The Economy in the Aftermath of the Earthquake

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01. December 2005

SPDC Social Policy and Development Centre

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SPECIAL REPORT:
THE ECONOMY IN THE AFTERMATH OF THE EARTHQUAKE

By

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Abstract: In this study, we use simulations from the Social Policy and Development Centre's large-scale empirical model of Pakistan's economy to quantify the economic losses resulting from the devastating earthquake that hit the country on October 8, 2005. We then use the model to trace the path that the economy can be expected to follow under the relief and reconstruction assumptions that seem most plausible at present. The main results are as follows: First, the earthquake could initially shave off 1½ percentage points from economic growth. In the absence of reconstruction, this initial hit would lead to permanent losses of levels of the capital stock, consumption, and income that are substantial. Second, the assumed rebuilding effort of $5.8 billion over a five-year period will bring the economy back only half-way to the path that would have prevailed in the absence of the earthquake. Third, this rebuilding effort will be inflationary in the short run, and could add 2 percentage points to the rate of increase of consumer prices in 2005-06 and 1 percentage point the following year.

[*] We would like to thank Aisha Bano for her assistance.

1. INTRODUCTION

The massive earthquake, measuring 7.6 on the Richter scale, which rocked northern Pakistan and Azad Jammu Kashmir (AJK) on October 8, 2005, has left a devastating toll of death and destruction. Assessments of the damage, its economic impact, and the cost of reconstruction have been much debated. Most experts see very little effect on overall economic growth. Yet, the relief and reconstruction needs have been estimated by some donor institutions to be about $5.2 billion—see the two companion studies carried out by the Asian Development Bank and the World Bank, ADB/WB (2005) and the United Nations, UN (2005),—whereas the estimated figure given by the Planning Commission is much higher than that.[1]

In this special report we use the Social Policy and Development Centre's (SPDC's) large-scale empirical model of the Pakistan economy to first isolate the effects that the earthquake itself will have on the economy, without factoring in the effects of the reconstruction activity. That is, hypothetically, in the absence of any reconstruction efforts, how much output and income would be lost to the economy and what effect would the earthquake have on future growth and prospects for the economy? We then use our model to provide simulation results that trace the path that the economy will follow under the assumptions in the early relief and reconstruction scenario that are laid out in the above-mentioned companion studies of the ADB/WB and the UN, that were commissioned by the Government of Pakistan. However, we have augmented their reconstruction scenario assumptions somewhat to postulate a total reconstruction outlay of $5.8 billion—rather than $5.2 billion—since this was the amount that was pledged at the donors' conference in Islamabad on November 19, 2005. At this point, this reconstruction scenario seems to be the one most likely to be adopted by the government.

Our model-simulation results lead to several noteworthy findings. First, the adverse effects of the earthquake alone on economic growth are significant, although they are temporary—largely restricted to FY 2005-06. But those who focus only on the "growth" effects miss the point. The real economic losses from the earthquake arise from

[1] The discrepancy between the donors' estimate of about $5 billion for reconstruction needs and the Planning Commission's estimate of about $10 billion was reported, for example, in Daily Dawn, Karachi, November 8, 2005.

the reductions in the *levels* of output, consumption and income resulting from the loss of the capital stock and these are quite significant; these level-shifts would be permanent in the absence of any rebuilding, even if growth returns subsequently to its original pace.

Second, the subsequent output growth and particularly investment growth that takes place in the aftermath of the quake in the $5.8 billion rebuilding scenario we consider is actually somewhat higher than what would happen in the baseline without an earthquake and any reconstruction activity. However, this higher subsequent growth would five years later still only bring the economy part way back to the path that would have prevailed in the absence of the earthquake.

Finally, importantly, because this has not been emphasized elsewhere enough, our model also predicts that the relief and reconstruction efforts will lead to a significant increase in inflation, at least in the absence of any explicit policy moves to counter this phenomenon. So, the rebuilding will come at a cost that goes beyond the actual financial outlays on reconstruction activities.

While interpreting our quantitative results, it should be recognized that the loss of life, the human tragedy and the suffering resulting from the earthquake are, of course, immeasurable in any monetary terms. We are restricting our analysis to the economic effects only because this is what we can measure with our model. It is important to study these economic effects in a systematic way because such information can be very relevant for taking vital decisions on reconstruction activities and their modes of financing. But, at the same time, considering such economic consequences and the money figures being associated with them as being the sum total of the losses resulting from the earthquake, would be inaccurate and highly inappropriate.

The balance of the paper is structured as follows: section 2 takes the reader through the notional exercise of what the economic effects of the earthquake itself would be, based on our model, in the absence of any resources devoted to relief and reconstruction activities; section 3 presents results on what path the economy will follow relative to the baseline path under the relief and reconstruction scenario that seem to guide the government's thinking at the moment, which is the one laid out in the UN and ADB/WB studies; and section 4 offers conclusions that emerge from the analysis.

2. ISOLATING THE ECONOMIC EFFECTS OF THE EARTHQUAKE

Historical experience from around the world suggests that economic activity follows a V-shaped pattern after a natural disaster. The disruption of normal economic activity and the damage to the infrastructure and the capital stock more generally initially leads to a loss of output. But subsequently, the economy receives a boost from the emergency relief funds and increased levels of spending related to rebuilding efforts that usually follow such disasters.

Our purpose here is to quantify these responses in the case of the Pakistan earthquake in a systematic manner. SPDCs large-scale model of the Pakistan economy is well-suited for this purpose for several reasons. First, by doing appropriate simulation analysis, it allows us to separate the notional effects that the earthquake alone would have on the economy from any effects of the reconstruction activity. Second, it gives us the effects on a large number of economic variables and the channels of transmission of these effects. Third, it allows us to study any unintended consequences of the reconstruction—such as an increase in inflation—that come out.[2]

The Integrated Social Policy and Macro (ISPM) Model

A brief sketch of the model being used to study the effects of the earthquake seems in order. The ISPM model is a highly disaggregated model and consists of more than 300 equations many of which are behavioural equations and many of which are identities. The behavioural equations have all been estimated using regression techniques and are based on consistent national level data from 1973-74 to 2004-05.

The model emphasizes the interlinkages between the macroeconomy, public finances and social sector development. The macroeconomy affects the tax base and, therefore, the tax revenues. It also affects the demand for social sector facilities—such as schools and hospitals—and, therefore, the equilibrium quantity of social sector outputs. Public finances, in turn, affect both the macroeconomy and the social sector. The former is affected through a direct impact of government expenditure on national income as well

[2] In principle, although we have studied the early recovery and reconstruction expenditure assumptions that seem to guide government thinking at the moment, the model is also well-suited to analyzing alternative reconstruction scenarios and examining issues such as whether the way in which reconstruction expenditures are financed matters or not.

as through the indirect influence of the budget deficit on monetary expansion and the rate of inflation; while the latter is affected by the availability of government resources and the influence of this on the level of development and recurring outlays to the social sector. Finally, social sector development feeds back into the macroeconomy—through enhancing human capital and through better health standards, both of which have a favourable effect on production; it also feeds back into public finances because social sector spending has consequences for the budget deficit, level of debt stocks and the debt-servicing burden of the government.

All three levels of government—federal, provincial and local—are incorporated into the public revenue and public expenditure blocks of the model. This, together with the level of disaggregation that exists in the model for government expenditures, allows us to calibrate our simulations quite closely to the assumptions on expenditures that are made in the early recovery and reconstruction scenarios laid out by the ADB, WB, and the UN.

Channels of transmission and calibration of the shocks

Within the model, the effects of the earthquake are assumed to be captured through several channels. The primary channel is the loss of the capital stock, including infrastructure. Another important channel is the loss of some of the population, which affects the labour force and, therefore, employment levels. There is also an additional temporary loss of employment due to both demand and supply factors; on the supply side, due to injuries and homelessness many are unable to work, while on the demand side many employed people do not have jobs left to go to due to the physical loss of the place in which they worked or a shutdown of the production activity they were involved in. Finally, we incorporate an effect on agricultural output through a loss of cultivated land. It is important to note that our model is not particularly well-suited to capturing any effect from losses of livestock and, thus, this channel has not been incorporated into the analysis.

The areas most affected by the earthquake are AJK and the three districts of Batagram, Mansehra and Shangla in NWFP.[3] One problem in using our model

[3] The districts of Abbotabad and Kohistan in NWFP have also been affected, although to a relatively lesser degree.

simulations is that the figures for AJK are not integrated in the official economic data for Pakistan, which are what have been used to calibrate and estimate our model. Thus, our explicit quantitative analysis is restricted to the effects on NWFP only. In order to estimate the AJK effects informally, a doubling of the estimates for NWFP would give a correct order of magnitude, although these losses would not show in the measured statistics of Pakistan.

To calibrate the *loss of NWFP's capital stock*, it is assumed that the entire capital stock of the three most affected districts listed above has been destroyed. While this might be an overestimate, anecdotal reports do suggest that the bulk of the capital stock in these districts may have been lost. Since two other districts of NWFP, Abbotabad and Kohistan have also suffered some capital stock damage, which we are not directly accounting for, 100 percent of the capital stock of these three districts might be a reasonable ballpark figure of how much of the *total* capital stock of NWFP has been destroyed.

One needs also to make an assumption about the share of the aggregate capital stock that was in place in the affected districts of NWFP, since our model does not disaggregate by district. The assumption made here is that the capital stock in place in different districts in the country is roughly in proportion to the population. As shown in Table 1, the share of the nation's population in the three most affected districts of NWFP is about 1½ percent.[4] As such, we have calibrated the shock to the capital stock to be a decline of 1½ percent in the private and public capital stocks in agriculture, manufacturing and other sectors, including federal and provincial infrastructures.[5]

[4] The share of the total labour force is a bit less at about 1.2 percent.

[5] This translates into a nominal loss of the capital stock of about Rs. 260 billion in 2005-06. This is quite a bit larger than the sum of the estimated direct damage and indirect losses of social and physical infrastructure and economic services for NWFP reported in ADB/WB (2005) of Rs. 73 billion [see table 2, p.3 of that study]. However, in their damage valuation criteria, immovable assets (i.e. damaged buildings) have been assessed at book value and thus evaluated at the prices of the year in which they were built [see Box 2, Annex 1 of the study]. With the building materials subindex of the wholesale price index (WPI) having risen by 4 ½-fold since 1981-82 and by about 2½-fold since 1990-91, for example, the damage assessment using book value is likely to be substantially understated. These years are chosen for illustrative purposes only, and do not bear any special significance except to note that some of the buildings would have been around since 1981-82 at least and many are likely to have been built before 1990-91 as well. (For information purposes the overall WPI has risen 5½-fold since 1981-82 and nearly 3-fold since 1990-91, while the overall CPI has risen 4½-fold since 1981-92 and about 2½-fold since 1990-91.)

TABLE 1
SELECTED STATISTICS

Regions	Population in 1998 (thousands)	Shares (percent)	Cultivated Area in 2000* (thousands of acres)	Shares (percent)	Labor Force in 1998 (thousands)	Shares (percent)
Pakistan	132,352	100	40,768	100	23,079	100
NWFP	17,735	13.40	4,096	10.05	2,518	10.91
Batagram	**307**	**0.23**	**73**	**0.18**	**41**	**0.18**
Mansehra	**1,153**	**0.87**	**198**	**0.49**	**158**	**0.68**
Shangla	**435**	**0.33**	**122**	**0.30**	**69**	**0.30**
Abbotabad	881	0.67	80	0.20	121	0.52
Kohistan	473	0.36	70	0.17	82	0.36
Selected NWFP Districts (Batagram+Mansehra+Shangla)	**1,895**	**1.43**	**455**	**0.96**	**268**	**1.16**
Memo: AJK	2,973	N/A	427	N/A	N/A	N/A

*except AJK figure is for 1998.
Sources: Pakistan and NWFP data for population and labour force are from *Federal, Provincial and District Census Reports* (1998) and for cultivated area from *Agricultural* Census (2000). AJK data are from *Azad Kashmir at a Glance*, 1999.

With respect to the *population loss*, it is assumed that the total death toll from the earthquake is 100,000. This is higher than the official figure of about 73,000 dead reported so far, but it seems likely that the official figures understate the death toll given the extent of the devastation that has been reported and thus, it is quite probable that this figure will continue to be revised upwards in the coming weeks.[6] Even the figure of 100,000 dead seems to us to be a conservative estimate, in fact. Of the deaths, 50 percent (or 50,000) are presumed to have taken place in NWFP districts. Our model requires an assessment of the allocation of this figure between different groups, namely children under the age of 10, females over the age of 10, and males over the age of 10 and our assumed numbers for these are 15,000, 17,000, and 18,000 deaths, respectively, which is in proportion to the existing population in each of these groups. The loss of some of the population leads in the model to some loss to the potential labour pool. Taking into account the labour participation rates of females and males, this translates into a permanent loss of about 15,000 people from the labour force.

Official government figures for the total number injured stand at about 130,000, of which about 70,000 are seriously injured—these figures also seem low given the extent of the devastation and there is a possibility that they may continue to be revised

[6] The official reported figure of 73,000 dead is as of December 2, 2005, taken from the website of the Federal Relief Commission of the Government of Pakistan.

upwards also.[7] About 3.2 million to 3.5 million people are estimated to be in need of assistance, including about an estimated 2.8 million people without shelter.[8] The injury losses and loss of shelter affect the supply of employment. In addition, the damages to assets and disruption to goods and services delivery is likely to have an effect on the demand for employment. The ADB/WB study estimates the employment loss to NWFP areas to be around 192,000. This is the figure we have assumed to be the temporary loss of NWFP employment in 2005-06, resulting from the above factors.

Finally, there is a *loss of cultivated area*, which affects agricultural output. The assumption made is that all of the cultivated area of the three affected districts of NWFP is lost to cultivation for an indefinite period. As shown earlier in Table 1, this amounts to a loss of about 1 percent of the total cultivated area of Pakistan. In the reconstruction scenario discussed later, this cultivated area is gradually restored over a period of five years.

The channels of transmission that are operational in the model in gauging the effects of the earthquake on the economy and the specific assumptions made about them, which have been discussed in detail above, are summarized in Table 2.

TABLE 2
MODEL ASSUMPTIONS ABOUT EARTHQUAKE

Channels of Transmission	Calibration of shocks for affected areas of NWFP
Loss of Capital stock	Decrease of 1.5% in private and public capital stocks in agriculture, manufacturing, and other sectors, including a decrease of 1.5% in federal and provincial infrastructure of Pakistan.
Decrease in Population	50,000 dead (15,000 children, 17,000 males over age 10, 18,000 females over age 10) implies a permanent loss to the labour force of about 15,000
Temporary Employment Losses	192,000 jobs in 2005-06
Loss of cultivated area	1% loss of cultivated area of Pakistan

Model simulations on the economic effects of the earthquake

The effects that would result from the earthquake alone on the growth rate of selected economic variables according to our model simulations are shown in Table 3. While this

[7]The official reported figures of about 70,000 seriously injured and 60,000 other injured are as of December 2, 2005, taken from the website of the Federal Relief Commission of the Government of Pakistan.
[8]The assistance need figures are from UN (2005) and the figure for those needing shelter is from ADB/WB (2005).

exercise is notional, it helps to isolate the economic losses from the earthquake and thus the extent to which such losses will be recouped in the rebuilding scenario which is being proposed.

TABLE 3
NOTIONAL EFFECTS OF EARTHQUAKE ON GROWTH
(Percentage Points Deviation from Baseline)

Selected Variables	2005-06	2006-07	2007-08	2008-09	2009-10
Growth of Real GDP	-1.4	0.0	0.0	0.0	0.0
Real Consumption Growth	-0.9	-0.3	-0.1	0.0	0.0
Real Investment Growth	-2.0	0.6	0.1	-0.2	-0.1
Private	-2.6	0.9	0.3	-0.2	-0.1
Public	-0.2	-0.3	-0.2	-0.1	0.0
Real Per Capita GDP Growth	-1.4	0.0	0.0	0.0	0.0

In the absence of any relief or reconstruction activity, real GDP growth and per capita real GDP growth would fall nearly 1½ percentage points in FY 2005-06 (Table 3).[9] Thereafter, there is no effect on economic growth. The initial declines in the growth rates reflect the losses to the capital stock, to the labour force, to employment and to the cultivated land that are a consequence of the earthquake, based on the assumptions discussed earlier. Note that the decrease in the growth rate of investment in 2005-06 (2 percentage points) is roughly two times the decline in the growth rate of consumption. As such, the composition of GDP shifts slightly from investment to consumption.

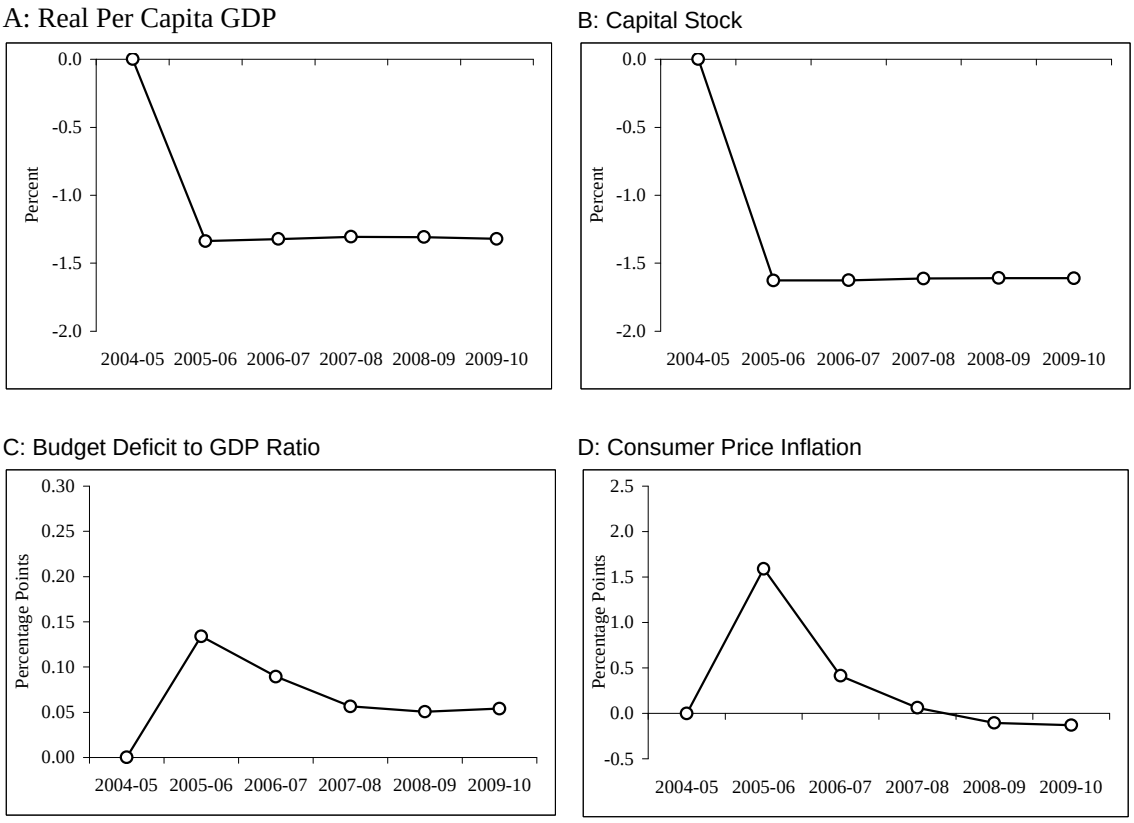
The deviations of the path of selected variables from the baseline path that would have prevailed in the absence of the earthquake are shown in Figure 1. The level of per capita real GDP takes an initial hit of nearly 1½ percent and then stays at this lower than baseline level subsequently (Panel A). The capital stock, being an important factor behind the decline in GDP, follows the same pattern (Panel B).

There is not a significant rise in the budget deficit-to-GDP ratio (Panel C), a 0.15 percentage points rise in 2005-06, which falls back over time to just a 0.05 percentage points higher ratio than in the baseline. The effect on the budget deficit as a proportion to

[9] This is real GDP measured at factor cost, which can be viewed as the aggregate supply of goods and services being in the economy.

GDP following the earthquake is rather modest because there is no reconstruction activity built into the scenario yet to put increased pressure on the government's financing gap.

FIGURE 1
NOTIONAL EFFECTS OF EARTHQUAKE:
DEVIATION FROM BASELINE PATH OF SELECTED VARIABLES



Even in the absence of any reconstruction activity, there is a tendency for inflation to rise in the first two years because supply falls more than demand, initially. Specifically, consumer price inflation is higher than baseline by about 1½ percentage points in 2005-06 and by ½ percentage point in 2006-07 (Panel D). However, inflation returns thereafter to more or less the baseline path.

The model simulation results thus indicate significant aggregate level effects on consumption and output resulting from the massive earthquake. However, the growth rates are not affected much beyond the current fiscal year of 2005-06, which, of course, means that the negative effects on levels would lead to a once and for all permanent decline in the level of per capita income (or a very long-lasting one at least) in the absence of any reconstruction activity.

The reader is reminded that our model's quantitative results capture only the effects resulting from losses in the affected areas of NWFP. One crude way to incorporate AJK effects in addition is to double the effects obtained in our model. Going back to Table 1, the selected statistics shown there suggest that this doubling of the effects would be a conservative estimate; the population of AJK is actually one-and-a-half times than that of the three districts most affected in NWFP and the cultivated land area is about the same. However, if one wants the effects on *measured* statistics of Pakistan, which do not typically incorporate AJK for most variables, then we would *not* want to double the effects shown here for NWFP.

3. THE RELIEF AND RECONSTRUCTION SCENARIO

We try to replicate the effects of the relief and reconstruction scenario laid out in UN (2005) and ADB/WB (2005) as closely as possible in the SPDC model since this is the scenario that seems to guide the government's rebuilding plans at the moment. However, we have augmented the total outlays envisaged to $5.8 billion instead of the needs assessment of $5.2 billion made by these donor agencies because this is the amount that has been pledged at the donors' conference of November 19, 2005, in Islamabad. This amount is assumed to be financed by concessional foreign borrowing. In the model, we can capture the effects on measured statistics of Pakistan only and thus we need the amount to be allocated to the affected areas of NWFP only. It is assumed that half of the relief and reconstruction efforts will be targeted to NWFP and half to AJK, which is roughly the regional shares of reconstruction costs allocated in ADB/WB (2005)—see Table 2 of that study.

The allocations of the relief and reconstruction expenditures to different types of activities assumed in our model simulations and their close correspondence to the assumptions made in the UN and ADB/WB studies are shown in Table 4. Of the $5.8 billion total outlay, $1.7 billion is assumed to be for early relief efforts and livelihood support, the same amount as in the studies mentioned above. Half of this amount is earmarked for NWFP and it is front-loaded in the sense that one-third of the relief expenditure is assumed to take place in the remainder of FY2005-06 and one-third each in 2006-07 and 2007-08, respectively. In the model, this relief is assumed to directly augment consumption.

TABLE 4
ASSUMPTIONS OF RELIEF AND RECONSTRUCTION SCENARIO

Expenditures assumed in simulation	Allocation in SPDC model	Expenditures assumed and allocation in UN (2005) and ADB/WB (2005)*
$0.85 billion relief expenditures assumed allocated to NWFP (50% of a total $1.7 billion): ? 1/3 in 2005-06 ? 1/3 in 2006-07 ? 1/3 in 2007-08	100% to consumption	$1.7 billion relief expenditures allocated as follows: ? 12% to death and injury compensation ? 64% to relief ? 24% to early recovery (inc. restoration of livelihood)
$2.05 billion reconstruction expenditures assumed allocated to NWFP (50% of a total $4.1 billion)**: ? 1/9 in 2005-06 ? 2/9 in 2006-07 ? 2/9 in 2007-08 ? 2/9 in 2008-09 ? 2/9 in 2009-10	? 44% to private investment in sectors other than manufacturing and agriculture ? 43% to provincial development expenditures: Economic services (13%) +Education (14%) +Health (9%) +Public health (5%) +Other (2%) ? 13% to public investment: Agriculture (9%) +Manufacturing / other (4%)	$3.5 billion reconstruction expenditures allocated as follows***: ? 44% to private housing ? 43% to: Transport, irrigation and energy (13%) +Education (14%) +Health (9%) +Water supply/sanitation and environment (5%) +Public administration (2%) ? 13% to: Agriculture and livestock (9%) +Industry and services (4%)

*__Sources:__ UN(2005), Table 1 and ADB/WB (2005), Table 2.

**The total of relief and reconstruction expenditures assumed over a 5-year period amount to $5.8 billion, the amount pledged at the donors' conference in Islamabad on November 19, 2005.

***The total of $5.2 billion is the amount that has been assessed by the two companion studies of UN and ADB/WB as the amount needed for relief and reconstruction.

The remainder amount of $4.1 billion is assumed to be allocated to the reconstruction of lost assets and the restoration of services. This is $0.6 billion more than allocated in the ADB/WB report, reflecting the difference between the amount pledged and that study's needs assessment. Half of the reconstruction expenditures amount is assumed to be allocated to NWFP which is consistent with the ADB/WB scenario. We assume that the reconstruction expenditure is uniformly spent over the remainder of FY2005-06 through the end of FY2009-10, about a five-year time horizon.

The allocation of the reconstruction outlays to different sectors made in our model simulations and those made in the ADB/WB study is also shown in Table 4. Thus 44 percent of the ADB/WB allocation to private housing shows up as a 44 percent allocation to private investment in other sectors in our model; a 43 percent allocation to the sectors of transport, irrigation, energy, education, health, water supply and sanitations, environment and public administration by ADB/WB shows up as a 43 percent allocation to provincial development expenditures in these same categories and in the same proportions in the model; and the 13 percent allocation to restoration of other agriculture and livestock assets as well as to restoration of other industry assets and services shows up as a 13 percent allocation to public investment in the model.

In addition, it is assumed that the rebuilding efforts will gradually restore cultivated land in the affected areas to the original amount in five years. Specifically, a quarter of the cultivated land is assumed to be restored in each of the four fiscal years from 2006-07 through 2009-10.

Path of the economy under the assumed rebuilding

The deviation from baseline of growth rates of selected variables under the relief and reconstruction scenario are shown in Table 5. A comparison of Table 5 to Table 3 shows that the hit to real GDP growth and per capita real GDP growth in 2005-06 (about a 1½ percentage points reduction in each) is about the same in the reconstruction scenario as in the earthquake scenario without rebuilding. This is because the computed effects are based on real GDP at factor cost, which can be viewed as the aggregate supply of the economy. The fall in aggregate supply resulting from losses of the capital stock, the labour force, employment and destruction of cultivated area, do not start to be made up until FY 2006-07.

TABLE 5
GROWTH UNDER THE RELIEF AND RECONSTRUCTION SCENARIO
(Percentage Points Deviation from Baseline)

Selected Variables	2005-06	2006-07	2007-08	2008-09	2009-10
Growth of Real GDP	-1.4	0.1	0.1	0.2	0.2
Real Consumption Growth	-0.5	-0.2	0.0	-0.2	0.0
Real Investment Growth	-1.8	1.9	1.2	0.9	0.3
Private	-3.1	1.7	1.2	1.0	0.3
Public	1.9	2.6	1.2	0.7	0.3
Real Per Capita GDP Growth	-1.4	0.1	0.1	0.2	0.2

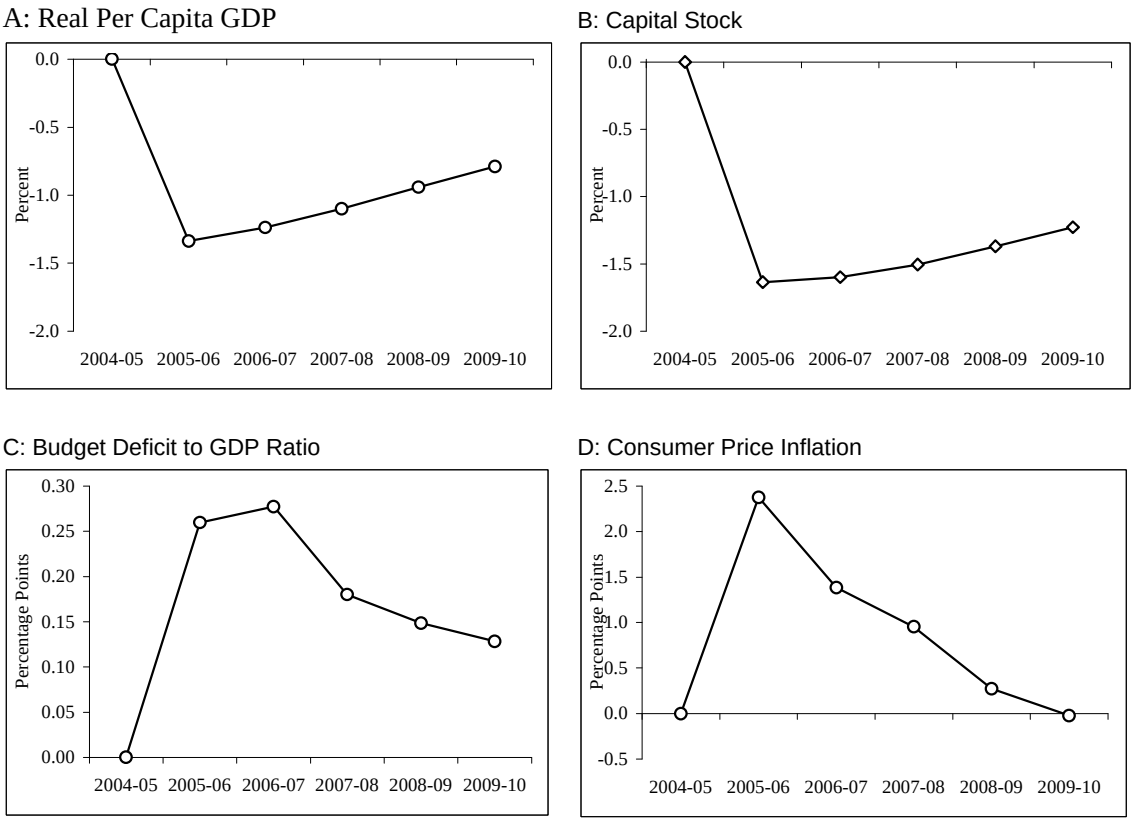
Note, however, that the immediate hit to final domestic demand in the reconstruction scenario is less than without any rebuilding, as reflected in the lower falls relative to baseline in the 2005-06 growth rates of private consumption and private investment in Table 5 compared to Table 3. This is a manifestation primarily of higher consumption and public investment resulting from reconstruction efforts.

In subsequent years beyond 2005-06, real GDP growth and per capita output growth increases relative to the baseline, reflecting the effects of the higher spending resulting from the reconstruction efforts. With the reconstruction effort concentrated primarily on investment activities, growth of real investment is higher relative to baseline by about 2 percentage points in 2006-07 and about 1 percentage points in the subsequent two years. Consumption growth still falls relative to baseline in the first two years, but less than it would without the relief effort. Note that consumption growth also slightly dips down relative to baseline in 2008-09 because the exogenous shock to consumption from the relief efforts expires in that period, according to our assumptions.

The deviations from baseline of selected variables under the relief and reconstruction scenario are plotted in Figure 2. Panel A depicts how real per capita output after falling by 1½ percent relative to baseline gradually starts returning to the zero-axis, which would imply that it was back on the baseline path. However, five years later it is still only about half-way back to the baseline path with real per capita output still about ¾ of percentage points below the baseline. The capital stock (panel B) also reverses some of its losses but is still more than one percent below its baseline by the end

of 2009-10. These results suggest that, according to our model at least, under the rebuilding scenario of $5.8 billion it will take significantly more than five years—perhaps on the order of 10 years—to recoup the lost capital stock and the lost income and output that likely resulted from the October 8 earthquake.

FIGURE 2
RELIEF AND RECONSTRUCTION SCENARIO:
DEVIATION FROM BASELINE PATH OF SELECTED VARIABLES



The budget deficit as a share of GDP (Panel C of Figure 2) rises more in the reconstruction scenario than we saw earlier in figure 1. Specifically, it rises by about 0.3 percentage points in 2005-06 and 2006-07, then falls gradually to about 0.15 percentage points higher relative to baseline after five years. Some of the reconstruction expenditures constitute public sector spending which is not being financed by higher taxation, which is the source of the modestly higher effect on the budget deficit relative to GDP.

The large amount of reconstruction spending does however increase inflation substantially relative to baseline. The inflation rate is higher than baseline by more than 2 percentage points in 2005-06 and by nearly 1½ percentage points in 2006-07 (Panel D). Thus if inflation was originally predicted to be about 7½ percent, for example, in each of these two years it would instead be 10 percent in 2005-06 and 9 percent in 2006-07.[10] Gradually, the inflation path returns to baseline by the end of FY 2009-10.

Despite the fact that there is not inordinate pressure from the government budget deficit in the rebuilding scenario, the rise in inflation relative to baseline is not surprising. This is because reconstruction activity raises aggregate demand much faster than it restores the lost productive capacity of the economy that resulted from the earthquake. In that sense, it is not necessarily and automatically the case that spending much more than $5.8 billion to achieve complete rebuilding within 5 years would be a better strategy because it would have severe consequences for the inflationary environment. If more money is to be spent, a more gradual approach to this spending may be more appropriate. In any case, there is a trade-off here for the government to evaluate.

4. CONCLUSIONS

The main questions that we posed in this study with respect to the earthquake were the following: How much economic loss has the earthquake caused that needs to be recouped? Under the rebuilding scenario that seems most plausible at present, what path can the economy be expected to take and how much of the economic loss can be expected to be made up within five years under this scenario? What pressures would the reconstruction efforts put on the government budget deficit and the inflation rate? The quantitative answers to these questions seem to vary. In this paper, we have attempted to use simulations from SPDC's large-scale model of the Pakistan economy to shed light on these questions. Our results lead to the following conclusions:

First, our model suggests, unlike the opinion of many experts, that the earthquake could initially shave off 1½ percentage points from economic growth, despite the

[10] Government circles seem to be discounting these inflationary effects of the relief and reconstruction—see, for example, the statement of the Minister of State for Finance reported in the Daily Dawn, Sunday, November 27, 2005. Our model simulation results are suggesting that the inflationary impacts can be substantial and should be factored in the analysis of where the economy is headed in the aftermath of the earthquake.

substantial reconstruction efforts being taken into account. But this effect on growth is likely to be temporary, largely restricted to year 2005-06. The initial hit from the earthquake leads to losses of levels of the capital stock, consumption and income that are substantial. These effects do not include the economic losses in AJK, which would roughly double these costs but these extra costs would not show up in the *measured* economic statistics of Pakistan.

Second, under the rebuilding effort assumed, which involves outlays of $5.8 billion over a five-year period, growth in subsequent years will in fact be higher than it otherwise would have been which is not surprising. However, this subsequent higher growth will only be enough to bring the economy back after five years about half-way to the path where it would have been in the absence of the earthquake.

Finally, the reconstruction is likely to lead to a significant increase in inflation for about two or three years. This is not because the rebuilding efforts put inordinate pressures on the budget deficit—such pressures are rather modest. Rather, it is because the reconstruction activity restores aggregate demand much faster than it restores the lost capacity of the economy to produce output. Thus, the government faces a delicate dilemma in that higher expenditures, more quickly disbursed would restore the economic losses faster but would be substantially more inflationary with the attendant adverse consequences of that.

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