoli* did not require firms' commitment via "intention letters", training institutions selected for the program were among the most prestigious and offered training in highly demanded fields.

Another mechanism that has helped improve labor market efficiency is the *Red de Colocacion e Informacion Laboral (CIL) Proempleo*, which is a public employment service. Although private employment services exist in the market, they target high profile workers that can afford paying for the service. Thus, private and public services tend to complement each other rather than compete. The *Red CIL* aims at reducing search costs for both employers and employees by improving the match between labor supply and demand. Chacaltana and Sulmont (2004) found that, as a result of the service, users increased their total earnings in 27% and their hourly earnings in 37%. The program, however, had limited coverage.

The above represent three interventions that have proven successful dealing with specific labor market requirements of a more structural nature. As such, Yamada (2008a and 2009), suggests integrating them into a single, extended[11] public effort. In fact, *Red CIL* can focus on facilitating demand-supply match for public programs like *Projoven, Construyendo Peru,* and even *Revalora*. The characteristics of *Propoli*, on the other hand, can be incorporated into *Projoven* as a second layer training for the most promising students. To promote sustainability and efficiency, this second layer could have a student-loan nature and repayment could start after graduation.

The second element of the MILES framework that needs to be highlighted in this section, is that referred to labor market regulations and institutions. Our country is largely above the region's average in non-wage costs and this is mainly explained by

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[10] Applying this type of tests to select beneficiaries from the general population would have a regressive bias. However, it should be noticed that *Propoli* is targeted on the poor, from which the most promising individuals are selected.

[11] Broadening the scope of training programs is also important. Yamada (2009) shows that Peruvian training and labor allocation programs only represent 0.04% of GDP. Mexico more than doubles our figure (0.09%) while countries like Spain and France have figures close to 1% of GDP.

vacations and bonuses. According to Jaramillo (2004), in Peru, non-wage costs represent nearly 60% of the gross salary, a figure only surpassed by the size of such costs in Argentina (and this is mainly due to Argentina's large pension contributions). The World Bank's 2009 Doing Business Report, on the other hand, ranked Peru 149 out of 181 economies in the "Ease of Employing Workers" index[12], making it the weakest indicator of the Peruvian economy.

While there is consensus about the fact that labor costs in our country are significantly high according to international standards, the literature offers mixed approaches to tackle the problem. On one hand, Jaramillo (2004) starts from the fact that our current labor code (or general regime) is too rigid and favors its revision so it would only ensure a minimum set of conditions, similar to those included in the special regime for small and microenterprises[13]. Extended benefits, then, should be the result of negotiation between firms and workers. He argues that the main problem with the special regime is, precisely, that it is special. This not only implies limited coverage but also that it can end up creating incentives for larger firms to split up in order to enjoy its benefits.

Chacaltana (2008), on the other hand, starts from the fact that small firms have very low productivity and argues in favor of a special regime. He favors a "graduation" approach and suggests that transition to the general regime should be progressive: it should start around the sixth year after the microenterprise begins operating, and finish around the tenth. On a middle ground, Yamada (2008c), prioritizes a general reduction in severance payments but also favors progressive access to labor benefits for small and microenterprises.

At this point we believe is important to remember that we have proposed three policy objectives to be served, and that the first two have to do with the fact that we a currently under the effects of an international crisis. Thus, when talking about labor costs, we would also like to stand on middle ground and suggest avoiding extensive labor code

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[12] This index is composed by 19 indicators grouped in four categories: Difficulty of Hiring, Rigidity of Hours, Difficulty of Firing and Firing Costs.

[13] The special regime for small and microenterprises (re-launched in June 2008), contemplates, among other incentives, halving vacations (from 30 to 15 days) and halving mid and end-year bonuses, each originally equivalent to a complete month salary.

revisions that would end up being unfeasible due to large political costs. According to World Bank (2007), Peruvian labor markets exhibit high firing and hiring costs compared to regional averages, so we suggest selecting specific adjustments which contribute in both avenues, instead of choosing a single recipe.

Currently, firms are required to pay a month and a half salary for each year of work up to a maximum of 12 months. A relatively straightforward way to cut down severance payments is by reducing them to a single month salary while keeping the 12 month upper bound, as originally established in the labor reform of the early nineties. Another way to promote formality and enhance the effects of the special regime for small and microenterprises is to approve --for new contracts- the existence of two minimum wages in our labor legislation, one for large firms and a lower one for smaller firms. The current level of the minimum wage is the main deterrent for low productivity firms to switch fully to formality. This issue was pre-approved at the National Labor Council[14] in 2008 but it was aborted at the last hour.

3.3 Conclusions so far

Table 2 proposes a summary of policy options and recommendations discussed so far. These have been arranged taking into account the three policy objectives and alternative crises scenarios. If we are concerned about adequate employment and income loss (objectives 1 and 2) under a short-to-medium lived recession focused on the tradable sector, policies could narrow down to temporary reductions in non-wage labor costs such as the social security and pension contribution transitory exonerations discussed above. These will benefit formal activities and should be accompanied by a strengthened and better focalized re-employment service.

However, if the shock transpires into the non-tradable side of the economy and we are still concerned about preventing income losses in vulnerable groups, we will need policy to reach workers involved in informal activities and the above will not suffice. Under such a scenario, a greater fiscal effort would be need to strengthen public work programs like ATU, but taking special care in maintaining its demand-driven nature and

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[14] The National Labor Council (*Consejo Nacional del Trabajo*) was established in 2001 as part of an effort to counteract this problem and narrow down the policy debate promoting a less ideological discussion among the labor unions, the Ministry of Labor and the trade unions.

adjusting wages to maximize its impact and progressiveness by attracting low income-low opportunity cost workers.

Table 2: Policy options available according to policy objectives and crisis scenarios

		Policy objectives and crisis scenarios			
		1. Prevent adequate employment loss **2.** Prevent real income loss in vulnerable groups			**3.** Extend formal employment benefits
		A. Short- to-medium lived recession		**B. Protracted and widespread recession**	
		Focused on tradable sector	*Transpires into non-tradable sector*		
Policy Options	**Business cycle dependent Transitory**	**I. Active labor market policies** **(i)** Job protection: → Temporary payroll tax holiday. **(ii)** Worker protection: → Strengthened and better focalized re-employment service (*Revalora Peru*).			
			II. Income support policies → Strengthened demand-driven public works programs attracting low income-low opportunity cost workers (*ATU-Construyendo Peru*)		
	Business cycle independent Permanent			**III. MILES framework** **M**acro policies **I**nvestment climate, institutions, infrastructure **L**abor market institutions and regulations <u>High formal labor costs</u> → Promote progressive access to labor benefits for small and microenterprises and cut down firing costs **E**ducation and skills <u>Low productivity</u> → Integrate and extend successful training and labor market information programs (*Projoven – Propoli – RedCIL*) **S**ocial protection	

Source: own elaboration based on typology suggested in TOR and World Bank (2009b).

If we move towards a harsher crisis scenario and/or our third policy objective, we will need to resort to the two MILES framework components highlighted above. As already discussed, progressive access to labor benefits for small and microenterprises together with a generalized reduction in firing costs both serve our third objective and can also exert a countercyclical effect with no significant fiscal effort. This last characteristic is

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particularly desirable under a protracted recession scenario, since this would imply a significant reduction in fiscal revenues which will have to be now focused on directly protecting vulnerable groups' income. Finally, integrating and extending successful training and labor market information programs is key to enhance labor productivity, promote formal job creation and increase real incomes in the long-run.

4. Quantitative scenarios and the effects of alternative policy options

In this section we present the results of our modeling exercise. Obviously, the broad list of potential transmission channels and specific policy options discussed in the previous sections is beyond the scope of any modeling effort. Thus, our objective is to complement the analysis so far and provide further insight regarding three key issues: (i) the effects of the crisis on the evolution of aggregate GDP and formal employment; (ii) the countercyclical potential of selected policy interventions (with special emphasis on the distinction between transitory and permanent interventions); and (iii) the potential effects of changes in labor regulation and productivity on the long run participation of the formal sector in terms of employment and value added.

4.1 Main model features

The main characteristics of our model[15] respond to the objectives highlighted above and to the nature of the shock as described in section 2. Extending Villacorta (2008), we build a three sector open economy model. The non-tradable sector demands domestic capital and labor to produce goods consumed only in the local market. The tradable sector, on the other hand, demands labor and imported capital to produce goods consumed both in the domestic and foreign markets. The third sector represents informal activity. It is modeled here as the sector with the lowest labor productivity which acts as a buffer for unemployed workers. Anyone losing a job in the other two sectors will find a job in this one[16]. We assume that the informal sector does not accumulate capital and its output is only for the domestic market.

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[15] Please refer to Appendix 1 for further detail.
[16] See equation (6.) in Appendix 1.

Since the crisis is hitting us mainly through what has been previously referred as the commercial channel, the tradable sector will play a crucial role in our modeling exercise. Within this sector, real returns to both labor and capital depend on international prices. Thus, reduced external demand leading to a worsening in terms of trade will invariably make this sector less profitable. Capital will seek to flow to the non-tradable sector and/or abroad, while labor will also aim to move to the non-tradable sector or informality. The extend at which this will end up hitting production and formal employment at the aggregate level will depend, basically, on: (i) the relative size of the tradable sector in terms of value added and employment; (ii) labor productivity within sectors; and (iii) factor mobility between sectors. Obviously, as the share of production accounted for by the tradable sector grows larger, the larger will be the pass-through of the initial shock to aggregate GDP. In addition, sectors are connected through the capital market. As capital moves across to the non-tradable sector in search for a larger return, labor will follow to maintain optimal capital-to-labor ratios. Thus, lower labor productivity in the receiving sector will also contribute to transmit the initial shock into the aggregate economy: production gains in the receiving sector will be smaller than production losses in the sector initially hit by the shock. On the other hand, capital mobility between the tradable and non-tradable sector should have a mitigating effect. If less capital is allowed to move across to the non-tradable economy, less labor will be demanded by this sector and, thus, more will end-up in the informal side of the economy. Thus, production gains will now be even smaller than production losses.

At this point, it is worth highlighting that one of the limitations of our model is that we have avoided the introduction of nominal rigidities or other market imperfections that could have an amplifying effect on the initial shock. An important implication of this is that the results that stem from our simulations should be understood as an upper boundary of the way our economy will react to the crisis in the absence of a fiscal expansion other than the specific labor market policy measures we model.

We want to capture the basic stylized facts of the real shock just described (serving our first objective), but we want to do this without loosing sight of what is behind the short and long-run effect of alternative policy interventions (to serve our last two objectives). Thus, two key attributes of our model are that it is based on behavioral relationships and that it includes a stochastic component when modeling families' decisions. Compared to

other modeling exercises that could capture the stylized facts of the shock based on reduced form relations, this will allow our model to provide insight on two additional aspects: (i) how does the long run allocation of resources respond to a new set of structural conditions; and (ii) what are the consequences (for policy) of dealing with agents that make decisions based on their expectations of the future. Accounting for these aspects is crucial if we are to comply with our last two objectives: distinguish the effects of transitory vs. permanent interventions while the crises goes on, and measure the effects of the permanent ones on formal employment and output, once the crisis is over.

Our model could be enriched in at least two ways. First, it could be interesting to model the behavior of the informal sector instead of assuming a passive response to a major shift in aggregate economic conditions. In addition –and as already discussed- one could introduce rigidities preventing a smooth transition of workers from tradable to non-tradable activities. This would not only add an extra dose of realism regarding the response of each labor market, but will also make a case for active labor market interventions such as retraining programs.

4.2 Alternative crisis scenarios

In the previous section, we discussed policy options under two alternative scenarios: a short-to-medium lived recession vs. a protracted and widespread recession. Analysts' expectations regarding the crisis resemble the milder one. In fact, in its June 2009 Inflation Report, the Central Bank has revised up its expectations of a further deterioration of export prices included in the March version. Instead of a drop of 26.6% in 2009 and a recovery of 6.1% in 2010, the Central Bank now expects a reduction of 20.3% in 2009 and a smaller recovery of 4.4 percent in 2010. In addition, it presents FDI projections close to 2008 levels (US$ 4 billion) and argues that the Peruvian economy will not get severely hit at the financial front compared to other Latin American countries.

Despite the above, we will start using our model to reproduce both crisis scenarios. Although our policy simulations will be based on the short-lived recession as a baseline, comparisons with the prolonged recession scenario will provide further insight on the effects of transitory vs. permanent interventions.

Box 1: Understanding steady state growth rates

If we look at the level of macroeconomic aggregates such as GDP, consumption and investment through a sufficiently long period of time, we will notice they exhibit a positive trend. This implies that, besides short term fluctuations, all these variables have a long-run, relatively stable, positive growth rate. This rate is what can be understood as a steady state growth rate which, in principle, defines a situation in which all these variables grow at a constant rate.

Of course, steady state growth rates can be modified and this is, precisely, what an endogenous growth model seeks to explain. These models rely on variables such as education, institutions and openness to explain how an economy can move towards a new steady state and start exhibiting a different long-term growth path.

Our model is not a growth model. In fact, it is designed to account for business cycle fluctuations and, particularly, account for the way in which real variables affect the business cycle. Therefore, the growth rates we present should be understood as additional to the long-run subjacent steady state growth rate. Any temporary shock that does not change the steady state equilibrium will eventually vanish and all variables will return to their long run (steady state) growth rates. A key characteristic for the shock to vanish is that each period only a fraction of its previous value remains (it is modeled as a stationary autoregressive process). Under this setting, permanent policies can be simulated by giving a value close to one to the autoregressive parameter, so the current value of the shock (or policy instrument) remains almost permanently affected by the innovation introduced several periods behind. This implies that all variables in levels (such as formal employment participation) reach a new equilibrium value but they all stop growing (as explained above, our model is not a growth model).

The steady state growth rate can, however, be estimated outside the model. For this, one could think of it as the growth rate of potential output, i.e. the level of output that would prevail in a frictionless world. On more practical terms, one could think of steady state growth as a long-term average and, thus, one could approximate this rate by means of a cycle-trend decomposition of real GDP data. If we remove high frequency fluctuations from Peruvian 1993-2008 real GDP, the remaining trend exhibits a growth rate of 5% per year. Thus, to approximate actual growth figures, the reader should add 5 percentage points to the year-to-year growth rates reported in the main text.

In Figure 7, we compare the response of the key macro variables related to the objectives of this section, under these two scenarios. In our model, the short-lived recession is triggered by a 20% drop in export prices in period 1 (year 2009)[17]. The prolonged recession scenario, on the other hand, is also triggered by a 20% drop in

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[17] The average terms of trade decline in the year starting in 2009 Q2 has been 18.4%.

export prices in the first period, but this is accompanied by a further 10% drop in period 2 (year 2010)[18]. At this point, it is worth highlighting that all year-to-year growth figures are expressed as deviations from the variables' steady state growth rates.

Due to the connection between real returns and export prices in the tradable sector, the first round of the shock directly affects employment and production in this side of the economy. Tradable GDP annual growth falls more than 15% with respect to its equilibrium rate. As discussed above, capital is mobile and this should help dampen the effects of the shock on the aggregate economy both in terms of formal employment and GDP. However, these effects are less than perfectly offset: to maintain optimal capital-to-labor ratios, some labor must be lost to informality and aggregate formal employment falls nearly 2% in year 1. Additionally, in the non-tradable sector labor is less productive than in the tradable sector, so production gains in the former are smaller than production losses in the latter. This, together with the fact that the tradable sector accounts for nearly 35% of aggregate production, implies that aggregate GDP growth falls nearly 5% below its steady state rate the first year of the crisis.

Consistent with the existence of flexible prices, wages in the tradable sector will exhibit a similar pattern as output and employment. In particular, wages in the tradable sector fall nearly 10% in year 1 and 1.4% in year 2 under the mild recession scenario. Although considerably smaller, we can also observe a reduction in wages in the non-tradable sector. In this case, however, the reason is different: due to an expansion in labor supply in this sector, wages fall 0.3%.

The last three panels of Figure 7 depict the evolution of other key variables that will be useful when comparing policy interventions. For now, it suffices to say that tax revenues deterioration due to a reduction in formal activity raises the fiscal deficit in 1% in terms of output. On the other hand, and consistent with the decline in formal employment and the level of activity in the tradable sector, formal employment and GDP (expressed as a percentage of total employment and output) fall nearly 1 and 2 percentage points, respectively.

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[18] We have decided not to introduce shocks to external financial conditions based on the stylized facts discussed in section 2 and Central Bank's latest projections regarding FDI flows.

Figure 7: Alternative crisis scenarios
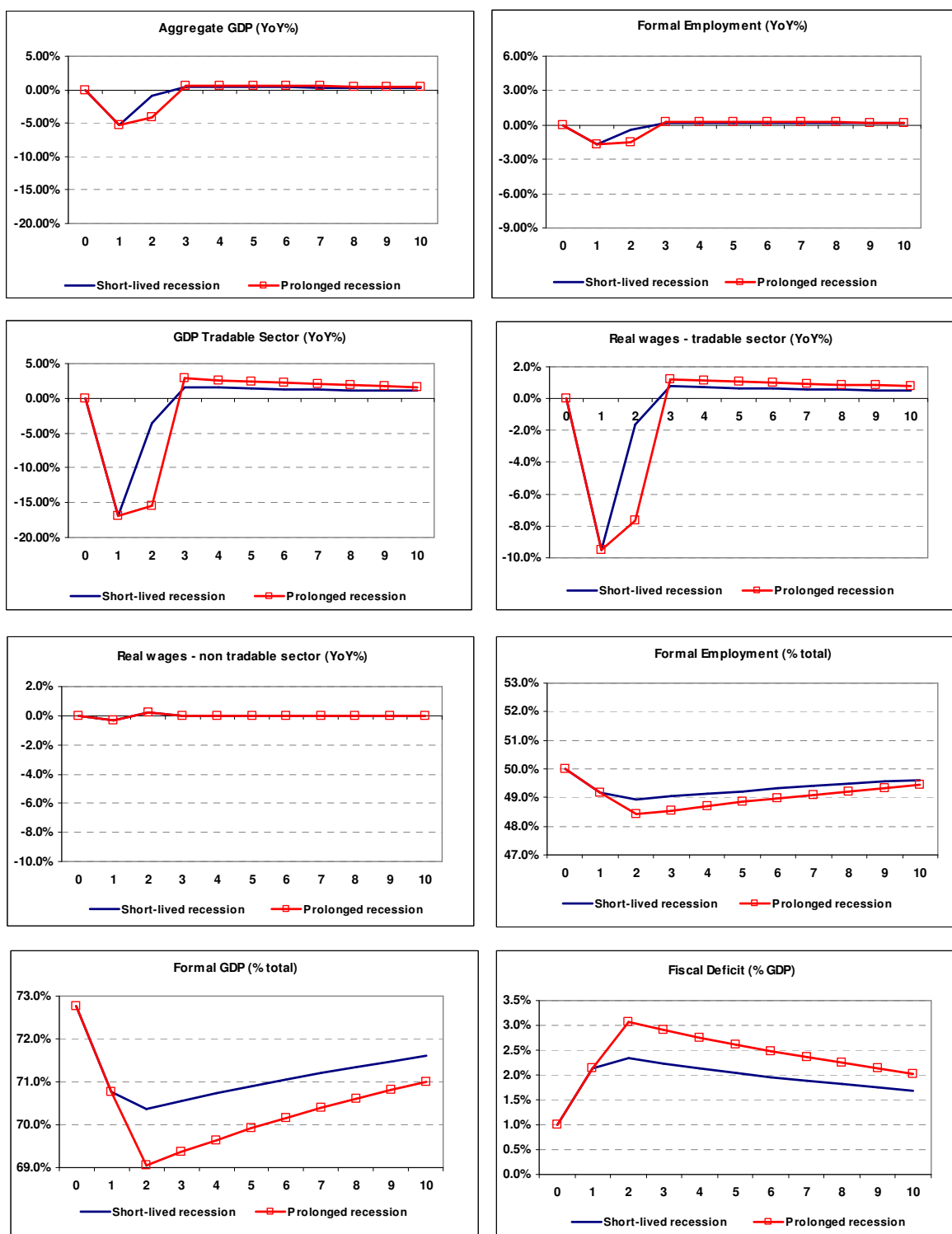
As revealed in Figure 7, the main differences between the short-lived and prolonged recessions are in period 2. Under the first scenario, output almost recovers its steady state growth rate and formal employment ceases to fall in period 2. If export prices

experience a continued decline (as the rest of the world takes more time to recover from the crisis), on the other hand, output growth will remain below its equilibrium level by nearly 4 percentage points and, consequently, formal employment will fall again by a figure close to 1.5% in year 2010.

4.3 Alternative policy options

In the discussion that follows, our aim is to serve the last two objectives of this modeling exercise: highlight the countercyclical potential of transitory vs. policy interventions of a more permanent nature, and assess the impact of the latter on formal employment and output.

As already discussed, we believe our model is particularly suited for this kind of exercise. In terms of our summary of policy objectives, crisis scenarios and policy options (see Table 2), this exercise should be interpreted as a comparison between cycle dependant active labor market policies and those that stem from the MILES framework (in particular, those referred to labor market institutions and education and skills). In fact, a transitory reduction in the labor tax will serve to mimic a temporary payroll tax holiday which is, clearly, a cycle-dependent type of policy intervention. A permanent reduction, on the other hand, can be interpreted as a change in labor market regulation conducive to cut down non-wage labor costs. Transitory changes in total factor productivity (TFP) can serve to illustrate the potential effects of training programs for dislocated workers. In fact, we assume this to be a shock of transitory nature since training is aimed at helping the unemployed find a new job and we cannot expect it to yield a permanent increase in labor productivity. Productivity enhancement programs, on the other, are expected to have more enduring effects and will therefore be interpreted via a permanent increase in TFP parameters.

Figure 8 compares a transitory and permanent reduction in labor tax with our baseline scenario (that referred as a short-lived recession in the previous discussion). In both cases, the labor tax is reduced by 20% in the first two periods. In the permanent scenario, this reduction is sustained in the years that follow. According to labor costs estimated in Jaramillo (2004), and if we exclude workers contribution to the pension

system, the transitory reduction is consistent with temporarily suppressing firms contribution to social security (public health). The permanent reduction, on the other hand, is consistent with eliminating one of the two yearly bonuses, each equivalent to a full month salary. It is worth highlighting that the temporary policy measure will have a fiscal cost as funds for social security will have to be transferred by the central government. Eliminating worker bonuses, on the other hand, should not entail any fiscal effort since this is a direct transfer from firms to families. To simulate this using our labor tax parameter, we reduced government transfers to families by the same amount, so the fiscal budget remained untouched while the family experienced an income reduction.

Figure 8, reveals several results that are worth highlighting. First, and despite having the same size in period 1, the permanent policy shock delivers a stronger countercyclical effect: aggregate GDP growth falls almost 2 percentage points less with respect to its equilibrium value, while formal employment grows nearly 1 percentage point more. Permanent policies have a stronger effect due to the forward-looking nature of agents, which implies that expected future outcomes affect current decisions[19].

In addition, our temporary payroll tax holiday prevents formal employment loss. As less labor moves into the informal sector and aggregate formal employment rises, formal employment participation grows, temporarily, above its equilibrium value (50%). The permanent policy shock, however, not only delivers a larger growth in formal employment participation on impact (consistent with its stronger countercyclical potential) but, more importantly, it delivers a long run effect: the participation of formal employment grows by nearly 2 percentage points in the new steady state, as the cost of being formal has been permanently reduced. The fifth panel in Figure 8 reveals that formal GDP participation experiences a similar long-run increase under the permanent intervention scenario[20].

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[19] Agents in the model are "forward looking" in the sense that they take current decisions based on the discounted future flow of revenues (consumption) which result form that decision. Because of this, permanent policies tend to have a greater impact today since their discounted future flow of effects is larger. The opposite would imply having "myopic" agents, which take decisions based only on current (static) revenues.

[20] The reader would notice that these permanent effects on formal employment and formal GDP are not accompanied by a permanent impact on GDP growth rate which, as shown in the first panel of Figure 7, returns to its original steady state growth rate. As explained in Box 1, our model is not a growth model and, thus, is unable to reproduce changes in long-run growth rates. It does, however, produce changes in

Figure 8: Baseline scenario vs. transitory and permanent 20% reduction in labor tax
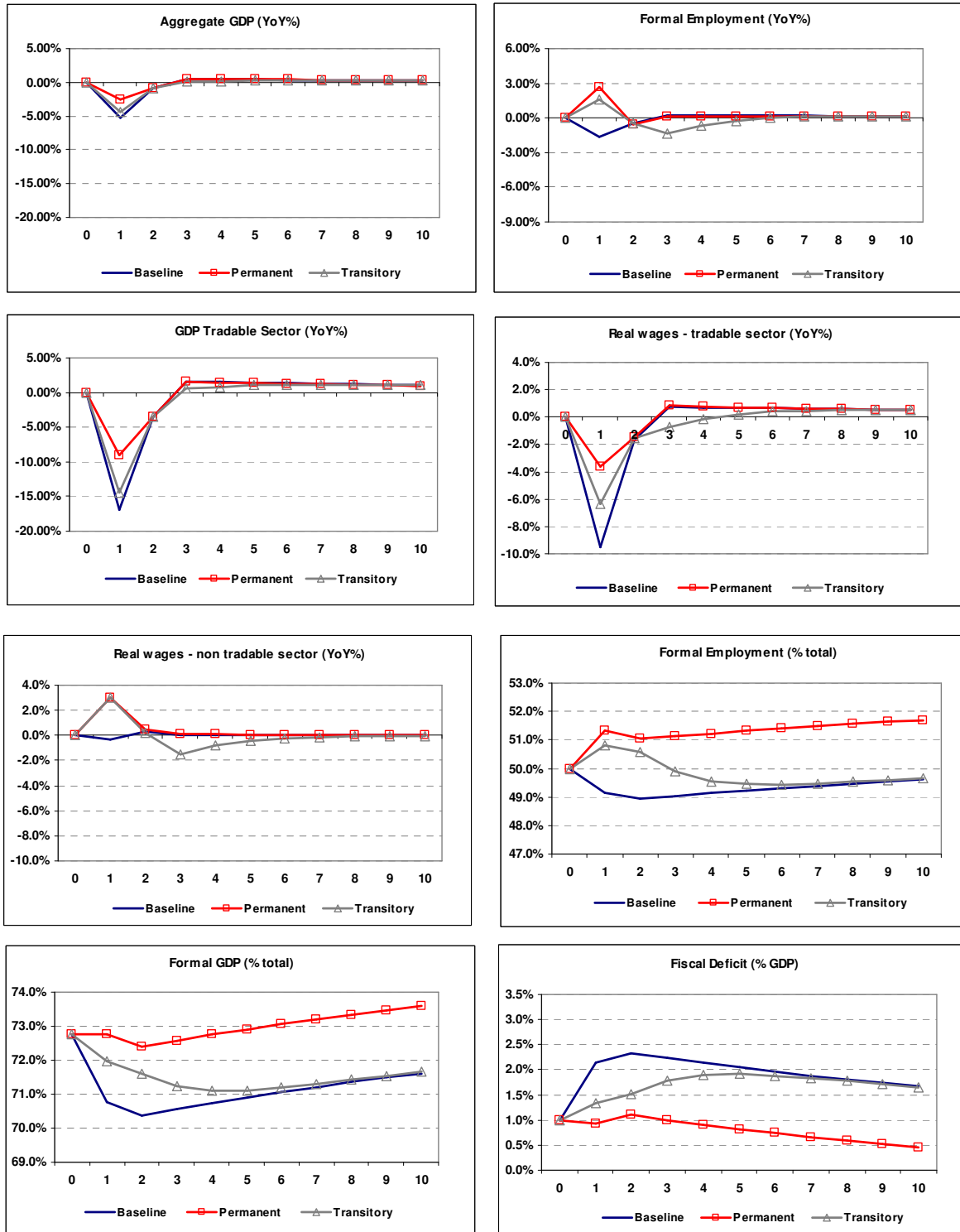
long-terms level values. Thus, if we simulate a permanent shock such as a reduction in labor costs or a permanent increase in TPF level (it is important to notice that this simulation is a permanent change in the level of TPF and not in its growth rate), we can obtain permanent effects in the level of some variables including those expressed as proportions, e.g. the participation of formal employment or the participation of formal GDP.

Finally, and consistent with the fact that the temporary policy is a tax cut, the fiscal deficit remains larger under this scenario than under the permanent intervention. In fact, the fiscal deficit converges to a new steady state value below 1% under this last scenario, as the size of the formal economy grows and remains larger. Despite being more expensive than the permanent policy, our temporary tax cut proves less costly (in fiscal terms) than the baseline scenario, as increased economic activity more than compensates a lower labor tax rate.

Although it does not correspond to what we believe is the most probable crisis scenario, Figure 9 illustrates the same policy comparison but under a prolonged recession. In this case, it becomes clearer that the permanent policy's stronger countercyclical potential is more significant in period 1. If the crisis is sustained, thus, additional short run benefits from the permanent intervention are more along the lines of a smaller fiscal burden. As revealed in the last panel of Figure 9, relying on tax cuts to offset the effects of the crisis under a prolonged recession becomes much more expensive: the fiscal deficit remains close to 2.5% for several periods as more debt needs to be taken to finance the countercyclical effort. The permanent policy intervention, on the other hand, does not imply a significant deviation of the fiscal deficit from its 1% steady state value. This comparison confirms that business cycle independent policies of the class proposed in the MILES framework can be more convenient under the protracted crisis scenario, as proposed in Table 2.

Finally, in Figure 10 we compare the outcome of a temporary increase in TFP in both formal sectors (tradable and non-tradable) with a permanent increase in the same parameters. In this case, we propose an increase of 3%. This is consistent with the expansion experienced in the contribution of TFP to GDP growth after the structural reforms of the 90s[21]. In a recent study, Burga and Morales (2006) found that the most promising policy interventions to attain another significant TFP increase are those aimed at: (i) reducing red tape and administrative steps required to start a new business; (ii) increasing political stability, reducing corruption and granting a predictable Judiciary system; and (iii) closing the infrastructure gap recently estimated to be around 30% of GDP (Pastor and Pérez (2009)).

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[21] Based on authors own calculations using Solow residual estimates for the period 1980-2008.

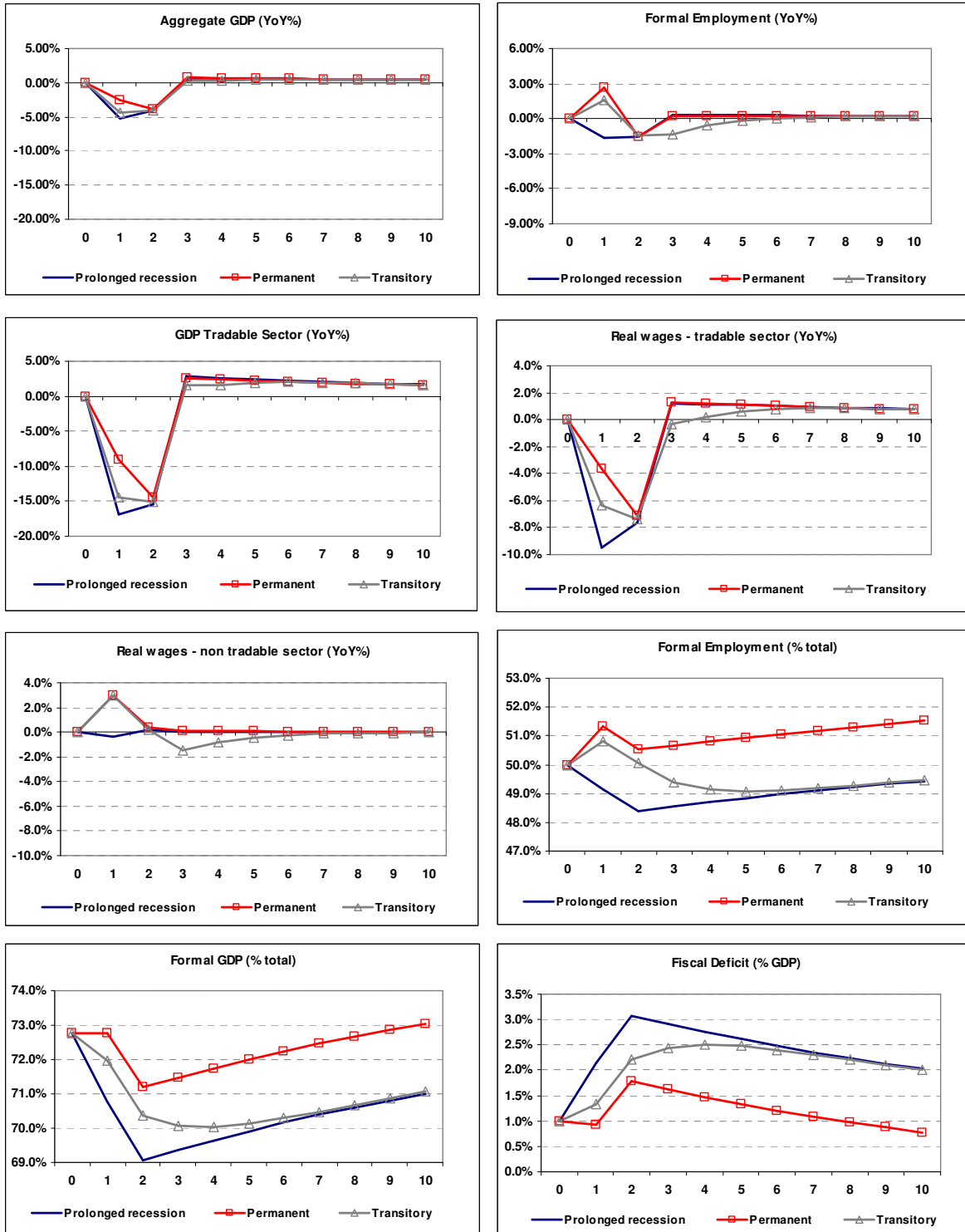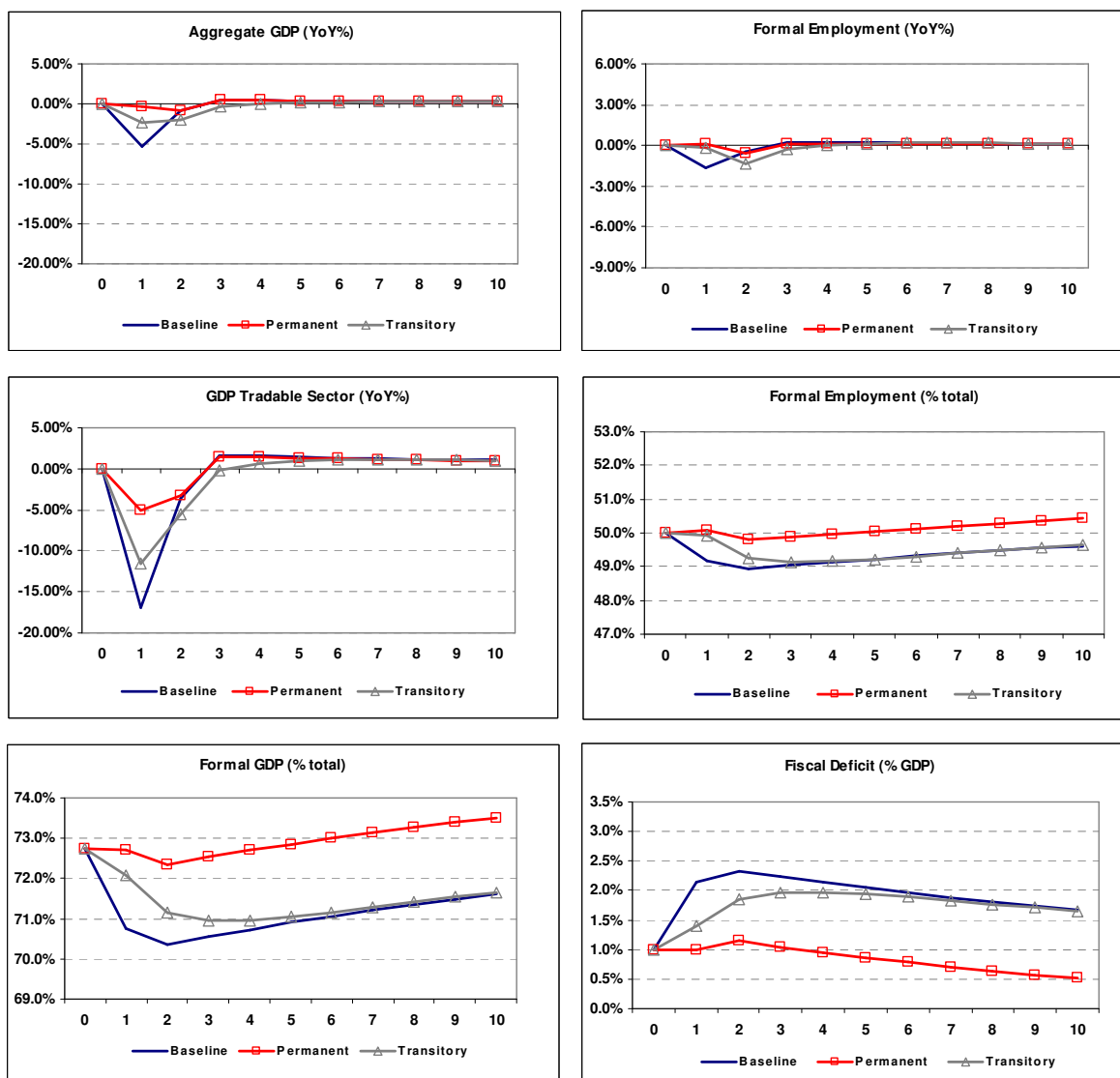# Figure 9: Prolonged recession scenario vs. transitory and permanent 20% reduction in labor tax

35

Figure 10: Baseline scenario vs. transitory and permanent 3% increase in total factor productivity

Aggregate GDP (YoY%)

Formal Employment (YoY%)

GDP Tradable Sector (YoY%)

Formal Employment (% total)

Formal GDP (% total)

Fiscal Deficit (% GDP)

A revealed in Figure 10, this type of intervention has a stronger countercyclical force than labor tax reductions if we compare transitory vs. permanent policy shocks in each case. In fact, TFP increases directly affect both capital and labor productivity. Consistent with this, a TFP increase with enduring effects has the largest ability to counteract the external shock: GDP growth is almost unscathed.

In this case, it is also worth looking at the changes in steady state values. Formal employment participation grows only 0.5 percentage points with a 3% increase in total factor productivity, while formal GDP participation exhibits a similar increase as with the permanent formal labor cost reduction. As already mentioned, productivity gains

under this last intervention scenario are not only focused on labor and, thus, can exhibit a smaller impact on formal employment. It must be said, however, that this avenue has no limit compared with a reduction in labor costs. TFP can be permanently enhanced and this exercise reveals its potential impact on formal employment participation.

Results highlighted in this section have helped make a stronger case for policy interventions that stem from the MILES framework. First, if we are concerned about adequate employment and income loss during the crisis, policy interventions of a permanent nature exhibit a larger countercyclical potential. As already mentioned, this result depends on the forward-looking nature of agents responsible of investment and labor supply decisions, and this means that expected future outcomes affect current decisions. Thus, and given the same policy shock on impact, labor flows away from the tradable sector (and into informality) are more effectively deterred if the promise of larger real returns is perceived as permanent. In addition, simulation results reveal that in the event of a prolonged recession, the fiscal burden of active labor market policies can be significantly larger, while adjustments to labor market regulations do not imply significant deviations of the fiscal deficit from its equilibrium level.

On the other hand, and if we are concerned about the size of the formal sector, the only effective avenue comes from the MILES framework and, in particular, from those elements that tackle the prime drivers of informality in our country: low productivity and high formal labor costs. Simulations show how changes in labor market regulations conducive to a reduction in labor costs and reforms aimed at increasing factor productivity, deliver long run benefits in terms of extending formal employment benefits to a larger share of the employed population. This occurs to the extent in which these policy interventions imply changing structural conditions that affect the equilibrium allocation of resources.

5. Concluding Remarks

The current worldwide economic downturn is hitting our economy mainly through the commercial channel. Falling external demand for our exports has reduced real returns in the tradable sector, affecting employment and production in this side of the economy. Job separations in extractive and manufacturing activities with a strong tradable

component imply that employment loss is concentrated in formal posts which, in turn, can be largely classified as adequate. Those activities concentrating informal jobs (like commerce) still exhibit positive growth rates both in terms of production and job creation. A surge in informality and underemployment, thus, is the main risk that the policymaker should aim to mitigate through the cycle.

In fact, the 1998-2001 recession has revealed that downturns are accompanied by a significant increase in the probability of moving from an adequate job to underemployment. A similar situation can be expected during the current slowdown but with less intensity, since during our past recession job separations were much more pervasive.

In theory, formal job separations can be reduced if the burden of keeping the job is shared with the government. For this, and as our simulations have shown, temporary payroll tax holidays or wage subsidies have a countercyclical potential. In principle, they should help firms demand a similar amount of labor without reducing workers income. Fiscal costs related to this kind of interventions, however, can be particularly high and especially if the world economy takes more time to recover.

Temporary exonerations from social security and pension contributions already implemented for wage bonuses will press the fiscal budget for an extra US$ 424 million during their two year duration. It should be noticed that the original proposal also comprised income tax exonerations but these were dismissed due to budgetary considerations.

Further temporary but generalized exonerations, thus, will be difficult to implement. We need to resort to additional short-run measures that can still have an impact during the second year of the crisis and have a more focalized nature, such as retraining and temporary public works programs. For these to be truly cost-effective, efforts should concentrate on targeting low income workers and, among them, women and the young.

On the more structural side of policy intervention, our simulations have revealed that permanent non-wage labor cost reductions can increase formal employment and formal GDP by 2 percentage points. Policies conducive to this were modeled as halving

bonuses or vacations in a way similar to that already implemented in the special labor regime for small and micro enterprises. This special regime constitutes an important step towards granting progressive access to labor benefits for low productivity firms and its potential for formal job creation could be complemented by introducing two minimum wage levels according to firm size for new contracts, and a generalized reduction in firing costs.

Our simulations have also served to highlight the role of productivity increases if we seek to expand formal employment benefits to a larger share of the workforce. In particular, our results reveal that formal employment participation can rise 0.5 percentage points for every 3% increase in total factor productivity. There is, however, no silver bullet to accomplish the latter. Some recent studies point towards the need to reduce administrative steps required to open new businesses as well as the provision of infrastructure. If we focus our attention on the labor market, however, we will find some promising experiences aimed at increasing labor productivity that can be strengthened and integrated into a single intervention package: *Projoven, Propoli* and *Red CIL*.

Our quantitative exploration has also allowed some interesting comparisons. Structural policy interventions as the ones discussed in the previous paragraphs have not only proven effective to accomplish structural transformations (such as increasing formal employment participation) but can also exhibit a large countercyclical potential due to their permanent nature. This should help make a stronger case for policy interventions that stem from a structural reform agenda and implies that we should not wait for the crisis to be over to start their implementation.

Our results, however, do not rule out the need for temporary labor market interventions due to three considerations that cannot be overlooked. First, changes in labor market regulations have to overcome complex political economy issues since this reform has concentrated costs (veto groups representing those who have a formal job) and dispersed benefits (those who still remain in informality). In addition, the effects of a comprehensive training program will take time to materialize and there is a need for short-term results in order to help with the countercyclical effort. Finally, policies must be regarded as credible in order to exert all the countercyclical and long-term potential depicted in our model. This is difficult to ensure as labor regulations in Peru are still

perceived as subject to debate and the range of policy alternatives remains too ample. In fact, the contents of a new General Labor Code have been under discussion in Congress for the last five years, without having reached a consensus.

Obstacles to implement and delays in getting results, however, should not be an obstacle to pursue these policies. As already mentioned, the current situation should be used as an opportunity to address them, as they are the only way to attain long-run objectives such as extending the benefits of formal employment without resorting to unsustainable fiscal policies.

References

Bosch, M. and W. Maloney (2008). "Cyclical Movements in Unemployment and Informality of Developing Countries", Universidad de Alicante and World Bank.

Burga, L. and M. Morales (2006). "Efectos de la complementariedad de las políticas y la apertura económica. Análisis del caso peruano en un contexto internacional 1975-2005". Universidad del Pacífico.

Chacaltana, J. and D. Sulmont (2004). "Políticas activas en el mercado laboral peruano: el potencial de la capacitación y los servicios de empleo" in Políticas de empleo en Perú, Consorcio de Investigación Económica y Social.

Chacaltana, J. (2003). "Impacto del programa A Trabajar Urbano: ganancias de ingreso y utilidad de las obras", Centro de Estudios para el Desarrollo y la Participación.

Chacaltana, J. (2008). "Una evaluación del régimen laboral especial para microempresa en Perú, al cuarto año de vigencia", Oficina Internacional del Trabajo (OIT).

Díaz, J. and M. Jaramillo (2006). "An Evaluation of the Peruvian Youth Labor Training Program PROJOVEN", Office of Evaluation and Oversight, Inter-American Development Bank.

Ikenson, J. (2008). "Don't Bail Out the Big Three". Retrieved July 16, 2009, from The Cato Institute Web site: http://www.cato.org/pub_display.php?pub_id=9804.

Pastor, C. and P. Pérez (2009). "El Reto de la Infraestructura al 2018: La Brecha de Inversión en Infraestructura en el Perú 2008", Instituto Peruano de Economía.

Jaramillo, M. (2005). "Cómo se ajusta el mercado de trabajo ante cambios en el salario mínimo en el Perú", GRADE-CIES.

Jaramillo, M. (2004). "Reforma del mercado laboral", for *Agenda Nacional de Reformas Económicas en Peru*, CIPE, El Comercio, Instituto Apoyo.

Morón, E., J.F. Castro and C. Sanborn (2009). "Helping Reforms Deliver Inclusive Growth in Peru", in L. Rojas-Suárez (ed.), Growing Pains in Latin America, Center for Global Development.

Reflexión Democrática (2009), Informativo Número 138.

Stiglitz, J. (2008). "We Aren't Done Yet: Comments on the Financial Crises and Bailout". The Berkeley Electronic Press.

Villacorta, L. (2008), "Un modelo con economía abierta para analizar los efectos de cambios en los precios de los minerales", Universidad del Pacífico.

World Bank (2007), "Peru: Casting Light on the Shadow Economy", World Bank.

World Bank (2009a). "Labor Markets and the Crisis in Latin America and the Caribbean (a preliminary review for selected countries)", World Bank.

World Bank (2009b). "How Should Labor Market Policy Respond to the Financial Crisis?", World Bank.

World Bank (2008). "Miles to Go: A Quest for an Operational Labor Market Paradigm for Developing Countries", Social Protection and Labor Sector, World Bank.

Yamada, G. (2009). "Comentarios sobre Mejores Prácticas en Servicios Públicos de Empleo", prepared for the conference *Propuestas sobre Empleo y Formación Profesional frente a la Crisis Financiera Internacional*", Ministerio de Trabajo y Promoción Social.

Yamada, G. (2008a). <u>Capacitación de alto impacto: las becas PROPOLI y lineamientos de política</u>, Programa de Lucha Contra la Pobreza en Lima Metropolitana.

Yamada, G. (2008b). "Reinserción Laboral Adecuada: Dificultades e Implicancias de Política", Documento de Discusión DD/08/01, Centro de Investigación de la Universidad del Pacífico.

Yamada, G. (2008c). "Hacia una mayor flexibilidad y seguridad en el mercado laboral peruano", Economía y Sociedad 70, Consorcio de Investigación Económica y Social.

Appendix 1: The Model

As in Villacorta (2008) we model the Peruvian economy as a small open economy in which households are represented by a homogenous single agent and a continuum of competitive firms divided into two different sectors with behavior to produce two goods.

The domestic consumption good is labor intensive and is manufactured in the country but not abroad. This will be the non tradable good (Y^N) of the economy which is produced by means of a Cobb Douglas technology. Capital used in this sector will be supplied domestically.

$$Y_t^{NT} = F(K_{t-1}^{NT}, L_t^{NT}) \qquad [\,1.\,]$$

The tradable good (Y^T) will be capital intensive and it will be distributed between internal and external demand. The share of this good that is directed to the external demand will define the total amount of exports of the economy.

$$Y_t^T = F(K_{t-1}^T, L_t^T) \qquad [\,2.\,]$$

Capital used in the tradable sector only will come from abroad. Therefore, the level of imports will be set by the level of investment in capital goods for this sector in each period. However, all investment (used in both sectors) will have to pay an extra cost, which can be understood either as a tax or as an increase in credit cost. In our case, this extra cost will play the role of a tax which will be collected by the government. Domestic households can borrow or lend resources coming from exports in the external bond market.

The public sector will finance its expenses and transfers collecting an income tax, a labor tax and a capital tax to both sectors. Any remaining fiscal imbalance will be financed using the external bond market.

1. Families

Families will be represented by an infinite lived continuum of households; they will have access to capital markets and therefore they can smooth their consumption path through their lives. They can take debt today to consume more or save to accumulate more assets and have higher future consumption. For these purposes, the model contains three assets (real and financial):

- Capital goods used as factors of production in the non tradable sector.

- Capital goods used as factors of production in the tradable sector.

- External bonds which offer an international interest rate.

Individuals consume both non tradable and tradable goods. Of course, have to decide how much hours they will work in the tradable and non tradable sectors. Working

reduces their present utility but allows them to increase their future utility as they can increase their consumption in the future. Their utility function is as follows:

$$U_t(C_t, L_t^T, L_t^{NT}) = \frac{C_t^{1-\sigma}}{1-\sigma} - b_{NT}\frac{L_t^{NT^{1+\eta}}}{1+\eta} - b_T\frac{L_t^{T^{1+\eta}}}{1+\eta} \qquad [\,3.\,]$$

This function exhibits positive but decreasing returns with respect to consumption goods at all times. Therefore, there will not be a saturation point but, at all times, the marginal unit of consumption will bring less utility than the last one.

Members of these households use their intertemporal income to consume non tradable and tradable goods, and to accumulate capital goods or bonds investing in both sectors of the economy. The problem faced by households can be summarized as follows:

$$MAX\,\beta^t\sum_{t=0}^{\infty}E_t[\frac{C_t^{1-\sigma}}{1-\sigma} - b_{NT}\frac{L_t^{NT^{1+\eta}}}{1+\eta} - b_T\frac{L_t^{T^{1+\eta}}}{1+\eta}] \qquad [\,4.\,]$$

Subject to:
$$C_t + (1+t_k)S_tI_t^{NT} + (1+t_k)S_tI_t^{T} + S_tB_t^{I} + S_tB_t^{G} =$$
$$w_t^{NT}L_t^{NT} + (1+t_k)r_t^{NT}K_{t-1}^{NT} + w_t^{T}L_t^{T} + (1+t_k)r_t^{T}K_{t-1}^{T} + \overline{w}L_t^{I} + (1+r_t^{B,I})S_tB_t^{F} + (1+r_t^{B,G})S_tB_t^{G} + T_t$$

$$[\,5.\,]$$

Households optimize their intertemporal utility maximizing the discounted sum of period utilities (discounted at a rate β). However, the choice of their consumption level at each point in time is limited by their intertemporal budget constraint: present income can finance either consumption now or asset accumulation for future consumption.

Equation 5 reflects the intertemporal budget constraint of households. In this equation w_t^{NT} represents the salary paid by non tradable firms, whereas w_t^T is the salary paid by tradable firms. L_t^{NT} represents the number of active workers in the non tradable sector and L_t^T those that work in the tradable sector. In addition, there is an informal sector that will be modeled as a supply determined sector. If there are workers willing to work but are not employed by the first two formal sectors, then the informal sector will pay them a fixed salary $\overline{w}_t$ which will be always lower than those in the formal sector. Therefore, if a shock moves employment away from its steady state level, some of the unemployed workers will be absorbed –with a lower salary- by the informal sector.

$$L_t^{I} - L_t^{I^{SS}} = \phi_1(L_t^{NT} - L_t^{NT^{SS}}) + \phi_2(L_t^{T} - L_t^{T^{SS}}) \qquad [\,6.\,]$$

The interest rates paid to capital in each sector and in the bond market are: r_t^{NT}, r_t^T and r_t^B, and t_k is the capital tax that will be paid by the families. Investment will increase capital in both sectors (K_t^{NT}, K_t^T) once we take into account the depreciation rate. In a similar fashion, the stock of international and government bonds will be denoted by B_t^I and B_t^G, respectively.

$$I_t^{NT} = K_t^{NT} - (1-\delta)K_{t-1}^{NT} \qquad [\,7.\,]$$

$$I_t^{T} = K_t^{T} - (1-\delta)K_{t-1}^{T} \qquad [\,8.\,]$$

The representative agent will receive, in period t, two types of salaries for labor offered in each sector, and three types of rents derived from the assets held.

As the model is expressed in domestic consumption goods, capital goods (used for the tradable sector) produced entirely abroad are expressed in domestic consumption goods using the real exchange rate S_t. This capital is levied with a proportional tariff denoted by τ_K, therefore its purchasing price should be multiplied by $(1+\tau_K)$. Bonds are expressed in external consumption goods, which need to be scaled by the real exchange rate to express them as domestic consumption goods. T_t define all public transfers set by the government in favor of households in period t.

Putting together all the elements mentioned above, we can set up the intertemporal Lagrangean that characterizes the consumer problem as:

$$l(C_t, L_t^{NT}, L_t^{T}, K_t^{NT}, K_t^{T}, B_t^{I}, B_t^{G}) = E_t \sum_{t=0}^{\infty}[\beta^t[\frac{C_t^{1-\sigma}}{1-\sigma} - b_{NT}\frac{L_t^{NT^{1+\eta}}}{1+\eta} - b_T\frac{L_t^{T^{1+\eta}}}{1+\eta}] +$$
$$\lambda_t[w_t^{NT}L_t^{NT} + (1+t_k)r_t^{NT}K_{t-1}^{NT} + w_t^{T}L_t^{T} + (1+t_k)r_t^{T}K_{t-1}^{T} + (1+r_t^{I})S_t B_{t-1}^{I} + T_t - (C_t + (1+t_k)I_t^{NT} + (1+t_k)S_t I_t^{T} + S_t B_t^{I})]]$$

The first order conditions of this maximization problem are:

$$\frac{\partial l}{\partial C_t} = 0 \rightarrow \beta^t C_t^{-\sigma} = \lambda_t \qquad [\,9.\,]$$

$$\frac{\partial l}{\partial L_t^{NT}} = 0 \rightarrow \beta^t b_{NT} L_t^{NT^\eta} = \lambda_t w_t^{NT} \qquad [\,10.\,]$$

$$\frac{\partial l}{\partial L_t^{T}} = 0 \rightarrow \beta^t b_T L_t^{T^\eta} = \lambda_t w_t^{T} \qquad [\,11.\,]$$

$$\frac{\partial l}{\partial K_t^{NT}} = 0 \rightarrow \frac{\lambda_t}{\lambda_{t+1}} = r_{t+1}^{NT} + (1-\delta) \qquad [\,12.\,]$$

$$\frac{\partial l}{\partial K_t^{T}} = 0 \rightarrow \frac{\lambda_t}{\lambda_{t+1}} = \frac{r_{t+1}^{T} + S_{t+1}(1-\delta)}{S_t} \qquad [\,13.\,]$$

$$\frac{\partial l}{\partial B_t^{I}} = 0 \rightarrow \frac{\lambda_t}{\lambda_{t+1}} = \frac{(1+r_{t+1}^{I})S_{t+1}}{S_t} \qquad [\,14.\,]$$

$$\frac{\partial l}{\partial \lambda_t} = 0 \rightarrow \text{Budget constraint} \qquad [\,15.\,]$$

These conditions can be re-written in the following form:

$$\frac{C_t^{-\sigma}}{E_t C_{t+1}^{-\sigma}} = \beta(1+r_{t+1}^I)\frac{S_{t+1}}{S_t} \qquad \qquad [\,16.]$$

$$\frac{S_{t+1}}{S_t} = (1+\gamma_{S,t+1}) \qquad \qquad [\,17.]$$

Equation (17.) defines the exchange rate depreciation (or appreciation) in period t+1. Combining (16.) and (17.), and assuming that $r_{t+1}^B \gamma_{S,t+1} \approx 0$ we can write the Euler condition of the problem as:

$$\frac{C_t^{-\sigma}}{E_t C_{t+1}^{-\sigma}} = \beta(1+r_{t+1}^I+\gamma_{S,t+1}) \qquad \qquad [\,18.]$$

This will determine the optimal consumption path. The optimal growth rate of consumption will be determined by two variables: (i) the return of investing in the domestic asset (defined by the external return plus the real exchange rate depreciation); and (ii) the intertemporal discount rate that defines preferences for current consumption. The growth rate of consumption will emerge as the equilibrium between these two forces.

Combining equations (9.), (12.), (13.), (14.) and (17.) and assuming that $\delta\gamma_{S,t+1} \approx 0$ we can arrive at an uncovered interest rate parity condition:

$$r_{t+1}^{NT} = \frac{r_{t+1}^T}{S_t} + \gamma_{S,t+1} = r_{t+1}^I + \delta + \gamma_{S,t+1} \qquad \qquad [\,19.]$$

This condition states that the real domestic asset used in the production of non tradable goods must pay the same interest rate as the real foreign asset after considering exchange rate depreciation. Likewise, the interest rate of bonds expressed in local currency must be equal to those rates netting out the depreciation rate of physical assets. In this way, this parity condition assures that all of three assets will coexist in equilibrium.

As usual, the transversality condition $\lim_{t\to\infty} K_t^i \lambda_t = 0$, states that capital in the last period becomes unproductive as there are no additional periods in which it could become output. Therefore, the value of capital in the last period should be zero, unless consumption reports no utility, which will be reflected by $\lambda_t = 0$. In that particular case, the value of K_t will be different from zero as we will not want to consume more. This last result is not possible if the utility function does not have a saturation point as in our case: the marginal utility of consumption and λ_t will be greater than zero at all times.

Combining equations (9.), (10.) and (11.) we can derive the conditions for choosing between labor and consumption which define the labor supply for both sectors:

$$\frac{b_{NT} L_t^{NT^\eta}}{C_t^{-\sigma}} = w_t^{NT} \qquad \qquad [\,20.]$$

$$\frac{b_T L_t^{T^\eta}}{C_t^{-\sigma}} = w_t^T \qquad [\,21.]$$

2. Firms

We assume a continuum of competitive firms that employ labor and capital in perfectly competitive input markets. Firms with explicit behavior are divided into two sectors: the non tradable and the tradable sector, which caters to the domestic and foreign markets.

In both sectors we use a Cobb-Douglas production function. This function has the classical assumptions of constant returns to scale, positive yet diminishing returns in each input and Inada conditions guarantee a steady state.

However, each production function has different productivity levels and also different shares for capital and labor.

Non tradable sector: $\qquad Y_t^{NT} = A_t^{NT} K_t^{NT^\theta} L_t^{NT^{1-\theta}} \qquad [\,22.]$

Tradable sector: $\qquad Y_t^T = A_t^T K_t^{T^\alpha} L_t^{T^{1-\alpha}} \qquad [\,23.]$

The non tradable sector is characterized as a more labor intensive sector whereas the tradable sector will be more capital intensive ($\alpha \succ \theta$). Firms behave as in perfect competition and maximize their benefits choosing the optimal combination of labor and capital.

Non-tradable sector
Non tradable firms have to pay a value added tax (τ) over their production level and an extra cost for the two inputs used in the production. As mentioned above, in this model this extra cost will play the role of a tax which will be collected by the government. In this way the production level of this sector will be determined solving the following problem.

$$\text{Max: } (1-\tau)A_t^{NT} K_t^{NT^\theta} L_t^{NT^{1-\theta}} - (1+\tau_L)w_t^{NT} L_t^{NT} - (1+\tau_K)r_t^{NT} K_{t-1}^{NT}$$

Investment decision:

$$r_t^{NT} = \frac{(1-\tau)}{1+\tau_K}\theta A_t^{NT}\left(\frac{K_{t-1}^{NT}}{L_t^{NT}}\right)^{\theta-1} \qquad [\,24.]$$

Contracting decision:

$$w_t^{NT} = \frac{(1-\tau)}{1+\tau_L}(1-\theta)A_t^{NT}\left(\frac{K_{t-1}^{NT}}{L_t^{NT}}\right)^{\theta} \qquad [\,25.]$$

Tradable sector
As in the non tradable sector, tradable firms have to pay a value added tax (τ), a capital tax (τ_K) for the capital rented and a labor tax (τ_L) for the labor employed. Since production if offered to both markets, firms have to include into its maximization

problem the relative price between export goods and tradable goods offered for domestic consumption. In this maximization problem P_t^T is the relative price of export goods which is determined abroad. Moreover, the share of production supplied to both markets will not be a decision taken by the firm, because the export level is determined exogenously by the external demand.

$$\text{Max } (1-\tau)(\psi S_t P_t^T A_t^T K_t^{T\alpha} L_t^{T^{1-\alpha}} + (1-\psi)A_t^T K_t^{T\alpha} L_t^{T^{1-\alpha}}) - w_t^T L_t^T - (1+\tau_K)r_t^T K_{t-1}^T$$

Investment decision:

$$r_t^T = (\psi P_t^T S_t + (1-\psi))\frac{(1-\tau)}{1+\tau_K}\alpha A_t^T \left(\frac{K_{t-1}^T}{L_t^T}\right)^{\alpha-1} \qquad [26.]$$

Contracting decision:

$$w_t^T = (\psi P_t^T S_t + (1-\psi))(1-\tau)(1-\alpha)A_t^T \left(\frac{K_{t-1}^T}{L_t^T}\right)^{\alpha} \qquad [27.]$$

3. Government

Public sector revenues come from income, labor and capital taxes. Recurrent expenditures are denoted as G_t and transfers to households as T_t. Any fiscal gap will be covered using the international bonds market.

$$\tau_t = \tau(Y_t^{NT} + Y_t^T) + \tau_K(I_t^{NT} + I_t^T) \qquad [28.]$$

$$\tau_t - G_t - T_t = -S_t(B_t^G - (1+r_t^G)B_{t-1}^G) \qquad [29.]$$

4. Equilibrium

Aggregating households' budget constraint and combining it with the maximization conditions for firms (25), (26), (27) and (28) we obtain the following equation:

$$C_t + I_t^{NT} + S_t I_t^T + S_t(B_t^I - (1+r_t^I)B_{t-1}^I) =$$
$$P_t S_t \psi Y_t^T (1-\psi)Y_t^T + Y_t^{NT} + Y_t^I + T_t - \tau_k S_t I_t^{NT} - \tau_k S_t I_t^T - \tau_L w_t^T L_t^T - \tau_L w_t^{NT} L_t^{NT} - \tau(P_t S_t \psi Y_t^T (1-\psi)Y_t^T + Y_t^{NT})$$

Balance of payments equilibrium implies that the current account is equal to the capital flow account, which is represented in our model by the accumulation of international bonds.

$$X_t - M_t = S_t(B_t^I - (1+r_t^I)B_{t-1}^I) + S_t(B_t^G - (1+r_t^G)B_{t-1}^G)$$

If we replace government equations (28.), (29.) and the balance of payments condition into the last equation, we can obtain the aggregate demand equation of the economy:

$$C_t + I_t^{NT} + S_t I_t^T + G_t + X_t - M_t = Y_t$$

As mentioned above, the total amount of capital investment used in the tradable sector is imported from abroad and families do not consume imported goods. Thus, the last equation can be written as:

$$C_t + G_t + X_t = Y_t$$

In order to satisfy external demand, the share of tradable production supplied to this market will define the total level of exports:

$$X_t = (1-\tau)\psi S_t P_t^T Y_t^T$$

Therefore, the rest of net internal production (tradable, non tradable and informal) will be devoted to private and public consumption as well as internal investment.

$$C_t + G_t + I_t^{NT} = (1-\tau)((1-\psi)S_t P_t^T Y_t^T + Y_t^{NT}) + Y_t^I$$

If we add up aggregate demand, the balance of payments and the government budget constraint, we arrive at the equilibrium condition which states that internal and external savings should be equal.

$$(X_t - M_t) = (Y_t - C_t - I_t) + (\tau_t - G_t) \qquad [\,30.]$$

5. Export prices

The main external shock will be modeled as a collapse in export prices. Thus, we model them as a first order autoregressive process AR(1).

$$\log P_t^T = (1-\rho)\log P_t^{T^{SS}} + \rho \log P_{t-1}^T + \mu_t \qquad [\,31.]$$

where μ_t is a normally distributed noise with zero mean and constant variance. Parameters were estimated using annual data from 1950-2008. The estimated value of the autoregressive parameter was 0.9.

6. Bonds stationarity condition

As pointed out by Schmitt-Grohe and Uribe (2002), open economy models with incomplete asset markets are characterized by a steady state that depends on initial conditions and a dynamic equilibrium with a random walk[22] component; i.e. including bonds (debt) in these models generates non stationarity. This could be easily verified introducing a shock that modifies the steady state level of net exports in the steady state equation for bonds or equation (30) above.

A temporary –a single period- shock in time t that modifies the level of net exports in steady state will change the level of debt in steady state. In period t+1, net exports will

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[22] This is the typical behavior of a non stationary variable.

return to its steady state level which, in turn, should move debt to its steady state values. However, this does not happen if we consider the following equation:

$$B_t = XN_t + (1+r)\bar{B}$$
$$B_{t+1} = \overline{XN} + (1+r)(XN_t + (1+r)\bar{B}) = \overline{XN}(1+r)XN_t + (1+r)^2\bar{B}$$
$$B_{t+2} = \overline{XN} + (1+r)(\overline{XN}(1+r)XN_t + (1+r)^2\bar{B}) = (2+r)\overline{XN} + (1+r)^2 XN_t + (1+r)^3\bar{B}$$
$$B_{t+n} = (n+r)\overline{XN} + (1+r)^n XN_t + (1+r)^{n+1}\bar{B}$$

[32.]

In this way, any stationary shock drives bonds (debt) into a non stationary variable. Following the proposed methodology by Schmitt-Grohe and Uribe (2002) we introduce an adjustment rule to the interest rate paid by bonds in such a way that ensures the existence of a steady state solution. We use a model with an interest rate that is elastic to the level of outstanding debt following the rule:

$$r_{b,t} = r + \phi(e^{\bar{B}-B_{t-1}} - 1) \qquad [33.]$$

where r represent the risk-free rate and $\phi(e^{\bar{B}-B_{t-1}} - 1)$ stands as the risk premium that the country has to pay for steering away from its steady state level of indebtedness.

Appendix 2: Simulating policy changes within the model

The following steps are required to obtain impulse response functions for the main aggregate variables of the model after a stochastic shock is introduced.

(i) Guarantee that the model is correctly closed, with a number of variables equal to the number of equations.

(ii) Calibrate the model deep parameters (see table below). Some of them were obtained from the literature and others were estimated econometrically using Peruvian data.

(iii) Obtain the steady state values for the variable levels. If the model has a steady state growth rate different than zero, it is necessary to scale all the variables using this rate in order to work with stationary variables.

(iv) Solve the stochastic model in order to obtain policy functions for the relevant variables. In this case, we used a numerical method proposed by Blanchard y Kahn (1980) in which endogenous variables can be expressed as a lineal function of the predetermined state variables, deep parameters, and exogenous shocks.

(v) Finally, we can simulate an array of policies introducing stochastic shocks into the policy functions of the policy variables. Shocks will transpire within the system of equations, generating the responses in the variables of the model.

We can introduce two types of shocks in the level of the policy variables: transitory and permanent. If the shock is transitory, it will provoke deviations of the variable levels from their steady states values and, thus, deviations of its growth rate from its steady state growth. However, after some time both (levels and growth rates) will return to their steady state values.

If the shock is permanent, some variables will change its steady state values, and the simulation will allow us to assess the transition of the variable level from the initial steady state to the new one. This type of shock will generate a deviation of growth rates from their steady states but only for a limited time.

To introduce policy changes we model our policy parameters (extra labor cost, and productivity parameter) as first order autoregressive processes:

$$\log \tau_{L,t} = (1 - \rho_L) \log \tau_L^{SS} + \rho_L \log \tau_{L,t-1} + \mu_{L,t}$$

$$\log A_t = (1 - \rho_A) \log A^{SS} + \rho_A \log A_{t-1} + \mu_{A,t}$$

Where $\mu_{L,t}$ and $\mu_{A,t}$ are normally distributed noises with zero mean and constant variance. Parameters ρ_L and ρ_A, on the other hand, represent the "memory" of the shocks. The value for these parameters depends on the type of shock that we are

simulating. For a transitory shock we assume a parameter of 0.5 and for a permanent shock we assume a parameter near to 1.

In all policy evaluations based on model simulations the researcher is forced to match policy variables as parameters or variables within the model. The table below summarizes the policy options discussed in the main text and its proposed representation in terms of our model.

Policy options	Type of shock	
	Transitory	Permanent
Business cycle dependent:		
Job protection: temporary payroll tax holiday	Labor tax: τ_L	-.-
Worker protection: training for dislocated workers	Total factor productivity: A^{NT}, A^{T}	-.-
Business cycle independent:		
Labor market regulation: reduce non-wage labor costs	-.-	Labor tax: τ_L
Productivity enhancement training	-.-	Total factor productivity: A^{NT}, A^{T}

Calibration of Deep Parameters of the Model				
Parameters	**Definition**	**Values**	**Explanation**	**Source**
β	Intertemporal discount factor	0.95	Implies an annual real interest rate of 5.2%.	Montoro et al. (2007)
σ	Intertemporal Consumption elasticity	1	Required to have a balanced equilibrium path.	King, Plosser y Rebelo (1988)
η	Parameter of leisure satiation	1	This is the value used in the RBC literature	Montoro el al. (2007)
τ	Income tax rate	0.07	Average of Tax Receipts over GDP in Peru 2008	Sunat
τ_l	Labor extra cost	0.3	Labor extra cost	Jaramillo
τ_K	Capital goods import tariff	0.0	Capital goods import tariff	Instituto Peruana de Economía (IPE)
δ	Depreciation rate	0.1	Implies a 10% annual depreciation rate	Montoro et al. (2007)
α	Share of capital in tradable output	0.4	Implies a share of 40% in total output	Own estimates
θ	Share of capital in non tradable output	0.2	Implies that the non tradable sector is less capital intensive than the tradable sector.	
ϕ	Interest rate elasticity to size of debt	0.02		Schmitt - Grohe y Uribe (2002)
ψ	Share of tradable production addressed to the foreign demand	0.5	Share of tradable production addressed to the foreign demand	BCRP
$\dfrac{L^I_{SS}}{L_{SS}}$	Share of informal workers in total workforce	0.5	Share of informal workers in total workforce	Saavedra and Nakasone (2003). GRADE
$\dfrac{Y^T_{SS}}{Y_{SS}}$	Share of tradable output in total GDP	0.35	Share of tradable output in total GDP	BCRP
$\dfrac{Y^I_{SS}}{Y_{SS}}$	Share of informal output in total GDP	0.27	Share of informal output in total GDP.	De la Roca and Hernández (2003.) GRADE

Steady state values

Steady state ratios	**Definition**	**Values**
$\dfrac{YI}{Y}$	Share of Informal GDP	27%
$\dfrac{X}{Y}$	Share of Exports in GDP	15%
$\dfrac{C}{Y}$	Share of Consumption in GDP	65%
$\dfrac{G}{Y}$	Share of Government Consumption in GDP	15%
$\dfrac{Deficit}{Y}$	Deficit as share of GDP	1%
$\dfrac{LI}{L}$	Share of workforce as informal workers	50%