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Fiscal Multipliers and Institutions in Peru: Getting the Largest Bang for the Sol

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Abstract

With the end of the commodity super cycle, Peru's potential growth has declined, raising questions of what government policies could do to help boost growth, including over the medium-term. Our econometric analysis shows that public investment multipliers have a larger effect on growth than current spending or tax-related stimulus in the short and medium terms. Peru's low debt and financial savings grants fiscal space for increasing investment spending, which could also entice and complement private investment, provided the former is efficient, fiscally sustainable and complemented by further reforms in public investment management and changes to the decentralization framework.

JEL Classification Numbers: E02, E62, G23, N26

Keywords: Peru, fiscal policy, fiscal sustainability, nonlinear models, multipliers, public investment management, decentralization.

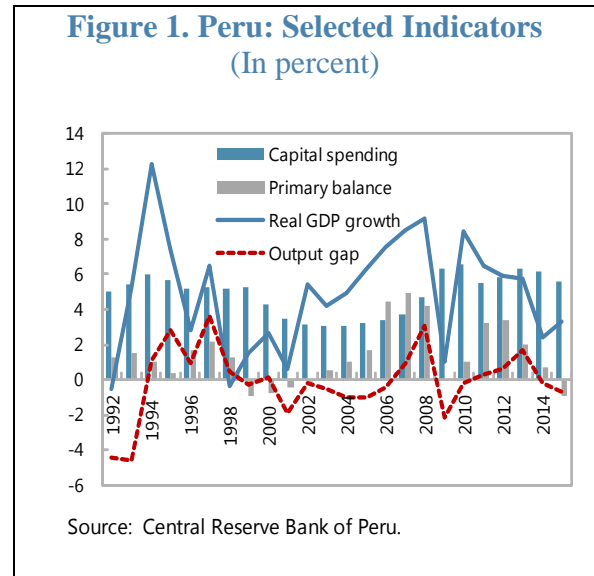
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I. CONTEXT

Peru's fiscal policy evolved over the turbulent eighties, austere nineties, and the commodity boom of the 2000s. It has played a crucial stabilization role, especially at times when inflation and dollarization were exceptionally high (Vtyurina, 2015). Impressive fiscal retrenchment in the nineties was growth-inducing by bringing stability after years of hyper inflation and economic mismanagement (Figure 1). While preserving fiscal sustainability, reflected by very low public debt levels, public investment has grown significantly and supported private investment (Ross and Peschiera, 2015). Deep structural reforms have aimed at strengthening fiscal rules, public treasury, and financial and investment management systems (Pessoa and others, 2015). Private sector investment has been crowded-in through the Public-Private Partnership (PPP) framework. However, infrastructure projects have been often derailed by bureaucratic and regulatory impediments, lingering weaknesses in the public investment management (PIM) system, and the unfinished decentralization process, leaving a still-large infrastructure gap.



Looking ahead, a slow global recovery and low commodity prices have prompted policymakers around the world to re-think the role of fiscal policy in supporting growth. The fiscal expansion enacted by the Peruvian authorities to the 2014 downturn brought to the fore the discussion on the effects of different fiscal expansionary measures on growth in the short-term.

With the end of the commodity super cycle and the projected halt in mining investment, Peru's medium-term growth potential has also been revised downward. In this context, it seems imperative to consider if Peru should maintain high public investment rates in order to attract and complement private investment to help close the infrastructure gap and become more competitive. However, maintaining or increasing capital spending will not be effective unless a strong PIM system is in place to obtain the largest bang for the sol invested.

The paper is organized as follows. Section II provides a brief background on public investment trends and recent fiscal stimulus measures. Section III overviews studies on fiscal multipliers; and section IV and Annex 1 present the results from the econometric analysis of the effect of fiscal policy measures on output. Section V discusses weaknesses in executing capital spending, including at a local level, and assesses Peru's capital spending efficiency and the PIM system. Section VI concludes with recommendations.

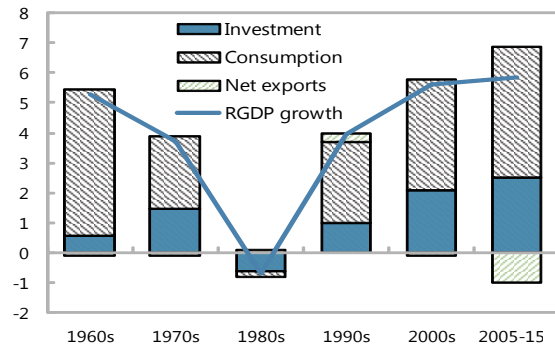
II. PUBLIC INVESTMENT TRENDS AND FISCAL LEVERS

Stylized facts on investment

Over the past decade, public investment spending has increased in Peru in line with private investment, reflecting investment promotion initiatives and the need to fill a large infrastructure gap (Ross and Tashu, 2015).

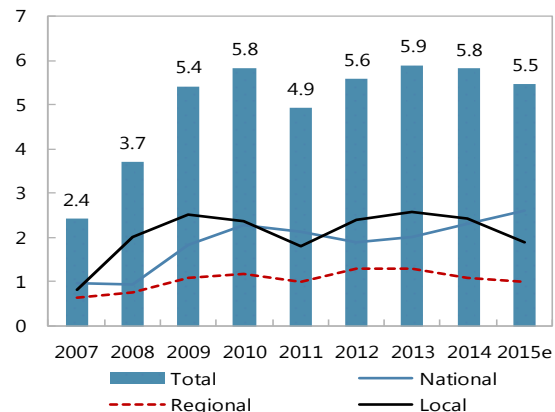
- As a percent of GDP, public investment spending increased from about 3 percent in the early 2000s to about 6 percent in 2013, before moderating in 2014-15. In the same period, private investment jumped from 14¼ percent to 19¼ percent of GDP. Over the last decade, public investment contributed 2¾ percentage points (21 percent) to the average annual growth in total real fixed capital investment of 12¾ percent (Figure 2).
- Local government spending has been a major boost to public investment till 2014. Local investment spending has tripled, increasing from less than 1 percent of GDP in 2007 to 2½ percent of GDP in 2013. Taken together, national and regional fixed investment spending has gone from about 1½ percent to 3 percent of GDP. To some extent, these results are a reflection of the decentralization process and the government's efforts to bring investment projects to the regional and municipal levels, on the back on increased revenues during the commodity super cycle (Figure 3).²

Figure 2. Contributions to Real GDP Growth (In percent)



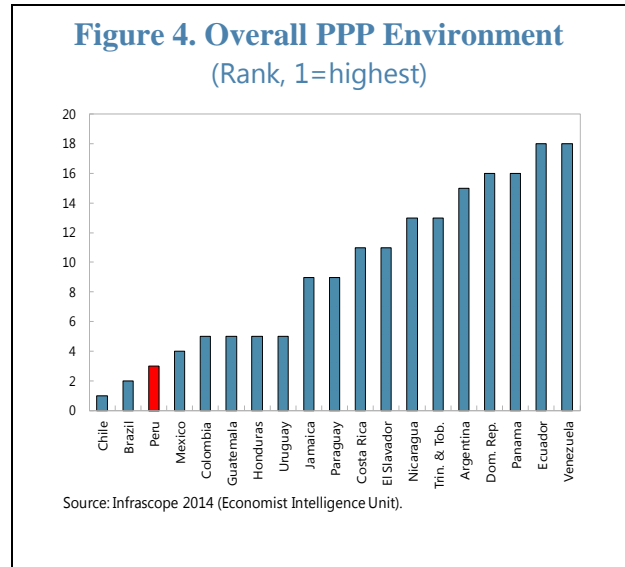
Sources: Central Reserve Bank of Peru and National Statistics Institute.

Figure 3. Public Fixed Investment Spending (In percent)



² Although Peru's commodity revenue intake is not that large comparing to large single commodity producers, especially of oil, at the height of the cycle, it reached above 4 percent of GDP, leading to higher transfers, and the accumulation of buffers, including in the Fiscal Stabilization Fund.

- In global and regional comparisons, public investment has risen in Peru over the last decade above the levels for emerging market economies (EMs) and Latin America and Caribbean countries (LAC). However, its capital stock, including on a per capita basis, still lags behind EMs, although is at par with LAC (Figure 4).³ At the same time, Peru leads in PPPs and has received high rankings regionally for the quality of its framework (Figure 5).



- As in other emerging markets, Peru's infrastructure gap remains large (WEO, 2014). The Peruvian Association of National Infrastructure Investment (AFIN), a private research and advocacy group, has estimated a national infrastructure gap at around US\$160 billion over 2016–25 (Table 1). For the next four years, the gap is about US\$70 billion. Deficit areas include energy, telecommunications, transportation, health and education.

Table 1. Peru: Infrastructure Gap by Sector

Sector	2016-20	2021-25
Water and Sanitation 1/	6.9	5.2
Telecommunications	12.6	14.4
Transport	21.2	36.2
Energy	11.4	19.4
Health	9.4	9.4
Education 2/	2.6	1.9
Hydraulic	4.5	3.9
Total	68.8	90.7

Source: AFIN (2015).

1/ Considers only water and sanitation service access and no improvement in existing connections and wastewater treatment.

2/ Covers only increases in coverage and does not take into account functional adequacy of schools, rehabilitation, or seismic reinforcement.

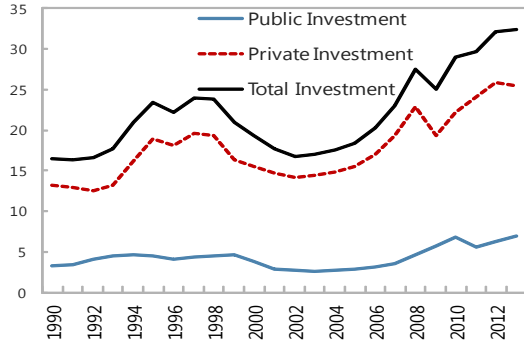
Stimulus measures

Peru has been able to comfortably resort to fiscal measures during cyclical downturns, utilizing the fiscal buffers accumulated during the boom years. For instance, following exceptionally high growth of 9.8 percent in 2008, activity in Peru decelerated sharply in 2009 due to the global financial crisis, GFC (IMF, 2010). In mid-2009, the government announced the *Plan for Sustaining Economic Growth, Employment, and Poverty Alleviation in a Global Crisis*, which presented a set of fiscal measures equivalent to nearly 4 percent of GDP that could be ready for implementation if conditions warranted (Table 2). The substantial fiscal stimulus – mainly for infrastructure and maintenance projects and financial assets—resulted in a fiscal impulse of around 3 percent of GDP over 2008–10 and budget deficits in two of those years.

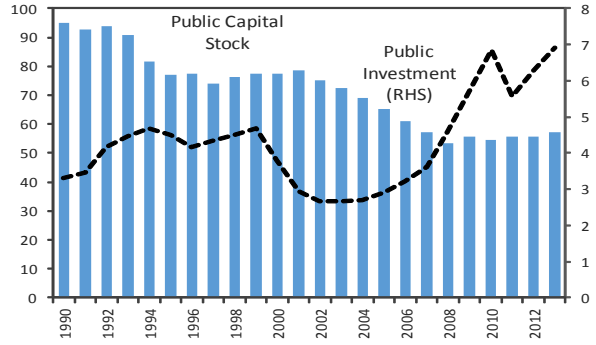
³ In emerging market economies and low-income countries, sharply higher public investment in the late 1970s and early 1980s significantly raised public stocks, but since then public capital relative to GDP has fallen (WEO, 2014).

Figure 5. Investment Dynamics
 (2005 Purchasing Power Parity US dollar-adjusted, in percent of GDP, unless otherwise indicated)

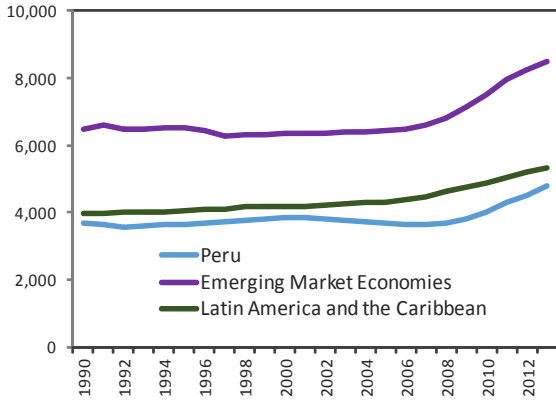
Peru: Investment



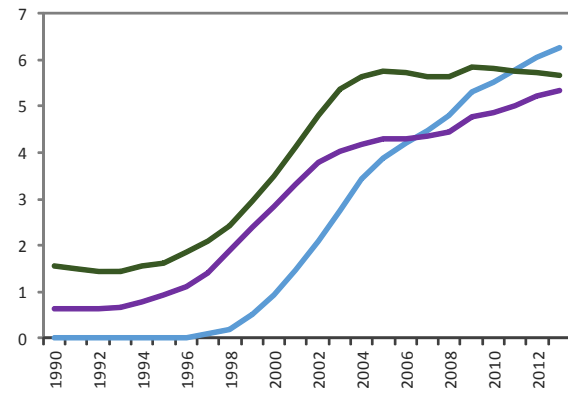
Peru: Public Investment and Capital Stock



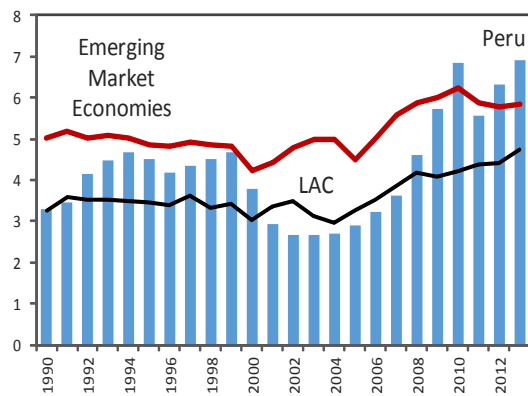
Real Public Capital Stock per Capita



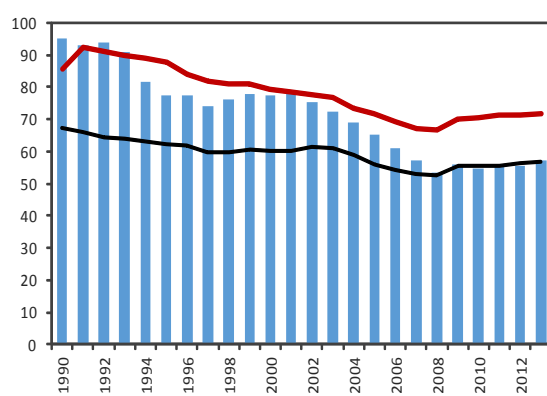
Public-Private Partnerships Capital Stock



Public Investment



Public Capital Stock



Sources: National authorities; and Fund staff calculations.

The government started to withdraw the fiscal stimulus once there were clear signs of a robust and sustained recovery of private expenditure in 2010.

In response to changes in the global environment starting in 2012, the authorities targeted a reduction in the budget surplus, which declined to around 1 percent of GDP in 2013 and turned to nearly balance in 2014. In addition, in mid-2014, when it became clear that the economy was softening rapidly due to external and domestic supply shocks, the government designed a fiscal stimulus plan equivalent to about 3 percent of GDP to boost aggregate demand, including higher public investment, maintenance spending at regional and local level, accelerating pass-through from international oil prices to local prices and tax reduction (Table 3). This led to an overall budget deficit of about 2 percent of GDP in 2015. However, most of the stimulus in 2014–15, came from tax measures—about 30 percent of a 2 percentage point decline in tax revenue came from tax rate reductions⁴—and an increase in current spending (in 2014) rather than higher public investment, which was under-executed in both years and dropped significantly in 2015 as percent of GDP. The limited resulting stimulus once again drew attention to the effects of fiscal expansion on growth, in particular whether capital spending would have had a stronger impact on growth than tax measures or current outlays.

Table 2. Peru: Selected Fiscal Stimulus Measures
(In percent of GDP)

A. Taxes (2015)	0.7
B. Net expenditure (2014)	0.3
Bonuses and salary increases	0.3
C. Expenditure (2015)	0.9
Current expenditure	0.1
Capital expenditure	0.4
Repayment of debt in arrears	0.3
Social assistance	0.1
Total (A+B+C)	1.9

Sources: National authorities; and Fund staff estimates.

Table 3. Peru: Anti-Crisis Fiscal Measures (2008-09)

	Percent of GDP
Support to construction sector	0.85
Access to drinking water	0.05
Support to SMEs and export sector	0.37
Public investment	1.37
Investment continuity initiative	0.41
Key new or accelerated projects (68)	0.28
Fund for Regional and Local Public Investment	0.63
Other	0.05
Social programs and targeted support to worker	0.15
Total	4.17

Source: Ministry of the Economy and Finance.

III. BACKGROUND ON MULTIPLIERS

Fiscal multipliers measure the effect of discretionary fiscal policy on output. Fiscal measures are considered to have a large impact on growth when a multiplier (in absolute terms) exceeds one. A spending multiplier greater than one indicates that boosting public spending as a share of GDP would raise output by more than the initial spending increase. A revenue multiplier lower than -1 implies that raising the ratio of taxes to GDP by 1 percent causes GDP to decline by more than 1 percent.

⁴ Income tax reductions were envisaged as a medium-term measure to increase competitiveness by aligning rates with the neighboring countries.

The implementation of contra-cyclical responses around the world has not been without controversy with respect to their magnitude or composition. The fiscal multiplier depends on certain macroeconomic characteristics, being substantially high, for instance, if individuals' marginal propensity to consume is high, if automatic stabilizers are small, if the fiscal expansion does not trigger interest rate increases, if the exchange rate is fixed and if the fiscal accounts are sustainable (Spilimbergo et al., 2009). The composition of the fiscal expansion (taxes, current, or capital spending) matters as well; and capital spending on average has been found to provide an effective impulse both in the short and in the long term (WEO, 2014). This said, findings have varied with the degree of a country's economic development, especially if PIM systems are poorly designed. This implies an important caveat, as it takes time to design and implement capital expenditures, possibly rendering them ineffective when trying to time a fiscal stimulus to stabilize the economic cycle or even producing an involuntary pro-cyclical fiscal stance (Rossini and others, 2012; MEF, 2015). Estimates of multipliers vary, sometimes significantly. Due to data limitations, it is harder to measure multipliers in emerging markets (EMs), and some studies propose a range of multipliers derived for countries with similar structural characteristics (Batini et al. (2014)). Peru fits into the country category with medium-size overall multipliers (0.4-0.6) in the first year of fiscal expansion. Some studies suggest that both spending and revenue multipliers are small in EMs, with revenue multipliers higher than spending ones (Ilzetzki, 2011).⁵ A few studies have been done specifically for Peru (Table 4).

Table 4. Peru: Selected Empirical Estimates of Fiscal Multipliers

Study	Cycle	Multiplier Estimate		Description
		Short-term	Medium-term	
Central Reserve Bank of Peru (2012)	downturn	0.24; 0.92	0.49; 1.42	Current; capital spending (period 1992Q1:2012Q1)
Rossini and others (2012)		0.78; 1.36; -0.44	0.52; 2.63; -0.38	Current; capital spending; current revenue
Sanchez and Galindo (2013)	downturn	1.3; 0.2		Government spending; taxes (period 1992Q1:2011Q4)
BBVA bank (2014)		0.55; 0.6; -0.1	0.2; 1.6; -0.2	current; capital spending; tax revenue
Ministry of Economy and Finance (2015)	downturn	0.12; 0.55	0.95; 1.69	Central government current; capital spending (1995Q1:2014Q4)
	upturn	0.13; 0.55	0.82; 1.74	
Central Reserve Bank of Peru (2014-15)	downturn		0.93; 1.42; -0.25	Current; capital spending; current revenue
	upturn		0.28; 0.73; 0.00	

⁵ For literature review on advanced economies Baunsgaard and others (2014).

IV. METHODOLOGY AND RESULTS

We used a non-linear model to estimate the asymmetric response of growth to discretionary changes in fiscal revenues and expenditures at two different stages of the economic cycle. That is, fiscal multipliers are estimated using a threshold vector autoregressive model (TVAR) in which a threshold variable is used to indicate the change from a regime of lower growth to a regime of higher growth, and vice versa. The general idea is to evaluate whether the response of fiscal policy is different depending on the economic cycle, which cannot be tested using conventional linear vector autoregressive models (VAR or SVAR). In this model, we use gross domestic product (GDP) growth as the threshold variable and its value is determined endogenously from the model, as it chooses the value that best fits the data in both regimes.

While several regimes (cycles) can be estimated from the TVAR model, for our purpose we only use two. The regimes are defined based on the boundary value of a threshold variable or indicator variable that marks the change from one regime to another. This threshold value can be chosen either endogenously or exogenously and the variables from the model will have different coefficients depending on the regime in which they are.

The TVAR model is of the form:

$$Y_t = \partial_1 X_t + \partial_2 X_t I [z_{t-d} \geq z^*] + U_t$$

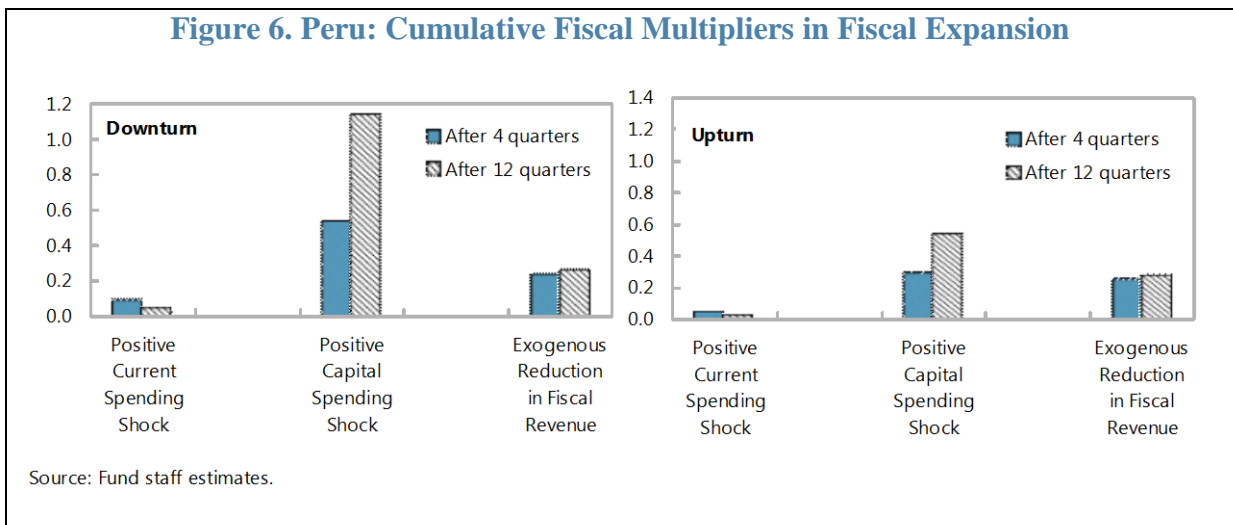
Where Y_t is a vector containing real revenues, real current expenditures, real capital expenditures, and real GDP growth rates. The consumer price index was used as deflator, data were seasonally adjusted, except for the series already adjusted by the authorities, and used as the first difference of the logarithm of their levels. The data refer to the general government and covers the period from 1995Q2 to 2015Q3. $X_t = (1, y_{t-1}, \dots, y_{t-p})'$, z_{t-d} is the threshold variable that indicates the prevailing regime, d is the time lag (set to 3), z^* is the threshold value that sets the boundary for the regime change and was estimated endogenously at 1.5 percent.^{6,7} This means that data will be used for the upper regime for the quarters in which GDP growth is above 1.5 percent. $I[.]$ is an indicator function that takes the value of 1 when the threshold variable is above z^* and zero when the threshold variable is below z^* . U_t is the vector of disturbances. The lag length of the variables was set at 1 and has been taken from the lag order selection criteria in the linear VAR estimation (Schwarz information criterion). For this model we followed the methodology proposed by Baum and Koester (2011) and used a Gauss code provided by Anja Baum (2012) and adapted for the case of Peru (see Annex I for further details).

⁶ To obtain the time lag value, we run a Tsay test for the threshold variable. Results from the test indicate that a lag of 3 is statistically significant at 90 percent confidence level. Results of the test are available upon request.

⁷ We have used a code provided by Gabriel Bruneau from the Bank of Canada to estimate this threshold value. The estimation method is a maximum likelihood, optimized by grid search. The likelihood is discontinuous at the threshold. Therefore, a grid of potential threshold value is formed. All values of potential threshold split the sample into separate regimes, and a least square is computed for each regime (since all least square is conditional on the value of the threshold, this is considered a conditional least square). Then the likelihood is computed based on all conditional least squares, and the threshold that maximize the likelihood is then chosen.

The results show supportive evidence for a nonlinear impact of fiscal policy on output: the effects of fiscal policy shocks on economic activity depend on their size, direction and timing with respect to the economic cycle. The results for capital spending multipliers are in accordance with other studies for Peru (Figure 6). One sol in capital spending will increase output by 0.5 soles in the first 4 quarters in the lower regime and slightly less in the upper regime. Cumulative effects are more disperse after 12 quarters when capital spending multipliers reach to 1.1 in the downturn and to 0.5 in expansion. We find current spending multipliers to be not significant in size in both cycles, which is a more conservative estimate than in other studies. This partly reflects the fact that current spending is usually associated with transfers (which are fairly flat in Peru) and one-off bonuses, which, like tax cuts, are intermediated by households' savings behavior before affecting household spending and, then, economic activity. In addition, the long-term effects of specific adjustments and the efficiency of tax and expenditure changes depend on their preexisting levels and structure. A historically high level of informality in Peru and low tax-to-GDP ratios also point to the limited effect of tax cuts on output, suggesting fiscal spending increases are more effective stimulus measures. Within spending, while capital outlays may take a while to be implemented, as argued above, current spending may create contingent liabilities in the shape of future spending (for examples, it is hard to cut public wages once they are increased) and thus be less nimble in the face of changing economic conditions.

Figure 6. Peru: Cumulative Fiscal Multipliers in Fiscal Expansion



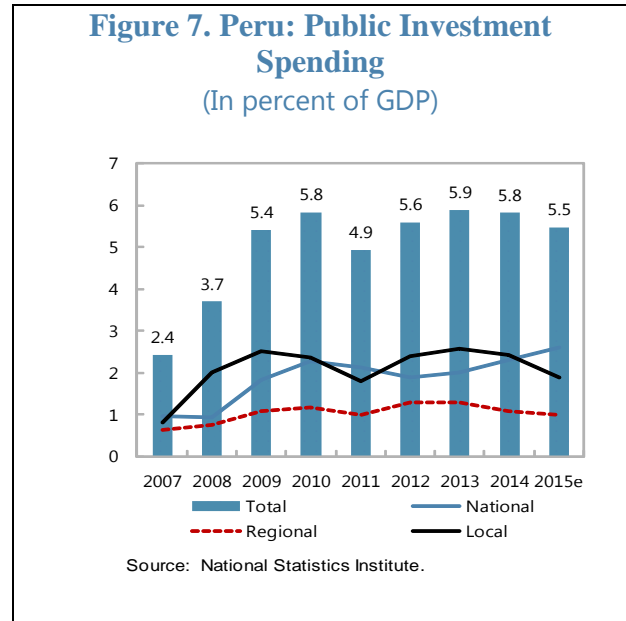
V. QUALITY, EFFICIENCY AND MANAGEMENT OF PUBLIC INFRASTRUCTURE⁸

The success of public investment projects across countries depends on many factors: the level of economic development and availability of fiscal space, structural characteristics of the economy, the quality of governance, geography, and climate (IMF, 2015). However, a growing body of literature underscores the role that the legal, institutional, and procedural

⁸ See more on regional comparisons of infrastructure trends in Western Hemisphere Department's Spring 2016 Regional Economic Outlook Chapter 5.

arrangements, including risk management, for public investment management play in determining the level, composition, and impact of public investment on the economy.

The Peruvian authorities have long recognized the importance of capital investment spending on growth and social indicators given large gaps. Implementation of planned public investment spending has improved over time, although still remains well below 100 percent, especially at the regional and local levels (Figure 7). Overall, fixed public investment spending is now about 80 percent of budgeted amounts—up 13 percentage points from 2007 (MEF 2016). The increase in metal prices (and, thus, higher commodity revenues during the super cycle) has reduced financial resource constraints for the national government, and at sub-national levels in specific mining regions. At the same time, the decentralization process has created a number of new jurisdictions with relatively inexperienced capital spending administrative units (see Section C).



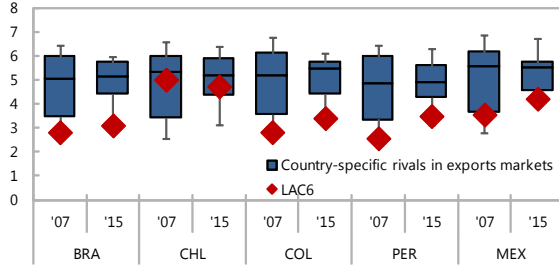
A. Infrastructure Quality and Efficiency

Given large capital multipliers, it is important to examine the quality and efficiency of capital spending in Peru so that to determine where improvements may be necessary to achieve a greater bang for the sol. A large chunk of public spending goes into infrastructure, a category which is most scrutinized when the country's competitive position is being assessed. Companies will be more reluctant to invest in a project in a country lacking the transport or logistical infrastructure. Following that notion, country-specific benchmarks were created for the region's five largest economies by identifying each country's top five competitors in each of its top five export products. The benchmark is the range of stock and quality of infrastructure in this rival group (Figure 8). On this metric, while improving from 2007 more than its neighbors, Peru's infrastructure quality is below its trading partners, suggesting continuing competitiveness concerns. Peru also dropped by 7 spots to 112th place out of 140 countries for quality of overall infrastructure by the World Economic Forum's, and is 17th of 22 countries in Latin America and the Caribbean.

A Public Investment Efficiency Indicator (PIE-X), recently designed by IMF (2015), estimates the relationship between the public capital stock and indicators of access to and the

Figure 8. Selected Competitiveness and Quality Indicators

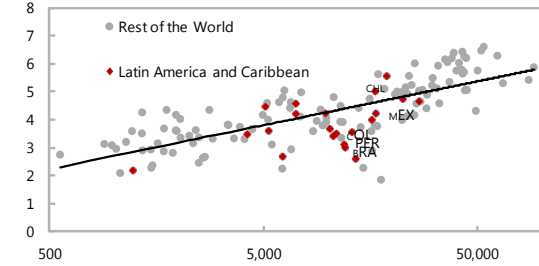
LACS and Trade Rivals Comparison 1/
(Index, 7 = best)



Sources: Staff estimates with World Economic Forum and UNCOMTRADE data.
1/Trade rivals sample defined as the top 5 exporters of each of the top 5 goods exported by the respective country.

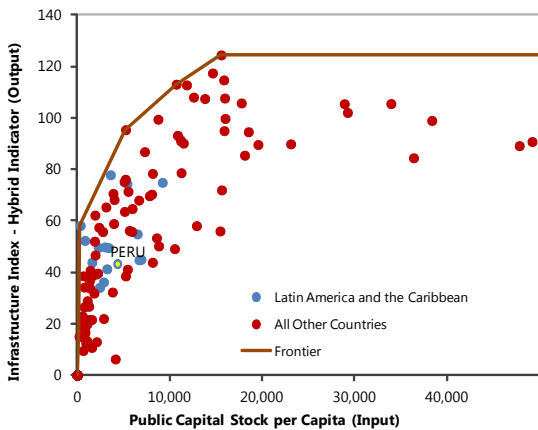
Quality of Infrastructure

(x-axis, GDP per capita, current PPP U.S. dollars, 2012; y-axis, Infrastructure indices, 7 = best)



Sources: World Economic Forum; and World Bank.

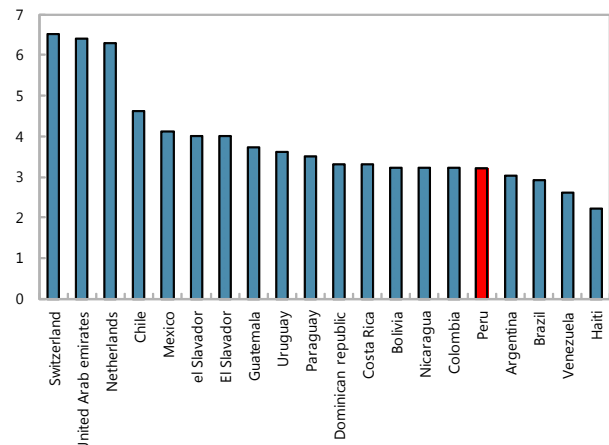
Efficiency Frontier (Hybrid Indicator) 1/



Sources: Center for International Comparisons (2013); World Economic Forum (2014); OECD (2014); World Economic Outlook; World Development Indicators; and Fund Staff estimates.

1/ Combines the physical and survey based indicators into a synthetic index of the coverage and quality of infrastructure networks.

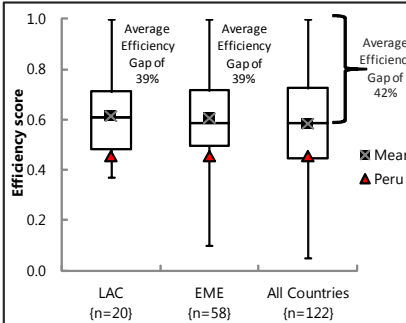
Quality of Infrastructure Ranking



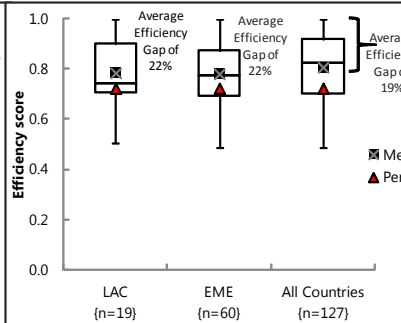
Source: Global Competitiveness Report 2015-16 (World Economic Forum).

Public Investment Efficiency Indicator

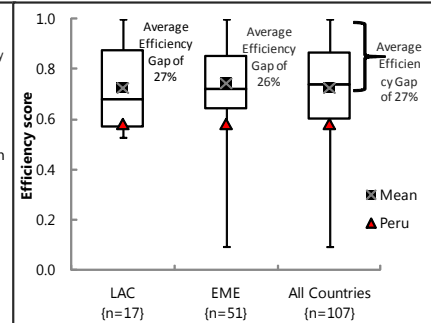
Physical Infrastructure



Quality of Infrastructure



Hybrid Indicator

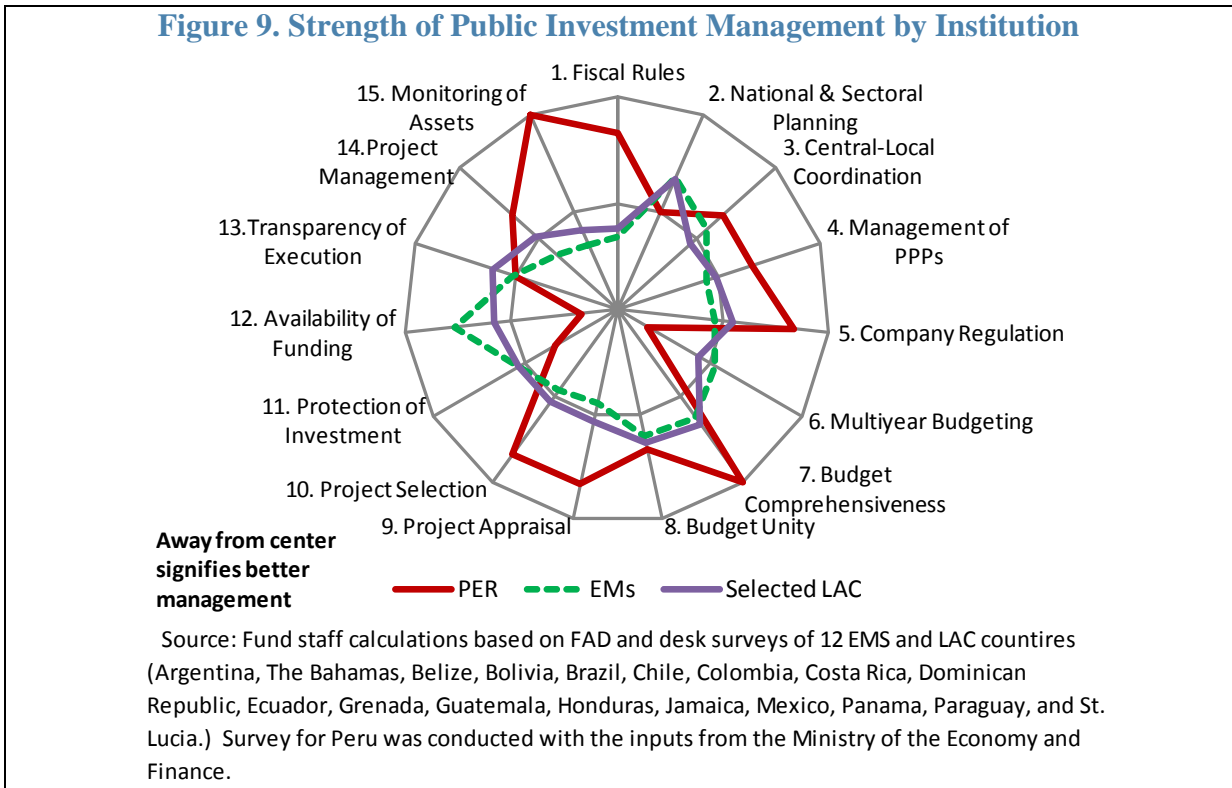


Source: Fund staff calculations.

quality of infrastructure assets (Figure 8).⁹ The PIE-X estimate for Peru confirms that there is substantial scope for improving public investment efficiency. While Peru compares fairly well with other LAC countries and EMs when looking at survey-based indicators (efficiency gap of 28 comparing to the average of 19 for LAC and EMs), it lags significantly behind on the physical indicator measure (54 versus 39, respectively).

B. Public Investment Management System

While infrastructure quality and efficiency shows large gaps, it does not have a linear relationship with the PIM system. In fact, on the face of it, Peru compares relatively well to other EMs and selected LAC countries, and excels in several categories according to PIM Assessment (PIMA), a survey-based ranking tool developed by IMF (2015). The assessment provides a comprehensive overview of the public investment decision-making process by evaluating 15 key institutions for planning, allocation, and implementing public investment (with scores of 0 (non-existent) to 10 (fully implemented)), farther from the center indicates better implementation (Figure 9).



⁹ Sample includes over 100 countries. Countries with the highest levels of infrastructure coverage and quality (output) for given levels of public capital stock and income per capita (inputs) form the basis of an efficiency frontier and are given a PIE-X score of 1. Countries are given a PIE-X score of between 0 and 1, based on their vertical distance to the frontier relative to peer best performers. The less efficient the country, the greater the distance from the frontier, and the lower its PIE-X score. Charts were adapted for Peru and LAC. A more detailed discussion of the measurement of infrastructure performance as well as the construction of PIE-X can be found in Annex II (IMF 2015).

Peru scores exceptionally well in the area of planning (categories 1-5). Ensuring sustainable levels of public investment manifests itself through the existence of fiscal rules that allow for planning for resources, including for public investment, making sure that public investment decisions are based on clear and realistic priorities and cost estimates, that there is certainty about funding from the central government and a sustainable level of sub-national borrowing, that management of PPPs leads to effective selection of projects and that regulation of infrastructure companies promoted open and competitive markets.

Peru scores more modestly in the area of resource allocation (categories 6-10). A rather obvious weakness lies in the area of multi-year budgeting. This category implies the practice in budgeting that provides transparency and predictability regarding levels of investment by ministry, program and project over the medium term. Project selection and appraisal use standard methodology and systematic vetting. Peru does not publish projections of capital spending beyond the budget year as the budget is approved on a yearly basis.¹⁰ Thus, there are no multiyear targets/ceilings on capital expenditure by ministry or program. And while projections of the total cost of major capital projects are published, they are not presented together with annual projections over a three-to-five year horizon. A particular weakness relates to multi-year investment spending, as there is no official record regarding commitments in future years from signed public investment contracts. This fact, coupled with the lack of absorption capacity, generates work abandonment and unplanned project modifications, particularly at the sub-national level. Peru does well in budget comprehensiveness, which ensures that all public investment is authorized by the legislature and disclosed in the budget recommendation.

Project implementation could also be improved substantially (categories 11-15). Peru scores well in project management by having a designated staff to prepare implementation plans, and in monitoring of public assets through comprehensive asset surveys that are conducted regularly by the government. This said, project appropriations are not sufficient to ensure the coverage of total project costs as they are approved by congress on a one-year basis and unspent appropriations of capital lapse at the end of the year (with a few exceptions). Cash flow forecasts are not prepared or updated regularly and ministries/agencies are not provided with commitment ceilings in a timely manner and cash for project outlays is sometimes released with delays, leading to some setbacks in project implementation. Finally, many major projects are tendered in a competitive process, but the public has only limited access to procurement information and only some large projects are subject to external audit.

C. Sub-national Framework

As discussed briefly above, the decentralization process that started in 2002, and is not yet complete, also poses a challenge for Peru's PIM (Cheasty and Pichihua, 2015). To fund subnational government responsibilities, regional and local governments are supposed to share transfers from the national government, license fees (canons), and royalties from commodity-related operations. That has allowed decentralization of public spending, but actual implementation has greatly varied across regions and municipalities, both in terms of quantity and quality. To a large extent this is explained by the diversity of Peru's subnational

¹⁰ Peru publishes projections of fiscal accounts on a three-year basis in the MEF's Macroeconomic Framework report but these are not binding beyond the budget year.

governments, many of which are small and have limited capacity to deliver local services. The local level in Peru is now one of the most fragmented in Latin America, which makes it quite challenging to assess their capacity to invest.

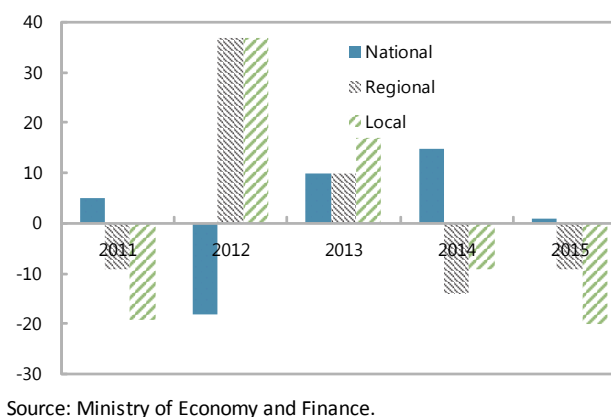
Public investment spending by local governments now accounts for more than 45 percent of total public investment in Peru (Figure 10). Decentralization of spending is tied to the delivery of general local services such as public sanitation, maintenance of parks and gardens, and local road construction and maintenance. To a large extent, investment spending at the local level is concentrated

primarily among a small group of local governments that receive enormous resources from license fees and royalties, without consideration of their spending responsibilities or capacity.¹¹ So, financing has come before capacity, contrary to best practices in decentralization. The abundance of resources, sometimes in very small and ill-equipped jurisdictions, has in many cases resulted in suboptimal project choices, wasted outlays, slow execution rates, buildup of idle balances in the banking system, and alleged corruption. At the same time, deep and frequent

employee turnover after elections, coupled with human resource limitations has led to capital spending shortfalls, especially in the last two years. Recent corruption investigations (2013–14) of several regional leaders have also led to worse investment execution at the local level by about 14 percent, on average, during 2014–2015 (MEF, 2016).

To address these issues, the national government has tried to help sustain investment levels at the local level. The Ministry of Economy and Finance (MEF) created a Special Investment Monitoring Unit (EESI) to facilitate the implementation of investment projects under the principles of competence and neutrality. The main functions of EESI are to monitor investment projects and identify obstacles affecting their implementation. In addition, 110 investment committees were formed in all three levels of government, allowing prioritization of a portfolio of strategic projects and modernization of the procurement procedures. The central government has also provided training for officials of regional and local governments on standards and methodology for the formulation and evaluation of projects; technical assistance in implementation and operation of the budgetary systems, investment and procurement; and tools for integrated management of investment projects (MEF, 2016). Arguably, the recent decline in investment could have been worse had these initiatives not been undertaken. However, deep structural changes are needed to improve the decentralization framework.

Figure 10. Peru: Infrastructure Spending by Government Level (Percent change)



Source: Ministry of Economy and Finance.

¹¹ These revenues are transferred primarily to local governments in extractive areas, with their use restricted to investment spending.

VI. CONCLUSIONS AND RECOMMENDATIONS

With the end of the commodity super cycle, Peru needs a new engine for growth, which could be non-mining investment and exports. Its low tax burden provides fiscal space for increasing public capital spending to improve infrastructure and competitiveness through better fiscal revenue collection. Higher public investment would continue to complement and encourage private sector investment, as long as it is efficient (further reforms in PIM and changes to the decentralization framework would contribute to greater efficiency) and fiscally sustainable. Despite increased investment in infrastructure and improved frameworks, Peru faces challenges in developing, executing, and managing investments, as infrastructure stocks have stagnated and are not considered of high quality. Based on our analysis, we offer the following considerations:

- ***Investment push:*** Our econometric exercise shows that public investment multipliers have a larger effect on aggregate output than current spending or tax-related stimulus in both the short and the medium terms, and especially during downturns.¹² In fact, weighting revenue and spending impulses by their respective multipliers, the impact of the fiscal impulse on the economy in 2015 was a negative 0.3 percent, despite the attempted measures. Had capital spending been executed as budgeted in 2015, real output growth would have been higher by 0.1 percentage point of GDP. While the effect is smaller in the short term, on the demand side, an extra boost could have come from crowding in private investment as there was some economic slack; and an improvement in confidence. Over the longer term, if Peru increases investment to 6-6.5 percent of GDP, this could result in about 2-percentage-points increase in output growth. Supply-side effects should kick in and raise potential output further, mainly through higher capital stock and TFP, as has happened in Peru previously. This would also improve potential for private sector investment, which would benefit from improved infrastructure, both indirectly and directly (through participation in PPPs). In this way, infrastructure can lift near-term demand and potential growth, which would also help counter risks of a significant drop in potential output owing to the end of the commodity super cycle.
- ***Fiscal sustainability:*** Peru's debt levels are very low, with net debt at 7 percent of GDP. However, given the exposure to commodity cycles, natural disasters, and contingent liabilities, it would be advisable for Peru to follow a medium-term fiscal path that allows for higher capital spending yet keeps current spending in check and ensures increasing tax collection as a percent of GDP. Independently of the combination of higher public investment and higher fiscal revenues, for debt to stabilize below 30 percent (starting from 2021), the budget would have to run primary balances of about 0.5 percent of GDP because the interest rate paid on the public debt

¹² Increased public investment raises output, both in the short term because of demand effects and in the long term as a result of supply effects. But these effects vary with a number of mediating factors, including (1) the degree of economic slack and monetary accommodation, (2) the efficiency of public investment, and (3) how public investment is financed (WEO, 2014).

is expected to be somewhat above nominal trend economic growth, unless potential GDP growth rises significantly in coming years as a result of this investment push.¹³

- **Enhancements in PIM:** Increasing public investment may lead to limited output gains, if efficiency in the investment process is not improved (WEO, 2014). While Peru scores well in several areas of PIM best practices, there is room for improvement (Table 5).¹⁴ The new administration has a unique opportunity to embrace past successes and answer to challenges by steadfast implementation of reforms where possible and by building political consensus for reforms in more sensitive areas.

Table 5. Summary of Recommendations	
PIM	Decentralization
Adopt a multi-year budget with the objective of guaranteeing full execution of multi-year investments, including documentation on scheduled commitments, especially in public investment	Revisit the assignment of natural resource revenues through a set of more transparent and equitable transfer mechanisms
Improve cash flow management so as to minimize project implementation delays	Strengthen the efficiency of subnational investment and service delivery through further capacity building initiatives
Design an Information System to integrate the process of planning, budgeting and investment over the project cycle. Monitor all major projects during project implementation for annual project costs, as well as physical progress, and conduct and publish external ex-post audits	Consider merging jurisdictions and reallocate resources away from low-capacity districts to avoid waste and seek efficiency from economies of scale
While information is available on the total cost of each project and the amount invested to date, the national planning system (SNIP) could be updated in a more timely fashion, especially with information on the stage of project execution at the municipal level	Centralize the assessment and selection of investment projects and decentralize their execution
Develop a national infrastructure strategy	

¹³ See IMF Country Reports No. 14/21 and 22 for analysis.

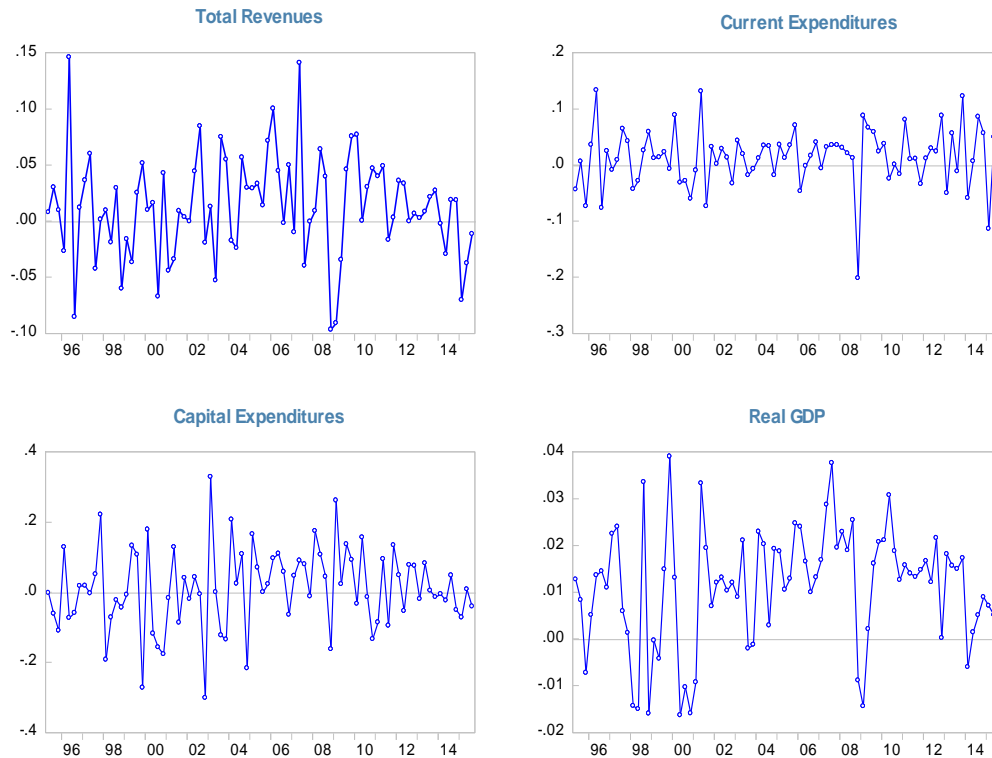
¹⁴ Draws on technical assistance recommendations.

APPENDIX: BACKGROUND ON DATA AND METHODOLOGY¹

In the model, changes in real revenues were ordered first, followed by changes in current and capital spending, and real GDP growth. The threshold value is selected endogenously over a search of possible values while keeping a minimum of 35 percent observations in each regime.

Results of the first difference of the logarithm for the variables in the model appear in the charts below.

Variables in the Model (dlog values)



Results from unit root tests were also conducted for the transformed variables and do not indicate the presence of non-stationary series.²

¹ Results and their interpretation (not shown here) are available upon request from the authors.

² The data are arranged in increasing order on the basis of the threshold variable (z) this means from less dependent variables to more dependent variables. We decided the ordering to be first of revenues, then current expenditures, and lastly capital expenditures, as the latter will be more dependent on the level of current expenditures and revenues at a certain budgeted outcome, and in the case of Peru, expenditure is a residual determined by fiscal rules. As the ordering of variables with respect to revenues has been under debate due to a perceived failure of capturing exogenous policy changes correctly (see Baum et al for an overview of criticisms), the responses of output to revenue shocks thus should be interpreted cautiously, however, our results are in line with other estimates for Peru (perhaps subject to the same criticisms). Multipliers are also small even without disaggregation to control for all cyclical factors.

Unit Root Test

ADF test

	t-statistic	p-value
Revenue	-8.76	0.0000
Capital Expenditure	-11.25	0.0001
Current Expenditure	-9.065	0.0000
GDP	-6.448	0.0000

Source: Fund staff estimates

Generalized Impulse Response Functions

In a linear VAR model the impulse response function (IRFs) will not depend on the history of the data, their response is symmetrical in terms of the sign of the shock and are linear in terms of the size of the shock. In contrast, generalized impulse response function (GIRFs) commonly used for nonlinear models and particularly for TVAR models will depend on whether the system is in one regime or the other, and the specific time in which the shock take places. Therefore GIRFs are data dependent and will be useful for our estimations of the response of growth to shocks to the variables of the system at different states of the cycle. Koop, et. al (1996) proposed the estimations of GIRFs based on the difference between the estimations of the path of variables with a shock and without the shock to a specific variable.

The GIRFs are calculated as:

$$GIRF = E[X_{t+m} | \varepsilon_t, \varepsilon_{t+1} = 0, \dots, \varepsilon_{t+m} = 0, \Omega_{t-1}] - E[X_{t+m} | \varepsilon_t = 0, \varepsilon_{t+1} = 0, \dots, \varepsilon_{t+m} = 0, \Omega_{t-1}]$$

Where ε_t is an exogenous shock of a determined size, Ω_{t-1} is the history available at time $t - 1$ before the shock in time t and m is the horizon for the forecast period. In our model we set the size of the shock at 2 percent and the forecasting horizon at 20 quarters.

Besides estimating responses to shocks between different regimes, GIRF's also incorporate regime switches, meaning that after a shock takes place, the system is allowed to change from one regime to another.

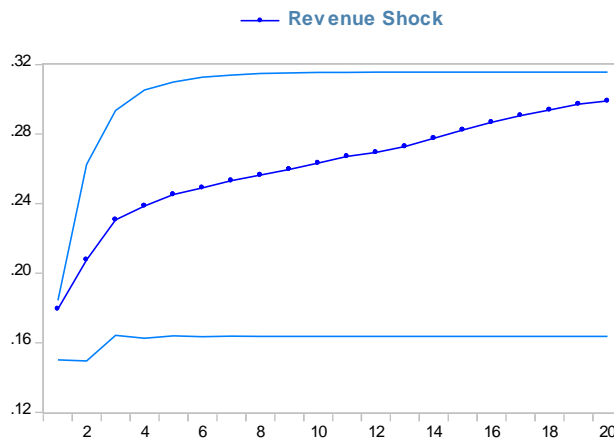
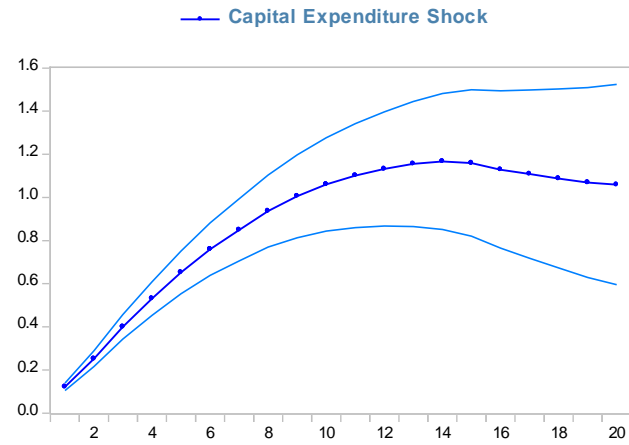
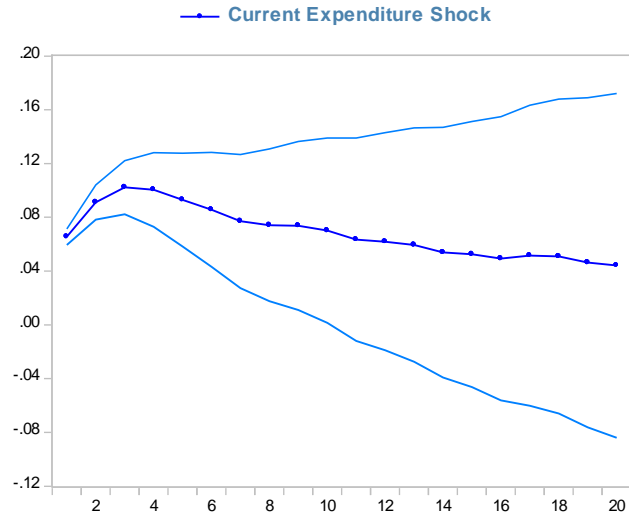
Results

We find a non-linear and statistically significant impact of fiscal policy on output.³

A 2-percent positive shock was applied to current and capital expenditures and a 2-percent negative shock to revenues. We find evidence that fiscal multipliers for government consumption are, in general, smaller than multipliers for capital spending. Consumption multipliers tend to disappear faster and tend to be higher for the lower regime than the upper regime. In contrast, positive shocks to capital spending can reach cumulative responses above 1 by 12 quarters in the future for the lower regime and are much smaller during upturns where they are below 0.6.

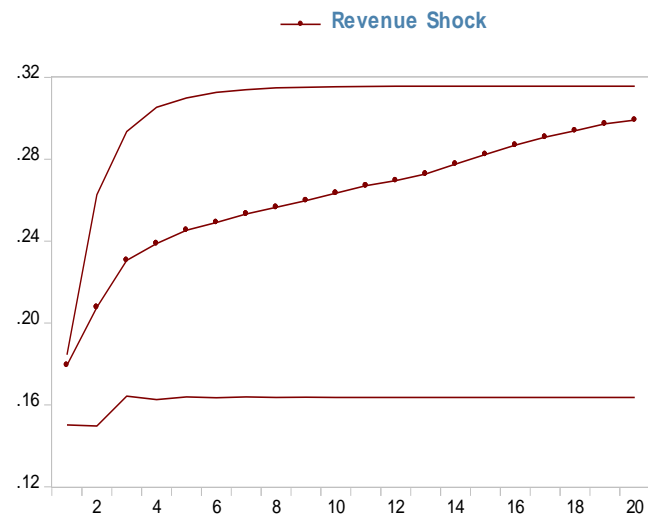
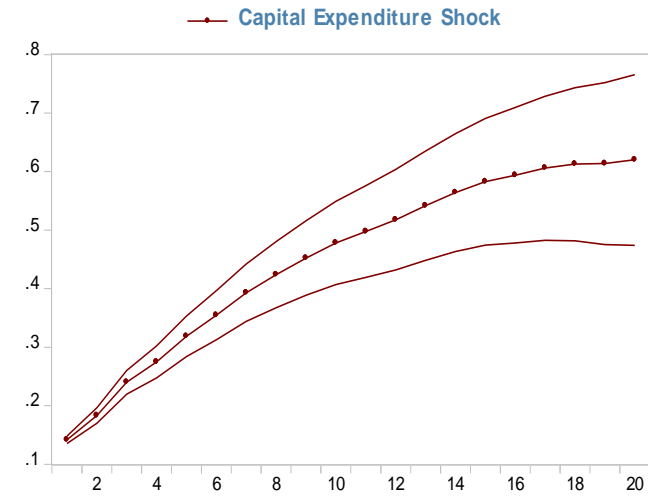
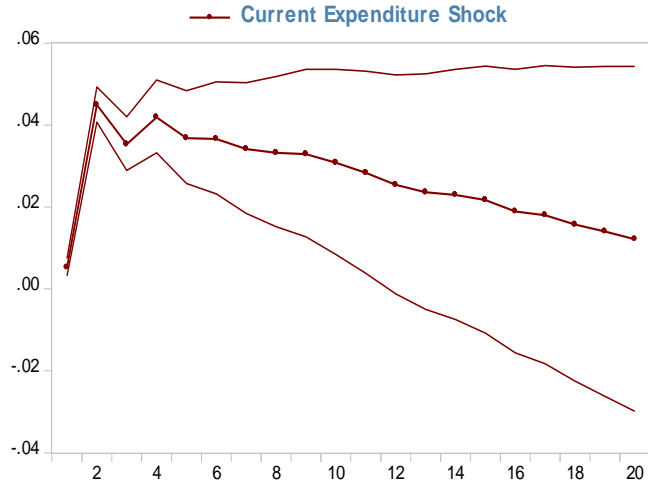
³ Confidence bands in non-linear models are used to test significance of the shock results. Results remain robust for the shocks in current and capital spending and revenues.

**Fiscal Multipliers: Fiscal Expansion
Cumulative Response- Lower Regime**



Source: Fund staff estimates.
 Note: A 2 percent positive shock was applied for current and capital expenditures and a 2 percent negative shock to revenues.

Fiscal Multipliers: Fiscal Expansion Cumulative Response- Upper Regime



REFERENCES

- Afonso, António, Jaromír Baxa, and Michal Slavík, 2011, “Fiscal Developments and Financial Stress: A Threshold VAR Analysis,” European Central Bank (April).
- Anderson, Heather, and Timo Teräsvirta, 1992, “Characterizing Nonlinearities in Business Cycles Using Smooth Transition Autoregressive Models,” *Journal of Applied Econometrics Supplement: Special Issue on Nonlinear Dynamics and Econometrics*, Vol.7, (December), pp.119–136.
- Batini, Nicoletta, and others, 2014, “Fiscal Multipliers: Size, Determinants, and Use in Macroeconomic Projections”, IMF Technical Guidance Note.
- Baum, Anja, Marcos Poplawski-Ribeiro, and Anke Weber, “Fiscal Multipliers and the State of the Economy,” IMF Working Paper No.12/286 (Washington: International Monetary Fund).
- Baum, Anja, and Gerrit Koester, 2011, “The Impact of Fiscal Policy on Economic Activity over the Business Cycle-Evidence from a Threshold VAR analysis”, Bundesbank Discussion Paper, 03/2011 (Frankfurt: Deutsche Bundesbank).
- BBVA Reseach, 2014, *Situción Peru: Cuatro Trimestere de 2014* (Lima, Peru).
- Central Reserve Bank of Peru, 2012, “Inflation Report: Recent Trends and Macroeconomic Forecasts 2012–14” (June).
- Cheasty, Adrienne and Juan Pichihua, 2015, “Peru: Fiscal Decentralization: Progress and Challenges for the Future,” Chapter 10 in *Peru: Staying the Course of Economic Success* (Washington: International Monetary Fund).
- Fazzari, Steven, James Morley, and Irina Panovskay, 2012, “Fiscal Policy Asymmetries: A Threshold Vector Autoregression Approach,” January 2012, available at <https://www.researchgate.net/publication>.
- Galindo, Hamilton, and William Sanchez, 2011, “Estimación del Multiplicar Fiscal en el Perú: en Enfoque Bayesiano,” Banco Central De Reserva Del Peru, October.
- Galindo, Hamilton, and William Sánchez Tapia, 2013, “Efectos Simétricos y Asimétricos de la Política Fiscal en el Perú”, Universidad Nacional De Ingeniería, Consorcio de Investigación Económica y Social (Lima; Perú).
- Hansen, Bruce, 2011, “Threshold Autoregression in Economics”. *Statistics and Its Interface*, Volume 4 (2011) 123–127 (February).
- Ilzetzki, Ethan, Enrique Mendoza and Carlos Végh, “How Big (Small?) are Fiscal Multipliers?”, IMF Working Paper No. 11/52 (Washington: International Monetary Fund).
- International Monetary Fund, IMF Country Reports 10/98 and 14/22.

International Monetary Fund, “Is it time for an Infrastructure Push? The Macroeconomic Effects of Public Investment”, Chapter 3 in World Economic Outlook (October 2014).

International Monetary Fund, 2015, Making Public Investment More Efficient, IMF Staff Report (Washington: International Monetary Fund).

Koop, Gary, Hashem Pesaran, and Simon Potter, 1996, “Impulse Response Analysis in Nonlinear Multivariate Models,” *Journal of Econometrics*, Vol. 74(1), pp. 119-147.

Loyola, Jorge, Renzo Rossini, and Zenón Quispe, 2012, “Fiscal Policy Considerations in the Design of Monetary Policy in Peru,” *Central Reserve Bank of Peru*, (November).

Multiannual Macroeconomic Framework (Marco Macronomico Annual), 2016-18. Ministry of Finance of Peru (April 2015).

Mitra, Pritha, and Tigran Pogoyan, “Fiscal Multipliers in Ukraine,” IMF Working Paper No.15/71 (Washington: International Monetary Fund).

Pessoa, Mario, Israel Fainboim, and Almudena Fernandez, 2015, “Modernization of Public Investment Management Systems,” Chapter 9 in Peru: Staying the Course of Economic Success (Washington: International Monetary Fund).

Pre-Election Report (Informe Preelectoral, Administracion 2011-2016), Ministry of Economy and Finance, January 2016.

Ross, Kevin, and Melesse Tashu, 2015, “Investment Dynamics in Peru”, Chapter 4 in Peru: Staying the Course of Economic Success (Washington: International Monetary Fund).

Ross, Kevin, and Alonso Peschiera, 2015, “Explaining the Peruvian Growth Miracle”, Chapter 3 in Peru: Staying the Course of Economic Success (Washington: International Monetary Fund).

Schmidt, Julia, 2013, “Country Risk Premia, Endogenous Collateral Constraints and Non-linearities: A Threshold VAR Approach,” May 2013, available at http://julia-schmidt.org/Nonlinearities_Schmidt.pdf

Teräsvirta, Timo, and Yukai Yang, 2014, “Specification, Estimation and Evaluation of Vector Smooth Transition Autoregressive Models with Applications”, March 2014, available at ftp://ftp.econ.au.dk/creates/rp/14/rp14_08.pdf

Tsay, Ruey, 1998, “Testing and Modeling Multivariate Threshold Models”, *Journal of the American Statistical Association*, Vol. 93, pp. 1188-1202.

Vtyurina, Svetlana, 2015, “The Role of Fiscal Policies in Peru’s Transformation”, Chapter 5 in Peru: Staying the Course of Economic Success (Washington: International Monetary Fund).