PERU

SELECTED ISSUES

January 2020

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PERU

SELECTED ISSUES

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CONTENTS

TAX REVENUES IN PERU—RECENT TRENDS, POLICIES AND PROSPECTS[1]

Peru's efforts to improve tax collection in the last 20 years have not been successful as modest gains in revenue mobilization have been offset by the impact of commodity price declines. While VAT and corporate income tax rates compare favorably with other countries in the region, collection has remained low owing to reductions in tax rates and limited compliance, with multiple small business tax regimes creating opportunities for misreporting and evasion. Overall revenues from property taxes, personal income taxes and excises are also low. Recent reforms have targeted structural weaknesses of the tax system, including by raising excise rates, reducing tax expenditures, and adopting electronic invoicing to improve tax administration. However, given the historically strong co-movement between tax revenues and commodity prices, the uncertain external outlook poses a challenge for Peru's ability to meet its fiscal needs. Reforms of the tax regimes for small businesses and continued strengthening of tax administration remain crucial to achieving Peru's ambitious revenue mobilization targets of 1 percent of GDP over 2019–20.

A. Introduction

1.   Despite strong macroeconomic performance and significant fiscal reforms, Peru's gains in revenue mobilization were almost nil in 1999–2017. Public debt declined from around 50 percent of GDP in 1999 to less than 26 percent of GDP at end-2018, owing to strong economic growth, high commodity prices, and restrained government expenditures. However, progress on revenue mobilization has been insignificant. Peru's tax revenues exceeded those of countries such as Mexico, Colombia and Ecuador in 1999. However, at end-2017, having seen no net gains in revenues as a percentage of GDP, Peru fell behind the overall regional average.[2,3] Closer analysis of this period reveals periods of strong revenue growth followed by sharp contractions deriving from a mix of external shocks and factors related to tax policy and administration.

Tax Collection
(Percent of GDP)

Sources: OECD and IMF staff estimates.

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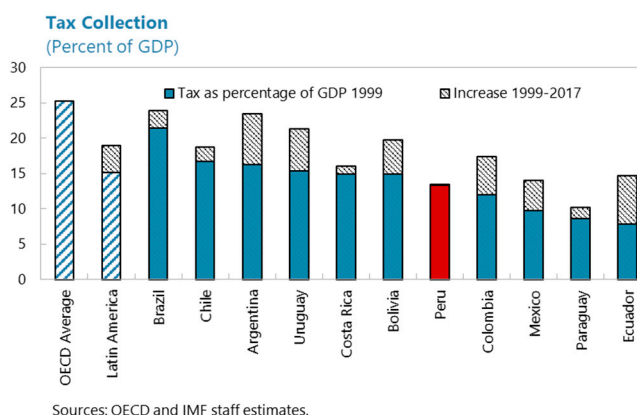
[1] Prepared by Salma Khalid.

[2] Owing to differences in payroll tax obligations across LAC countries, we exclude social security contributions from total tax collection for comparability purposes.

[3] The 1999-2017 period is chosen based on cross-country data availability. While Peru's revenues were atypically low in 2017 owing to El Niño events, the net gain in the 1999-2018 period remains lower than in the comparator countries presented in the figure above.

2.   Recent reforms hold promise for improved domestic resource mobilization, but needs are large and risks increasing. Reductions in exemptions and increases in excises have helped the recovery in tax revenue mobilization during 2018 and early 2019. The introduction of electronic invoicing can improve tax compliance, provided complementary tax administration strategies are developed. However, Peru's plans to address its key spending priorities—including filling sizeable infrastructure gaps – require further efforts, while the uncertain global outlook presents additional risks to revenue mobilization in the short term. Tax policy reforms—including of small taxpayer regimes—and tax administration strengthening to combat tax leakages will be critical for the government to achieve its ambitious revenue targets. In the medium term, improving revenues from property taxes, further reform of excises, and enhancing coverage of personal income taxes will be necessary to address large spending needs.

3.   This chapter evaluates features of the Peruvian tax system that may have contributed to weak revenue growth, as well as reforms to strengthen the tax system. Using data on domestic tax collection in conjunction with cross-country data on tax rates, collection and tax expenditures, we attempt to shed light on the factors that distinguish tax revenue mobilization in Peru from other countries in the region. We also reflect on recent reforms in tax policy and tax administration, and present advice for continued progress in these areas.

B.   Tax Policy and Revenue Mobilization

4.   Peru's domestic tax revenue mobilization has closely traced the commodity cycle. The largest increase in tax revenues coincided with a long period of increasing commodity prices, with price reversals in 2007 and 2011 leading to downturns in revenue mobilization. Of the two largest components of overall tax collections, IGV (*Impuesto General a las Ventas*—value added tax) has shown lower net growth resulting in IR (Impuesto a la Renta—tax on corporate

Peru Tax Revenues and Metal Price Index
(Tax revenues in percent of GDP)

Sources: SUNAT and IMF staff setimates.

and personal incomes) contributing a larger share over time. Since VAT is considered a regressive tax relative to IR, this shift may have had positive distributional implications. However, IR is also substantially more volatile than IGV. On net, however, the taxation system has evolved away from distortionary tariffs towards greater reliance on taxes from income and sales, with taxes on imports declining from 1.7 percent of GDP in 1999 to 0.2 percent of GDP in 2018 (page 16).
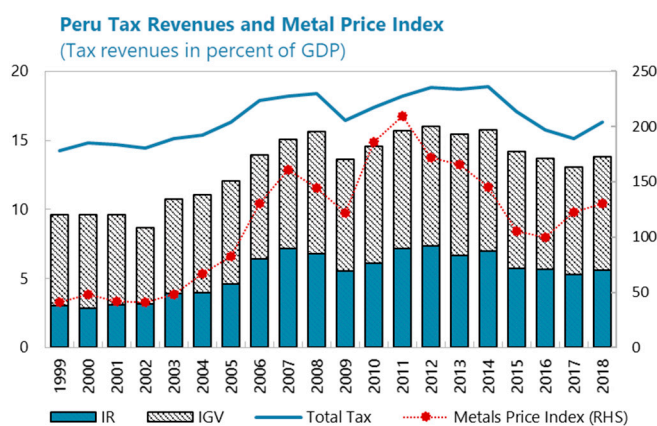
5.   Lowering the VAT rate may have contributed to weak VAT revenue growth. Over the 1999–2017 period, Peru's growth in VAT revenues was well below the Latin American average of 1.9 percentage points of GDP. One of the highest in the region (page 16), Peru's VAT rate was lowered from 19 to 18 percent in 2011. This has likely weakened Peru's gains in VAT collection relative to countries such as Chile, Argentina, and Uruguay which did not change their VAT rates.

6. **VAT collections have also been weakened by VAT gaps driven by poor compliance.** Peru has made marked progress in reducing the VAT gap[4] from 50 percent in 2003 to below 35 percent in 2018. Moreover, Peru outperforms several peer countries with higher income levels in terms of its VAT c-efficiency[5]. The VAT policy gap[6] for Peru is lower than in European countries, suggesting that the rate structure, base and exemptions are in line with best practices. Consequently, the key to improvements in VAT collections lies in improvement in VAT compliance by combating tax avoidance and evasion.

VAT Revenues
(In percent of GDP, year 2017)
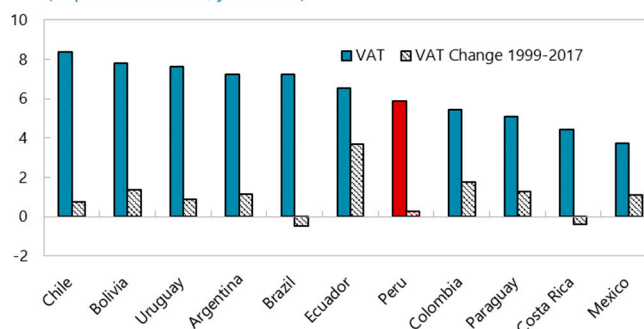
Source: OECD.

7. **The VAT gap is countercyclical, suggesting that weaker commodity prices would further exacerbate low collection.** The VAT gap appears to co-move with the commodity cycle, with the largest reduction occurring during the commodity boom of the mid 2000s, and the subsequent weakening of commodity prices resulting in a reversion to moderately higher gaps than were seen at the peak of the cycle. This relationship would suggest that a weaker external outlook may place greater stress on VAT revenues and some of the improvements in VAT efficiency may be short-lived. On the other hand, Peru may see enhanced compliance result from their introduction of electronic invoicing for VAT transactions, which can reduce tax evasion and avoidance by raising the probability of evasion detection and lowering compliance costs. However, IMF research indicates

C-Efficiency Ratio
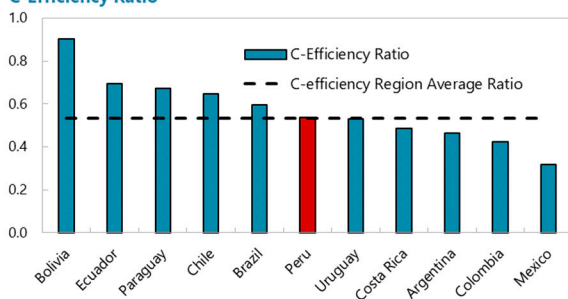
Source: IMF staff estimates.

Peru VAT Gap and Metal Price Index
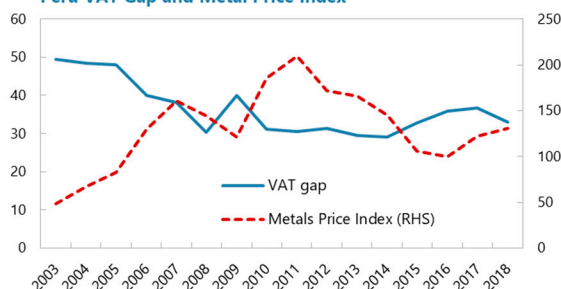
Source: SUNAT and IMF staff estimates.

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[4] The VAT gap is the overall difference between VAT revenues expected and the VAT revenues actually collected

[5] The ratio of the actual VAT revenue to the theoretical revenue, widely used as an indicator of the overall efficiency and effectiveness of the VAT system.

[6] The policy gap is a measure of the lost revenues relative to a theoretical maximum where the VAT rate is applied uniformly and without exemptions

that, as of 2017, improved compliance from e-invoicing adoption has been limited to small firms, which contribute little to aggregate VAT collection (Box 1).

8.   Recent elimination of inefficient tax expenditures should enable more revenue generation while reducing avenues for tax avoidance. Though broadly in line with international best practices, Peru had higher consumption tax expenditures (1.6 percent of GDP) than many other countries in the region.[7,8] Moreover, while the number of tax expenditures remained unchanged over 2013–2016, year-on-year increases in consumption tax expenditures were larger than increases in consumption tax collections, suggesting that taxpayers were exploiting them more intensively over time (page 16). A 2014 Asia Pacific Economic Cooperation (APEC) review of the preferential VAT and excise rates in Amazonia found these exemptions to be ineffective in promoting regional development and contributing to the creation of a black market in fossil fuels. In 2018 the authorities eliminated VAT exemptions in the Amazonia region and tax refunds for infrastructure development in the Loreto region, in exchange for annual transfers to the regional governments for financing infrastructure, education, and health initiatives. This is expected to improve revenue collections while increasing the efficiency of transfers to the regions.

Tax Expenditures
(In percent)

Source: CIAT, 2016 or latest available.

Excise Revenues
(In percent of GDP, year 2017)
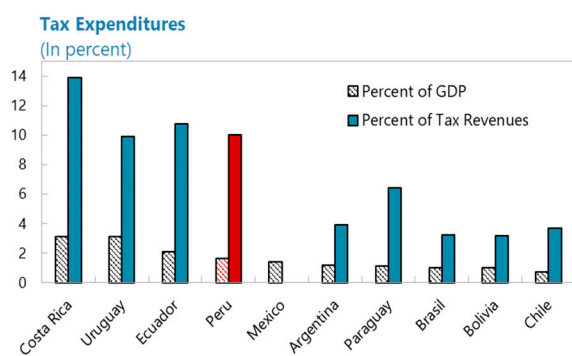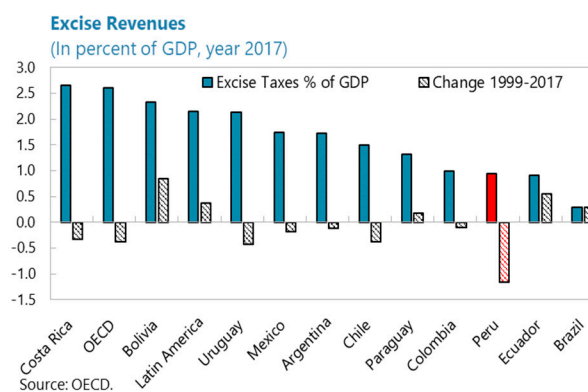
Source: OECD.

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[7] According to the RA-GAP report for Peru, during 2007–14 VAT expenditures compared favorably with European countries who provide more exemptions on average.

[8] In nominal terms, the two largest VAT tax expenditure are attributed to the agricultural sector (6.4 percent of total VAT collections and 2.4 percent of overall tax revenues in 2016) and the Amazonia region (5 percent of total VAT collections in 2016).

Box 1. Electronic Invoicing Adoption and VAT Revenues

In 2014, Peru initiated a reform mandating a switch from paper invoices to electronic invoices for the filing of VAT taxes. Over 10 countries in Latin America, and over 50 countries globally, have switched to electronic invoicing (e-invoicing), which allows for digital transfer of information between tax payers and tax authorities. From October 2014, successive waves of Peruvian firms were mandated to shift to the electronic invoicing system, starting with the largest firms who contributed the bulk of the VAT revenues, and gradually extending to medium and small firms.

Electronic invoicing holds the promise of reducing VAT noncompliance, a persistent problem in Peru and the region. By reducing the cost and complexity of aggregating and cross-checking large quantities of transactions data in real time, e-invoicing enhances the 'self-enforcing' feature of VAT by allowing quicker detection of misreporting of tax liabilities from anomalous sale and purchase declarations. In addition, by lowering administrative costs, it reduces the cost of compliance for taxpaying firms while encouraging their digital transformation. Lower costs of tax compliance and increased probability of evasion detection can also encourage formalization.

E-invoicing adoption has increased reported sales, purchases, and value added in small firms in the first year after adoption. A joint research study conducted by the IMF and SUNAT[1], using administrative taxpayer data comprising all large, medium and small VAT paying firms in Peru, finds that the mandated switch to e-invoicing resulted in small firms[2] reporting higher sales, purchases and taxable value added one year after adoption. These firms also demonstrate over 5 percent higher VAT payments in the first year after adoption. However, no such results are found among larger taxpayers, which constitute over 80 percent of VAT collections in Peru. Sectoral analysis reveals that effects are larger where compliance has historically been difficult to enforce, such as in retail, services, and construction.

The effect of e-invoicing has been less significant for firms with outstanding VAT credits. For these firms, which represent 40 percent of the total, no increase in VAT liabilities or VAT payments is observed after the introduction of e-invoicing. With larger increases in reported taxable purchases than sales among these firms, there is a sizeable increase in their stock of VAT credits during this time period, which can be used to offset future VAT obligations. This points to the need for effective control of VAT credits to ensure that the benefits of e-invoicing are fully realized.

The results of this study present a lower bound of the potential benefits of e-invoicing. As the e-invoicing is on-going, more small firms are being inducted into the system, potentially creating larger effects on aggregate. Moreover, over the period examined, SUNAT has made no significant change to its risk management strategy to incorporate the wealth of new data provided by the e-invoicing system to enhance control procedures. Consequently, with the complementary use of audit strategies based on e-invoicing data, larger reductions in noncompliance may be anticipated.

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[1] "Digitalization to Improve Tax Compliance: Evidence from VAT e-Invoicing in Peru", by M. Bellon, J. Chang, E. Dabla-Norris, S. Khalid, F. Lima, E. Rojas and P. Villena, IMF Working Paper No. 19/231
[2] Firms with sales under 1700 UIT (Unidad Impositiva Tributaria—equivalent to S/4,200 in 2019).

9. **Reforms of tax rates on fuel, vehicles, alcohol, tobacco, and other beverages will provide a much-needed boost to excise revenues**. While the average rate of excise taxes has risen in the Latin American and Caribbean region between 1999 and 2017, Peru has seen one of the most significant declines in revenue from excise taxes. This decline reflects the reduction in taxes on fuels in 2004/2005 in response to high oil prices, which was not reversed subsequently. In May 2018, however, the ISC on fuel, vehicles, alcoholic beverages, other beverages and tobacco were all raised, with an anticipated annual impact on revenue of 0.3 percent of GDP. As of September 2019, excise revenues have increased by 30 percent year-on-year, relative to 1.8 percent in 2017–18, contributing 0.1 percent of additional revenue. The reform underperformed in 2019 owing to avoidance measures undertaken by the alcoholic beverage sectors, but authorities expect the reform to perform at full potential in 2020 as a result of successful legal actions to combat this tax avoidance.

10. **Corporate tax revenues have been weakened by tax policy changes.** Peru's current maximum corporate tax rate was reduced in 2015 to 28 percent (page 16) and now falls in the middle of the spectrum of comparator countries. This policy reform was intended as a counter-cyclical measure to offset the reversal of the commodity cycle. This led to a decline in revenues from corporate taxes from an average of 4 percent of GDP in 2013–14 to

Corporate Income Taxes
(In percent of GDP, year 2017)

Source: OECD.

an average of 3 percent of GDP in 2015-2017, which was not reversed as commodity prices began to recover. The reduction in corporate tax rates was intended to be balanced by an increase in tax on dividends, which however was not approved by Congress. Consequently, while corporate tax revenues have increased between 1999–2017, the gains are not as large as in comparator economies such as Chile, Mexico, and Colombia. The rate was increased once again to 29.5 percent in 2017, but the impact on collections has been limited so far, partly owing to the presence of tax stability agreements.[9]
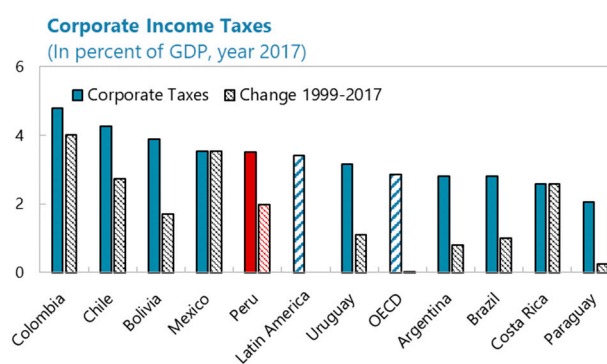
11. **The creation of multiple tax regimes has contributed to the deterioration of corporate tax revenues.** Until 2017, businesses in Peru could register to pay corporate taxes under two simplified schemes for micro and mid-sized businesses and one general scheme (Box 2). With the 2017 reform, a new regime (RMT, *Regimen MYPE Tributario*) introduced a bracket of lower marginal tax rates for smaller quantities of sales. While the stated goal was to encourage the transition between the simplified regimes and the GR *(Regimen General)* by offering a region of lower

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[9] Tax stability agreements stabilize the income tax regime in force at the time of signing, such that stability agreements signed during the period of lower corporate tax rates will shield the taxpayers from changes in income tax rates while the agreement is in place

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Box 2. Tax Regimes for Small Businesses in Peru

Special regimes for taxation of small business must be designed with a view to increasing formalization while discouraging tax evasion and avoidance. Empirical studies have concluded that taxation policy (marginal tax rates, average tax rates and the complexity of the taxation system) is one of the key factors discouraging the formalization of firms, resulting in direct relationship between ease of paying 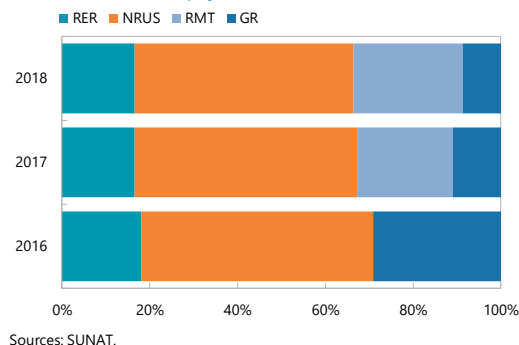taxes and the size of the informal sector. As a result, the design of taxation regimes for small firms must balance the mandate of reducing tax compliance costs for taxpayers—by, for instance, reducing accounting requirements—with limiting the use of special regimes for tax evasion and tax avoidance in the larger economy.

Peru Small Taxpayer Regimes
(Percent of total Taxpayers)

Sources: SUNAT.

Peru has multiple regimes under which small businesses can file their taxes. Until 2017, small businesses had the option of two regimes, the NRUS (Nuevo Regimen Unico Simplificado) and the RER (Regimen Especial del Impuesto a la Renta). The NRUS for microbusinesses allows firms to pay corporate tax and VAT as a single fee based on sales and purchases. Firms filing under this regime are ineligible to provide invoices to their buyers for VAT refunds[1]. Firms in the RER regimes pay taxes on their gross sales and can generate purchase invoices for larger firms in the general regime. The low rate at which their sales are taxed creates the opportunity for firms in the RER to generate false invoices for firms in the general regime thus enabling tax evasion. In 2017, the government of Peru added a third regime, the RMT (Regimen MYPE Tributario), with a view to creating an intermediate regime to ease transition from the NRUS into the general regime[2]. Hence, for eligible firms under a sales threshold, the corporate tax rate was made progressive with sales under 15 UIT being taxed at 10 percent relative to the higher rate of 29.5 percent for sales above 15 UIT and all sales of firms in the general regime[3].

By encouraging firms to exit the general regime, the introduction of the RMT regime created a loss in corporate tax revenues. 2017's reform resulted in the outflux of firms from the general regime into the RMT, resulting in an overall loss in corporate tax revenues owing to the lower marginal rates in RMT. Meanwhile, the effect on the number of firms under NRUS was minimal, suggesting that the progressivity of the RMT failed to convince firms to switch from either the RER or the NRUS. The introduction of a fourth regime also increased the number of thresholds in the tax system susceptible to arbitration by firms through misreporting

Peru needs to reduce the number of regimes for small businesses with a view to ensuring that small businesses are not able to facilitate greater leakage of taxes from the general regime. A review of the small business tax regime has ascertained the need to eliminate the RMT and RER regimes, replacing them with a new simplified regime with the same marginal tax rate as the general regime to prevent arbitrage at the threshold but with simplified accounting to lower the cost of compliance. This is particularly well suited to Peru where the burden of taxes is not cited as a major reason for not formalizing.

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[1]They can provide payment slips, and firms in the General Regime can deduct up to 6 percent of their purchase with payments slips instead of invoices.
[2]Simultaneously, the threshold of eligibility for firms in the NRUS was lowered.
[3] Unidad Impositiva Tributaria – equivalent to S/4,200 in 2019.

marginal tax rates, the creation of the RMT caused the opposite effect with a large outflow from the GR and a fall in revenues owing to the lower effective tax rate paid under the RMT. Meanwhile, the proportion of firms under the simplified regimes did not contract significantly, suggesting that the reform failed to achieve its target. Consequently, the authorities should consider following technical advice to eliminate the multiple regimes and replace them with a new simplified regime which has the same marginal tax rates as the GR, to prevent tax arbitration, but has simplified accounting procedures to lower the cost of tax compliance for the smaller firms that choose to file in this regime.

12. **The proportion of the working population exempt from personal income taxes is very high.** While personal income tax collection in Latin America lags far behind the OECD average, Peru also lags the Latin American average. Analysis by the authorities has found that collection of the personal income tax has increased steadily, but most workers do not pay any income tax since they declare

Personal Income Taxes
(In percent of GDP, year 2017)

Source: OECD

incomes in the lowest bracket where marginal tax rate is zero. Hence, in 2017, 78.2 percent of taxpayers were declaring income subject to zero marginal tax and an additional 14 percent of taxpayers were in the lowest marginal tax bracket, resulting in an effective tax rate of 5.6 percent across all taxpayers[10]. This highlights the need to improve coverage of the tax net and for improved control of personal income declarations to ensure that individuals are fully reporting their incomes.
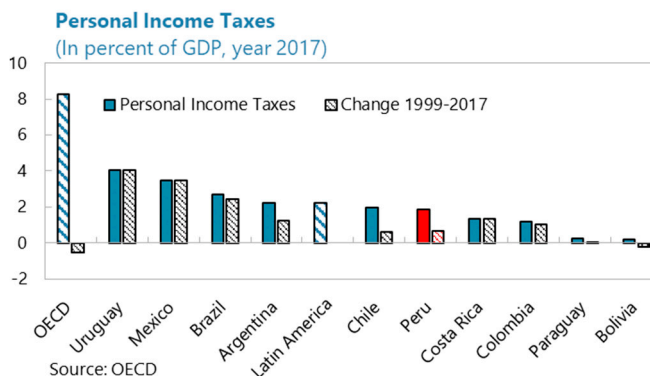
13. **Property tax collections have not kept pace with increases in property values.** Not only does Peru collect very little in property taxes relative to some peer economies, the revenue from property taxes has also grown very little since 2011, while average residential property prices increased by 15 percent. Studies by the central bank indicate that property valuations being used to

Property Tax
(Percent of GDP)

Sources: OECD and IMF staff estimates.

Peru. Property Price Index and Property Tax

Sources: OECD and FRED

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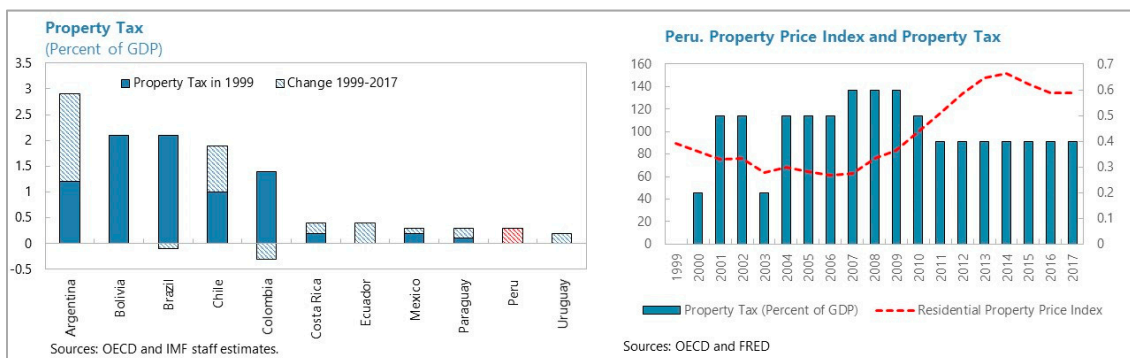
[10] Analisis del Rendimiento de los Tributos 2018, Ministerio de Economia y Finanzas.

establish tax obligations are up to 200–300 percent below market valuations.[11] The World Bank has provided technical support to selected municipalities in six cities with the largest tax generation potential to improve their urban cadasters. This should lay the groundwork for municipalities to capture market valuations of taxable properties, expanding their tax base and generating significant revenue potential.

C. Tax Administration

14.   The performance of the tax administration authority (SUNAT) compares favorably with international best practices. A TADAT (Tax Administration Diagnostic Assessment Tool) evaluation was carried out for SUNAT in May 2017 to assess its performance on the administration of major taxes including VAT, personal income tax and corporate income tax. In 15 out of the 28 indicators assessed, Peru meets or exceeds international standards for best practices, with only three indicators inadequate and four indicators weaker than international practices.[12] The report also highlights the modernization efforts of the organization and its high level of competence, which allows it to provide technical assistance to tax administrations of neighboring countries.

15.   As fiscal demands for fulfilling infrastructure needs rise, SUNAT must continue to advance in its reform agenda to bring its tax collections to the level of its peers. In the past few years, SUNAT has implemented important changes to improve general management and control procedures under the guidance of Fund TA. Improvements in IT systems have allowed increases in the number of control actions as well as the yield from these actions, which will have beneficial effects on overall collection and future voluntary compliance.[13] Other reforms have been implemented to enhance the tax payer registry, ensure control of VAT withholding and refunds, and improve information systems to maximize the potential of electronic data on business transactions (Box 3).

16.   SUNAT's functional autonomy is integral to the efficiency of its operations and its continued progress. SUNAT enjoys the status of a specialized technical body attached to the Ministry of Finance. In line with best practices, SUNAT has autonomy over the organization of its internal structure and exercises discretion over its operating budget to account for changing priorities and to respond flexibly to changes in the external environment. In addition, it exercises autonomy over human resource management with the authority to determine hiring, promotion, and salaries of its staff. Given its specialized status and the technical nature of its work, the personnel in SUNAT have

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[11] Inflation Report March 2019, Central Reserve Bank of Peru.

[12] Weakness are found in the management of institutional risk, timeliness of VAT payments, stocks of tax arrears, scope of the audit process, time taken to resolve administrative reviews, and timeliness of refunds.

[13] The number of control orders has increased by 43 percent in 2018 (reaching 84,316 cases) and the amount of tax revenues subject to control under these cases has reached 2,408 million soles, with a growth of 31 percent. SUNAT's tax recovery from these control procedures has increased by 75 percent between 2017 and 2018.

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Box 3. Tax Administration Reform Priorities and Progress

SUNAT has made commendable progress in recent years on the tax administration reform agendas. As a recipient of technical assistance from the IMF, SUNAT has implemented reforms in the areas of general management, control procedures, and IT systems. Improvements in IT systems have generated increases in the number of control actions as well as the yield from these actions,[1] which will have beneficial effects on total collection and future voluntary compliance. Areas where the continuation of the reform process is critical include:

- **Improving the quality of the Tax Payer Registry (RUC)**. While SUNAT has made significant progress in promoting the use of the RUC as the single fiscal identifier, it must develop plans to improve risk analysis for compliance risk management by updating the registry, removing duplicates, enacting control procedures at the moment of incorporation into the RUC, and classifying tax payers according to economic sectors. While SUNAT has begun to pilot the identification of tax non-compliers based on cross-checking of multiple sources of data, this work must be expanded greatly to generate significant impact on collections.

- **Developing integrated control strategy and closing cycles of control procedures**. Given that audits are expensive, control of VAT and IR should be integrated, and the decisions regarding the type of control activity should be coordinated by technical personnel using the breadth of information being collected by SUNAT. Moreover, SUNAT should ensure that all control files that are started should be closed through appropriate action, whether by the taxpayer responding to the control action or by initiating more severe control actions or penalties. Failure to close the cycle of control increases noncompliance by weakening the probability of being sanctioned.

- **Ensure control of VAT withholding and refunds**. SUNAT has acknowledged the need to improve control processes surrounding the declaration and refunds of VAT. Until now, there was no process of automatic control of all declarations and only deep control of a few cases identified as critical. SUNAT should adhere to its calendar to initiate automatic control of VAT declarations by cross-checking them against payment vouchers given the potentially large amount of tax leakage that may occur through the VAT payment system. SUNAT has also identified legal regulations requiring modification to improve the application of the VAT and should proceed with these changes.

- **Continue improving the information system to reap maximum gains from new technologies and the availability of data**. With the digitalization of tax filing in Peru, SUNAT is in possession of large volumes of data. It should continue its efforts to ensure good data management, quality and accessibility, while developing processes for integrating new sources of data and utilizing this data to improve its functions. Hence, the development of alert systems against unwanted taxpayer behavior is an important step.

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[1]The number of control orders has increased by 43 percent in 2018 with respect to 2017 and the total amount has reached 2,408 million soles with a growth of 31 percent. The induced actions have increased their impact by 75 percent yoy.

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been provided a higher level of remuneration than the rest of the state's institutions.[14] Authorities should therefore be cognizant that including SUNAT in the Law of the Civil Service (Law 30057, of June 2013) will result in a decline in remunerations of staff and will weaken its ability to attract and retain qualified staff.

D. Expenditure Assessment

17. **The share of capital spending has increased, but gaps in infrastructure remain a challenge.** Between 2000 and 2018, Peru has maintained a relatively stable ratio of government expenditure to GDP while spending in most of its LAC countries and other emerging economies has increased. This has been accomplished through compression of current spending, while capital spending has increased significantly more than in its regional comparators. Consequently, further rationalization of current expenditures may prove difficult from an already low base. Moreover, despite high capital spending, Peru's public capital stock remains well below the LAC average and quality of infrastructure lags the LAC region in areas of air transport, ports, and very markedly in the quality of roads (page 16).

Change in Total Spending
(In percent of GDP, 2000-2018)

Sources: IMF staff estimates (Expenditure Assessment Tool - EAT)
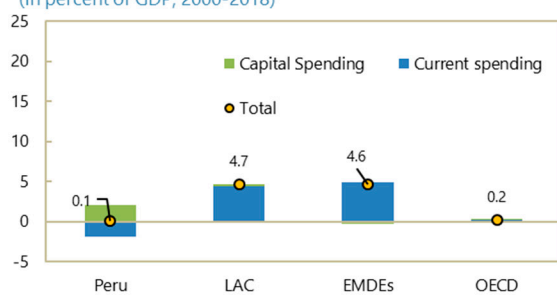
Current and Capital Spending
(In percent of GDP, 2018)

Sources: IMF staff estimates (EAT)
Note: Dashlines are the average of LAC.
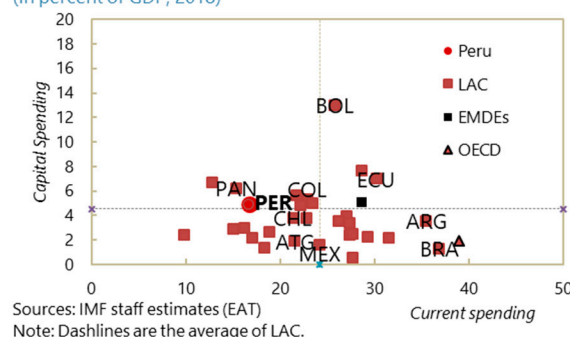
18. **Improving public sector efficiency provides scope for greater infrastructure development with fewer resources**. Peru lags behind the efficiency frontier both in terms of the coverage of physical infrastructure and its quality. Peru's 2017 Public Investment Management

Physical Infrastructure

Sources: Authorities and IMF staff estimates.

Quality of Infrastructure

Sources: Authorities and IMF staff estimates.

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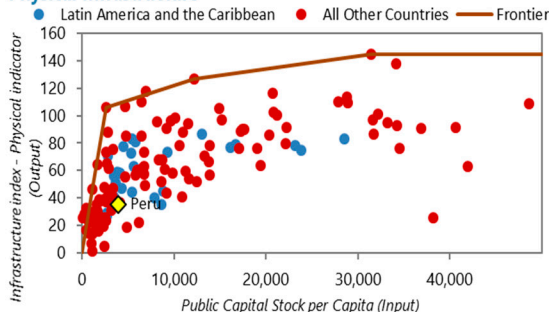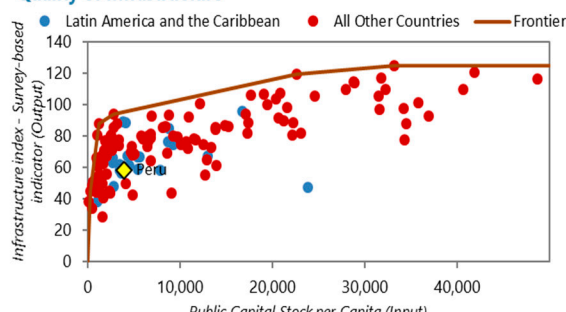
[14] This is in line with the practices of tax administrations in comparator countries. Hence, according to OECD's Tax Administration Series Database, pay scales for the tax administration in Chile, Mexico, Brazil, Costa Rica, Argentina, and Colombia are unique.

Assessment finds that Peru's efficiency gap is significantly larger than the regional average. The evaluation also finds scope for reducing the efficiency gap by two-thirds by improving the efficiency of investment management institutions with respect to their processes for project preparation and selection, stability of financial flows, and execution times.

E. Conclusions

19. **Improving compliance is key to expand VAT revenues mobilization.** Peru's largest source of internal revenue remains the VAT. Given its high c-efficiency, which implies an efficient structure, base and exemptions, weak growth of VAT revenues must be addressed by reducing compliance gaps. SUNAT's policies in the near term appropriately focus on improving tax controls, with the promulgation of laws to allow SUNAT to sanction tax avoidance and tax evasion; enhancing control of tax defaulters; stronger risk profiling of taxpayers; and extending the use of electronic invoicing.

20. **Reductions in the VAT gap can make sizeable contributions to revenue targets.** Historically, the lowest observed VAT gap was 29 percent in 2014. Based on reasonable assumptions, VAT collections could increase by 0.17 percent of nominal GDP in 2019.[15] Reduction in VAT noncompliance will have spillover benefits on collections of corporate income taxes, suggesting that the direct estimate is a lower bound for the full effect of a reduction in noncompliance. By SUNAT's estimations, the VAT gap narrowed by 3.8 percent to 32.9 percent in 2018. Hence, while such a large reduction in the VAT gap is not unprecedented, whether this momentum of improved compliance can be maintained remains to be seen.

21. **Elimination of multiple tax regimes for small businesses can provide a boost to revenues from corporate taxes.** An IMF technical evaluation of the small business tax regimes (Box 2) finds that a rationalization of the two existing regimes (the RER[16] and RMT) into one with the same marginal rate as the general regime will result in revenue gains of around 0.14 percent of GDP. Perhaps equally important will be the effect of the new regime on evasion and formality. Using cash flow as the tax base would simplify accounting and increase incentives to register sales and purchase invoices, improving information reporting for the VAT regime for firms and their customers. Additionally, firms will have an incentive to formalize their workers so they can deduct their cost from their cash flow.

22. **There is ample room to increase the contribution of excises and property taxes to overall tax revenues.** Relative to the regional average, Peru will continue to lag peer economies even if the current reform performs at full potential. This suggests room for further policy reforms to bring excise taxes in line with the levels of comparable economies. It is similarly critical that the

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[15] Assuming growth of potential VAT in line with the growth of nominal GDP and a similar reduction of the VAT gap to 29 percent.

[16] Regimen Especial del Impuesto a la Renta, which taxes firms based on their sales, hence creating no incentive to register purchase invoices, critical for control of VAT

authorities capitalize on the information provided by updated urban cadasters to enhance revenue mobilization from property taxes.

23. **Improving spending efficiency, particularly on public investment efficiency, is also key.** The authorities' target of 15 percent increase in central government revenues over 2019–20 through administrative measures alone appears optimistic when measured against historical trends and in the context of declining growth rates, weaker commodity prices, and on the heels of the significant results already obtained in 2017–18. The outturn for January-September 2019 is exceeding expectations, allowing for cautious optimism, but downside risks prevail. Making strides in improving public investment efficiency and reducing cost overruns in public infrastructure projects would contribute to speeding up investment execution and attaining overall fiscal targets.

Figure 1. Peru: Tax Rates, Tax Revenues and Government Expenditures

Taxes on Imports and Excises 2005-2018
(In percent of nominal GDP)
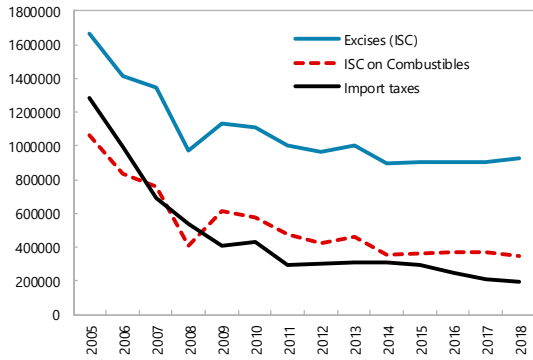
VAT Rate
(In percent, year 2017)
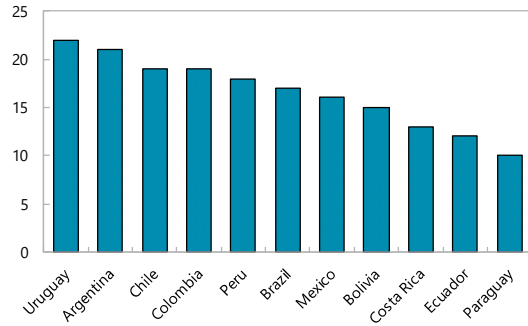
Consumption Taxes and Consumption Tax Expenditures 1/
(In percent, yoy)
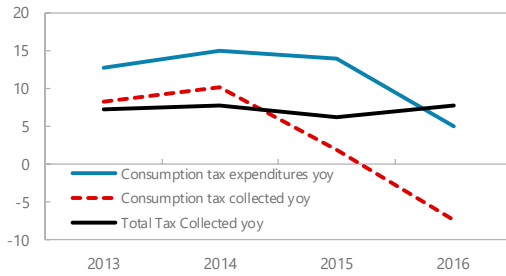
Source: CIAT, 2016 or latest available.

Maximum Corporate Tax Rates
(In percent of GDP)

General Government Spending
(In percent of GDP)

Public Capital Stock per Capita
(Thousands, 2017)
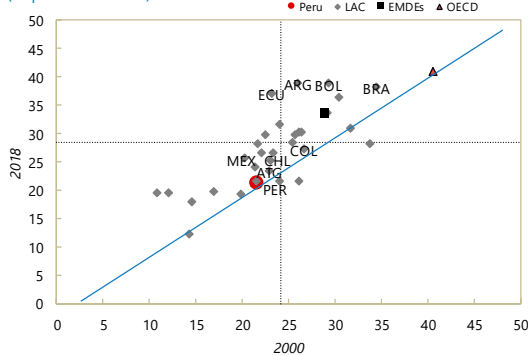
Sources: Authorities and IMF staff estimates.
1/ CIAT, 2016 or latest available.
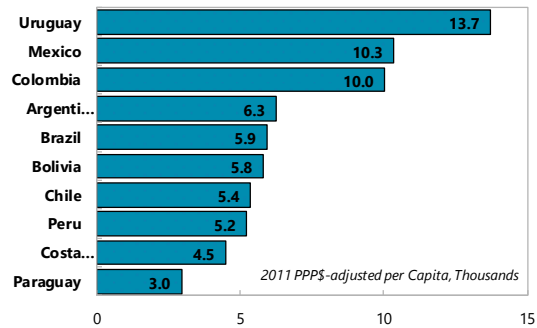
THE EVOLUTION OF PERU'S MULTI-INSTRUMENT POLICY FRAMEWORK[1]

As in many EMEs, Peru's inflation targeting framework is characterized by a strong focus on exchange rate and financial stability, and the use of several instruments to attain those additional objectives. This framework has significantly evolved since the adoption of inflation targeting in 2002, but its complexity presents a challenge when describing its evolution because of the multiplicity of instruments that have been used at different times in response to shocks of different nature. This paper attempts to do so by summarizing the evolution of the framework with a policy triangle, which shows how tensions and trade-offs between different objectives have developed and been resolved. Our preliminary analysis suggests that Peru's multi-instrument policy framework has worked well since the adoption of inflation targeting although the absense of a counterfactual prevents us from drawing definite conclusions. Over this period, Peru's macroeconomic performance in terms of inflation and output compares well with that of other EMEs, particularly on inflation. The success of this framework in achieving macroeconomic stability and lowering dollarization has likely strengthened the monetary policy transmission mechanism, allowing a gradual reduction of exchange rate intervention. Going forward, it will be important to assess how instruments interact with each other and how their combination can be improved.

A. Introduction

1.   Peru's monetary framework strengthened significantly after a long period of macroeconomic instability. Two decades of severe macroeconomic imbalances and hyperinflation until the early 1990s entrenched low confidence in the national currency, leaving widespread dollarization (Rossini et al., 2011). Monetary regulation was enhanced with new instruments, including certificates of deposit (1994) and repos (1997), while reserve requirements (RRs) on domestic deposits were reduced substantially to foster an effective interbank market (1991–93). The BCRP (Banco Central de Reserva del Perú), mandated by the Constitution to maintain monetary stability, adopted an inflation targeting framework in 2002, becoming the first monetary authority to implement it under a dual monetary system.[2] The reference interest rate has been the main monetary policy instrument. Owing to the possible effects of exchange rate movements on dollar liabilities, foreign-exchange intervention—sterilized to preserve the inflation objective—remained a key policy tool.

2.   The crisis at the end of the 1990s paved the way for financial system reform and new macroprudential tools. Following the Asian and Russian crisis, Peru experienced a series of bank

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[2] The target range for inflation was initially set at 1-3 percent. In 2002, the target was set to 2.5 per cent with a tolerance margin of +/– 1 per cent. From 2007 onwards, the target was lowered to 2 percent with the same tolerance margin.

failures and a collapse in credit. The SBS (Superintendencia de Banca, Seguros y AFP) took steps to strengthen banking supervision and the regulatory framework and improve its enforcement capacity.[3] New tools were introduced to enhance resilience, dampen the credit cycle, prevent liquidity shortages, and mitigate risks stemming from dollarization.

3.   **This paper is organized as follows.** In section B, we outline the concept of policy triangle that we use to characterize the history of Peru's multi-instrument framework since the adoption of inflation targeting in 2002. In section C, we describe the events in the period leading to the Global Financial Crisis (GFC), (2002–07). In section D, we look at the GFC and its aftermath (2008–11). In section E, we focus on the episodes of global risk aversion that have characterized the period after the GFC (2012–19). In section F, we examine Peru's macroeconomic performance over the whole period 2002-19. Section G concludes. Performance of key macroeconomic variables during the periods is presented in Figures 1–5 in the Annex. Annex I further details policy trade-offs with the role of financial stability.

B.   A Stylized Representation of The Multi-Instrument Policy Framework

4.   **The evolution of Peru's multi-instrument policy framework can be described using a policy triangle (Figure 1).** The sides represent different combinations of three policy objectives of price, financial, and exchange rate stability—the latter being instrumental to attaining the first two fundamental goals; and the vertices indicate the three main policy instruments used to attain these goals, i.e., the policy interest rate (MP), exchange rate intervention, (FXI), and macro-prudential policies (MPPs).[4] Movements inside the triangle toward one of the vertices show that the use of a particular instrument has increased over time. Movements toward the sides indicates how trade-offs between objectives have evolved in response to different shocks. Obviously, this does not mean to say that objectives changed over time, only that trade-offs between objectives changed depending on the shocks hitting the economy. In this respect, the movements inside the triangle represent movements that can be interpreted as "revealed preferences" of policy makers in response to a changing monetary and financial environment.

5.   **Declining dollarization, new macroprudential tools, and the changing nature of shocks are pushing Peru's framework towards a more intense use of the MP and away from FXI.** In 2002–03, when the economy was experiencing large capital inflows and favorable terms of trade shocks, FXI was used intensely to accumulate reserves and reduce exchange rate pressures. The

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[3] Both the BCRP and the SBS operate macroprudential policy tools. The BCPR's instruments target mainly liquidity risk, both in domestic and foreign currency, and excessive credit growth, whereas the SBS's instruments focus primarily on strengthening the financial system's loss absorption capacity (Rossini and Quispe, 2014).

[4] Capital flow measures (CFMs) and reserve requirements (RRs) have a somewhat special status as they do no fit perfectly in this classification. Between 2010–15, Peru introduced five measures that were classified as CFMs at the time of their adoption according to the IMF taxonomy. Currently, only one of them—a tax on non-resident income gains from short-term financial derivatives—remains classified as CFM, and the other four measures are assessed as CFM/MPMs (for additional details on CFMs for Peru, see https://www.imf.org/external/np/g20/pdf/2018/IMF2018CFMTaxonomy.xlsx). RRs are also a key component of the policy framework and there is no clear-cut answer as to whether they belong to MP or MPPs. In our discussion, we follow Alam et al. (2018) by classifying RRs under MPPs, but we also show the behavior of RRs alone.

movement to the north east continued until the GFC and initially involved little use of MPPs (points 1 and 2 in Figure 1). During the GFC and immediately after, in 2008–11, when terms trade worsened and capital inflows stalled, the framework moved further to the north east (point 3), as many new MPPs and RRs were used together with foreign currency sales. In 2012–16, with declining terms of trade and volatile capital flows, MPPs continued to be aggressively deployed and more flexibility was allowed in the exchange rate (from 3 to 4 and 5). In the last few years, as terms of trade have continued to decline and capital flows have remained volatile, the policy rate has been used more intensely and FXI less so, continuing to rely on a large number of MPP tools (point 6). The next three sections provide a more detailed descriptions of these three periods.

C. The Commodity Price Boom (2002–07)

6. In response to favorable terms of trade and large capital inflows, the BCRP began accumulating foreign-exchange reserves. External conditions were favorable, with large metal price increases creating appreciation pressures, which the BCRP used to strengthen its reserve buffers and limit the impact of capital inflows on the exchange rate.[5] Between January 2002 and December 2007, foreign exchange (FX) reserves increased by more than US$18 billion (12 percent of GDP), nearly all of which was sterilized.[6]

Peru: Selected Macroeconomic Variables, 2002-07

Sources: Central Bank of Peru; Alam and others 2018; Haver Analytics; IMF staff calculations.

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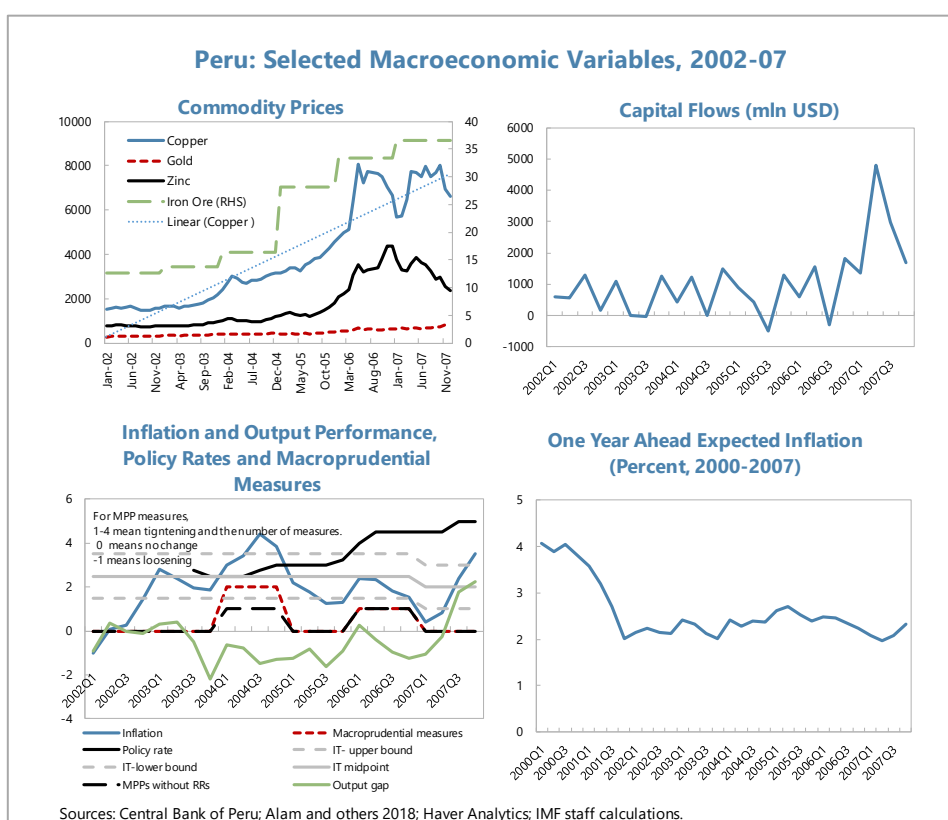
[5] Dollarization was still high, with 55 percent of broad money and 70 percent of credit to the private sector denominated in foreign currency at end-2005.

[6] During this period, Peru had two stand-by arrangements with the IMF.

Figure 1. Peru's Multi-Instrument Monetary Policy Framework: Policy Triangle
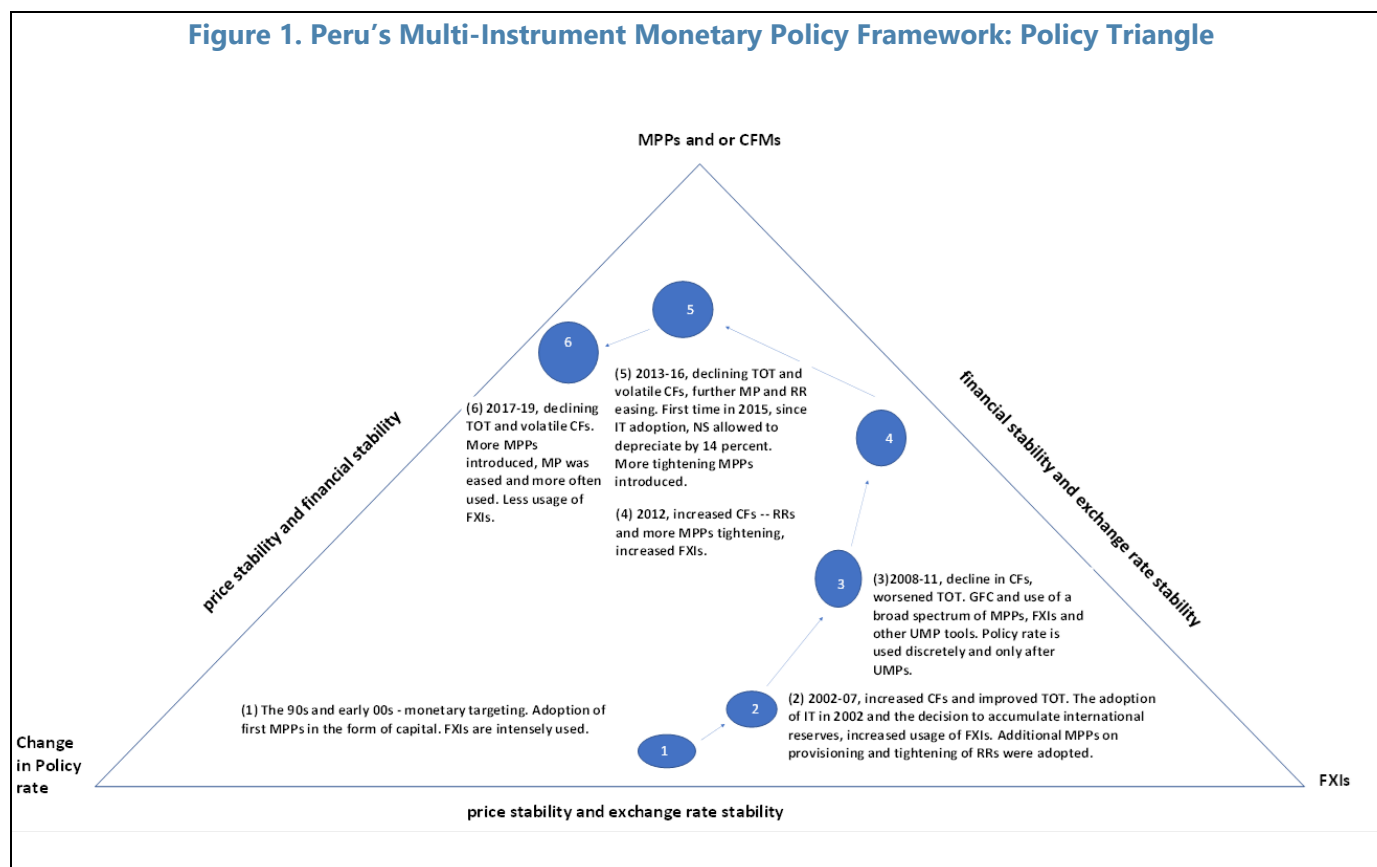
7. **After the adoption of inflation targeting, monetary policy was tightened to lower inflation and new MPPs were taken to contain credit growth.** After interest rates fell to record lows in early 2002, the BCRP raised its reference rate by 150 basis points from September in response to heightened regional uncertainties, pressures in the FX market, and rising inflationary pressures. Inflation was reduced to about 2 percent on average while the output gap was negative at 0.5 percent. Owing to dollarization, banks were required to assess exchange-rate-related credit risks, and mortgage lending in foreign currency to unhedged borrowers was put under scrutiny. Reserve requirements, both in domestic and foreign currency, were increased. Loan loss provision requirements were

Selected Calculations 1/				
	2002q1-2019q1	2002q1-2007q4	2008q1-2011q4	2012q1-2019q1
Inflation	2.71	1.92	3.41	2.97
Output gap	-0.08	-0.46	0.05	0.17
Inflation volatility	1.08	1.14	1.79	0.65
Output volatility	1.90	1.67	3.41	1.25
Real credit growth, y-y, average for the period	9.10	5.03	16.53	8.36
REER y-y change, average for the period	0.07	-1.67	1.66	0.64
REER volatility	3.00	2.50	2.69	3.59
FXIs, net million USD	43375.30	20306.10	15461.90	7607.30
FXI, in percent of GDP	30.29	27.36	10.99	3.73
MPP measures 2/	T	T	T	T
MP stance 3/	L	T	L	L
MPP measures (share of total)		12	29	59
NIR, average for the period, million USD	41926.56	15247.33	39313.00	63242.75
NIR, in percent of GDP	29.28	20.55	27.94	31.03

Source: Haver analytics; BCRP; staff calculations.
1/ Average for the period. Volatilites are measured as 8 quarters rolling standard deviation.
2/ T stands for tightening measures, L for loosening measures.
3/ Measured by the change in the policy rate for the entire period by end points. T stands for tightening, L for loosening, and N for neutral stance. Within period changes are discussed in the text.

augmented to include dynamic provisioning and sectoral provisions (on housing loans, in particular).[7]

8.   These policies were successful in lowering inflation, stabilizing inflation expectations, and containing the impact of capital inflows. They can be represented as a move from point 1 to point 2 in the policy triangle (Figure 1). Nonetheless, despite the favorable terms of trade shock, the output gap was negative on average and output volatility was high, probably reflecting the disinflation effort (Figure 5).

D. The Global Financial Crisis (2008-11)

9.   As global external conditions worsened, monetary policy became accommodative in 2008. After the long boom experienced in the first part of the decade, commodity prices started declining and capital flows became very volatile. The BCRP responded by using a broad range of unconventional instruments: currency swaps, repo operations, as well as the repurchase of central bank certificates of deposit, and sold nearly US$7 billion (20 percent of international reserves). Only later, starting in February 2009, the BCRP began a series of aggressive rate cuts (with the reference rate reduced overall by 525 bps to 1.25 percent), partially replacing unconventional measures. These cuts were reversed rapidly as commodity prices and demand recovered in mid-2010 when the policy rate was increased by a total of 300 bps to 4.25 percent by May 2011.

Peru: Selected Macroeconomic Variables, 2008-11

Source: Central Bank of Peru; Alam and others 2018; Haver Analytics; Bloomberg; IMF staff calculations.

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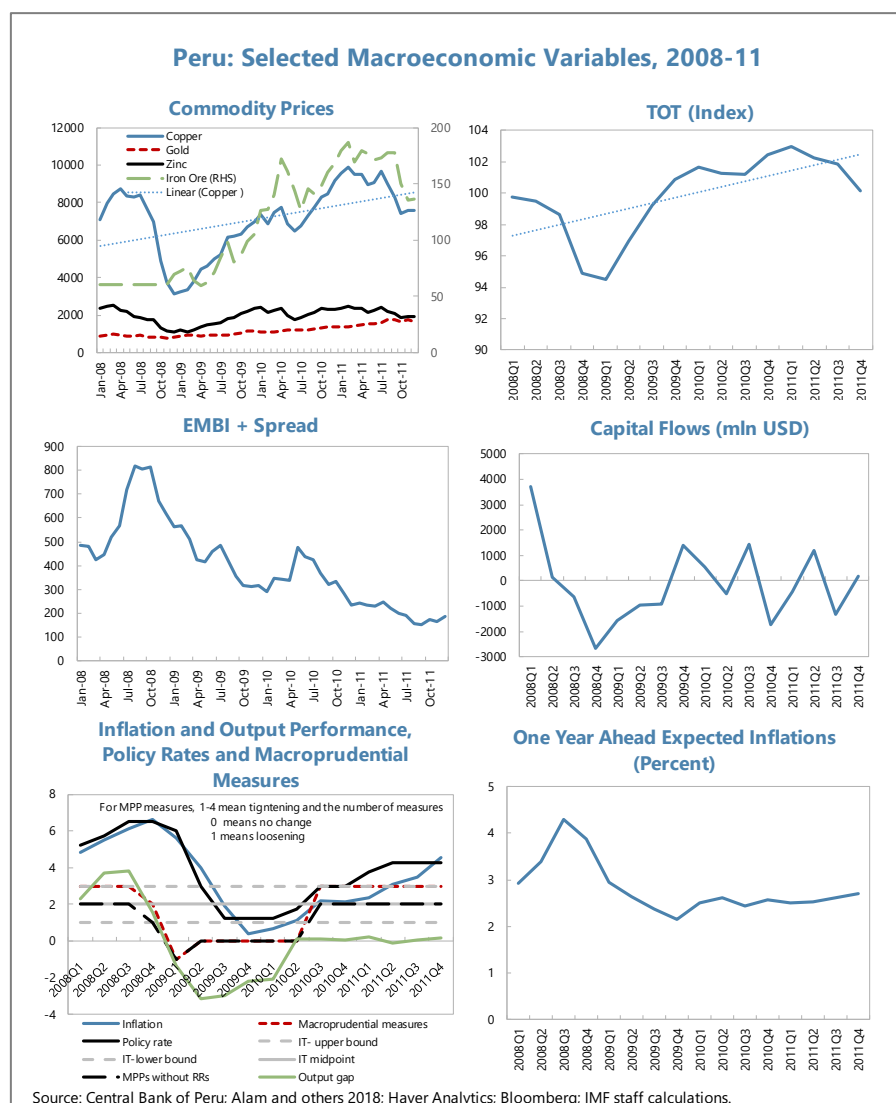
[7] For a detailed account of MPPs in Peru see Alam et al. (2018), Cabello et al. (2017), and Rossini (2014).

10. **Many MPPs, changes in RRs, and CFMs were used to stabilize credit conditions and further enhance the management of capital flows.**
RRs were also tightened considerably to further curb credit growth which has stayed at about 20 percent in 2010–11, with growth in foreign currency credit surpassing that in domestic currency. The marginal requirement for domestic currency deposits increased from 15 to 25 percent in the same period and the required ratio for non-residents increased from 15 to 120 percent by October 2008. RRs for foreign currency deposits and short-term debt increased from 30 percent to 49 percent by September 2008, respectively. RRs on long-term external liabilities were reintroduced at 9 percent in July 2008. As conditions stabilized, the BCRP began to reverse some of these measures. At times, the opposite movements of RRs, MPPs and policy rate changes could have weakened the impact of the monetary policy. The first phase of a comprehensive reform of capital requirements was announced by SBS in July 2008 and in 2010, when new

Peru: Reserve Requirements (Percent, 2008-2011)

RR – legal minimum — Marginal RR - DC deposits
Marginal RR - DC, nonresidents — Marginal RR - FC deposits
RR - ST external liabilities — RR - LT external liabilities

Source: Central Bank of Peru; Alam and others (2018).

Peru: Changes in the Policy Rate and MPPs without RRs (2008-2011)

1-3 means tightening
0 no change
-1 loosening

Changes in MPPs without RRs — Changes in the policy rate

Source: Central Bank of Peru.

asset-based instruments were created. The first CFM was introduced in February 2010 as a RR on foreign credit lines and other external obligations.
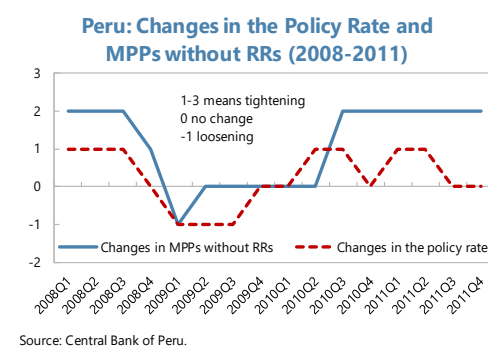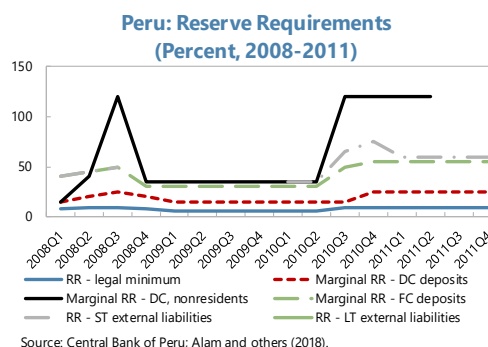
11. **Large use of FXI and macroprudential policies may have helped preserve financial stability during the GFC.** These policies can be represented as a movement from point 2 to point 3 (Figure 1). Nonetheless, global turbulence led to a temporary increase in inflation expectations and the inflation target was missed twice. Peru still performed better than many of its peers on inflation, and growth picked up quite quickly (Figure 5).

E. Global Risk Aversion Events (2012-19)

12. **Following the GFC, commodity prices continued declining and capital flows remained very volatile.** Episodes of global risk aversion and volatile capital flows to EMEs were triggered by China's slowdown in 2012, lingering U.S. fiscal policy uncertainty and the taper tantrum in 2013, further Renminbi depreciation in 2016, and trade and geopolitical tensions in 2017-19.

13. **In 2012, monetary policy remained on hold, while FXI and MPPs were used to limit the impact of large capital inflows.** In the first three quarters of 2012, net capital inflows were over

$16 billion (about 8 percent of GDP), of which only about half was in the form of foreign direct investment. Nonresident holdings of domestically-issued debt also continued to increase, reaching over half of the total (about 3.5 percent of GDP) in 2012. The BCRP kept the policy rate unchanged at 4.25 percent until the third quarter of 2013 but placed large amounts of central bank securities to sterilize FX purchases.

Peru: Selected Macroeconomic Variables, 2012-19

Source: Central Bank of Peru; Alam and others 2018; Haver Analytics; Bloomberg; IMF staff calculations.
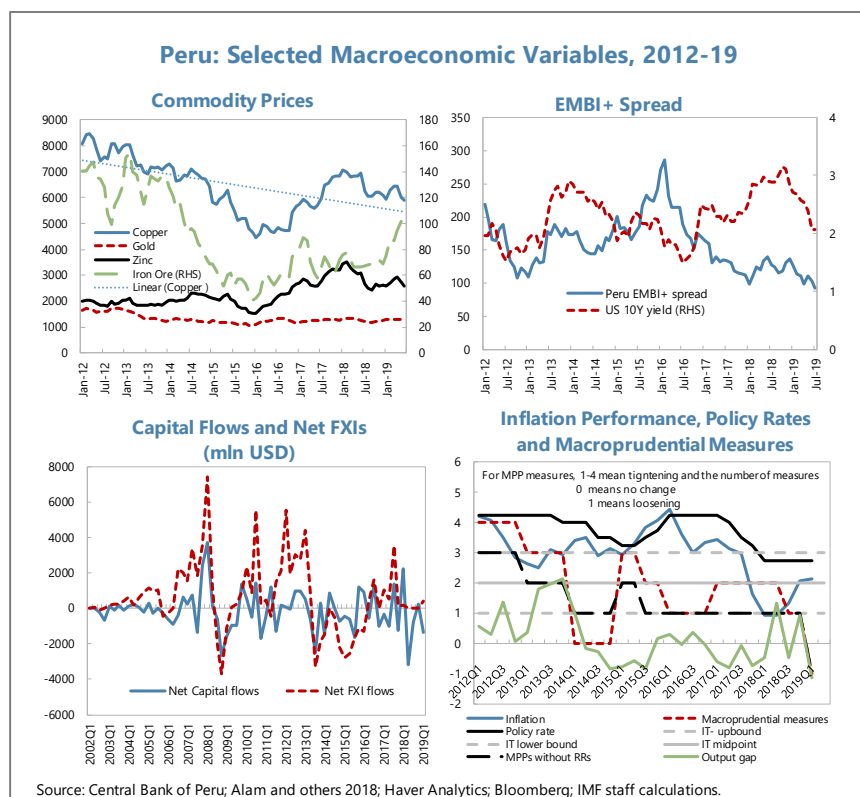
14.   RRs were further tightened, and the second phase of capital reforms started. Through November 2013, the BCRP tightened RRs further and allowed more investment abroad of the private pension funds, while the Ministry of Finance announced additional efforts to reduce appreciation pressures, including prepayment of external debt, larger accumulation of FX to repay debt, and a significant increase in the Fiscal Stabilization Fund. Gross international reserves reached US$64 billion (32 percent of GDP). Despite the large intervention, the sol appreciated by about 4 percent (yoy) against the US dollar and by almost 9 percent (yoy) in real effective terms during January-November 2012. A countercyclical capital buffer as part of the second phase of raising capital requirements was introduced in 2012 through October 2014. The newly introduced noncyclical capital buffer consisted of various concentration risk buffers, a risk-propensity buffer and, for the four largest banks, a very small systemic risk buffer.[8]

Peru: Reserve Requirements (RRs) (Percent, 2012-2019)

Source: Central Bank of Peru; Alam and others (2018).

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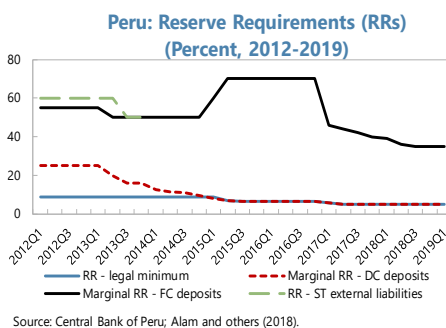
[8] For more details on Peruvian capital reforms, see Fang et al., (2018).

15.   External conditions started to deteriorate rapidly in 2013, prompting a preemptive easing of monetary policy, FX sales, and new MPPs aimed at supporting monetary policy. Concerns about the unwinding of unconventional monetary policy in the U.S. and weaker metal prices contributed to a deterioration of domestic confidence and increased uncertainty. The BCRP cut the policy rate by 0.25 bps to 4 percent in November 2013, citing slower domestic and global growth, and declining inflationary expectations. The reference rate was further reduced in steps to 3.25 percent through January 2015. RRs on domestic currency deposits were also cut by a cumulative 23 bps to 7 percent between August 2013 and May 2015 and the legal minimum requirement rate was further reduced from 9 percent to 6.5 percent by year-end.

16.   RRs and MPPs were also used to reduce dollarization and enhance the resilience of banks. The BCRP raised marginal RRs on FX deposits from 60 to 70 percent and introduced additional RRs on short positions in FX derivatives and others conditional on FX loan balances which could at times weakened the impact of the monetary policy during this period too.[9] Other MPPs were mostly related to increasing capital buffers on FX loans to reduce FX-related credit risk, additional capital buffers on consumption loans, and higher risk weights on mortgages with high loan-to-value (LTV) ratios. New liquidity coverage ratios (LCRs) were introduced in 2014. In January 2015, LCRs in both local and foreign currency were increased from 90 to 100 percent. Two additional RRs for financial institutions considered as CFMs were introduced in February and March 2015.

Peru: Changes in the Policy Rate and RRs (2012-2019Q4)

Source: Central Bank of Peru.

Peru: Policy Rates and RRs (Percent, 2012-2019)

Source: IMF World Economic Outlook; Central Bank of Peru, IMF staff calculations.

Peru: Changes in the Policy Rate and MPPs without RRs (2012-2019Q4)

Source: Central Bank of Peru.

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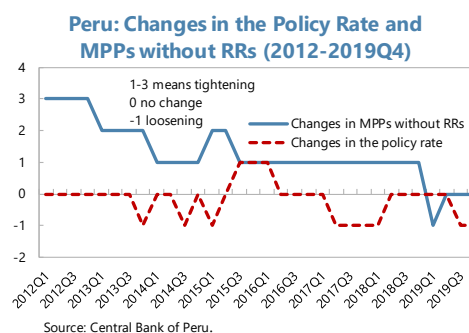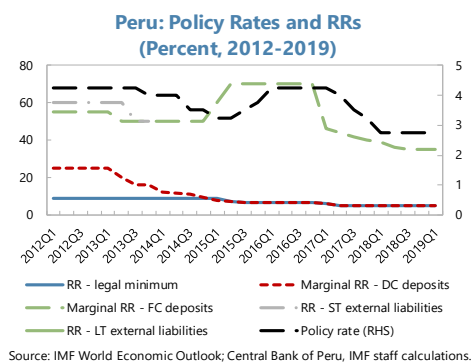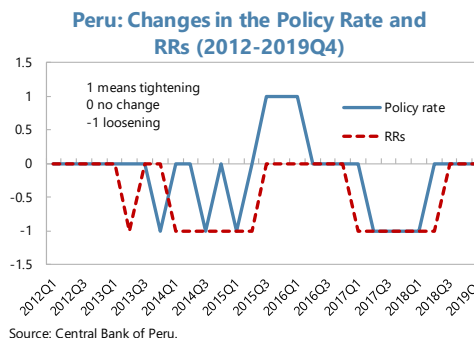
[9] Peru's public debt management strategy has been focused on developing a yield curve of government bonds in soles while reducing FX-denominated public debt. In line with this objective, in 2013 the Ministry of Economy and Finance launched a program to develop a market for fixed-rate sovereign instruments in domestic currency. As a result, government bonds in soles have gained liquidity and the yield curve has been extended considerably.

17. **In 2016, following the large Renminbi depreciation and lower metal prices, monetary policy was tightened, FXI was used less, and new MPPs were introduced.** The BCRP raised the policy rate from September 2015 by a full percentage point to 4.25 percent aiming at re-anchoring inflation expectations. The sol depreciated by 14 percent with respect to the U.S. dollar by the end of 2015 over a year, the largest yearly exchange rate movement since the adoption of inflation targeting, but the volatility of the exchange rate was otherwise contained. In 2016, as part of the capital reforms, the SBS continued to tighten the countercyclical capital buffers on past lending.

Peru: One Year Ahead Expected Inflation (Percent, 2012-2019)

Source: Central Bank of Peru.
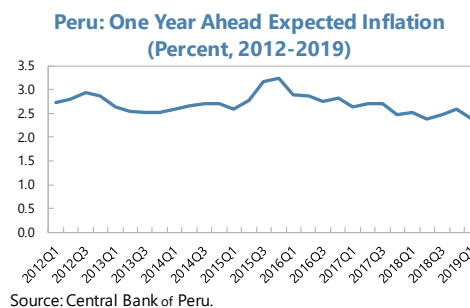
18. **In 2017, global trade tensions and adverse domestic factors prompted monetary easing and relaxation of some MPPs, with very little use of FXI**. The BCRP gradually reduced the policy rate in May 2017 from 4.25 percent to 2.75 in April 2018 in response to increased uncertainty in the global outlook, weak commodity prices, domestic political uncertainty, and an adverse weather event. As economic activity continued to weaken, the BCRP started easing again with two 25 bps rate cuts in August and November 2019 to 2.25 percent. The BCRP also reduced reserve requirements to 5 percent for domestic currency deposits and 35 percent in mid-2017 and mid-2018, respectively for FX deposits while introducing new limits on banks' FX transactions. While quantitative limits on FX credit growth remained in place, further decline in RRs for FX deposits was made possible by the progress attained in reducing dollarization.[10] In March 2018, the BCRP introduced new measures, allowing foreign currency loans to increase if local currency credit to enterprises rises more than proportionally, subject to certain thresholds. The operational limit on private pension funds' investment in foreign securities increased from 46 to 50 percent of their portfolio by September 2018. In March 2019, the BCRP relaxed limits on FX operations with forwards and swaps. During this period the use of FXIs were limited in size amounting to less than 3 percent of GDP in 2018-2019 with balances on swap agreements reduced to zero and they were broadly symmetric.

19. **As dollarization declined, the use of FXI was reduced in favor of a more active use of the policy rate, while the MPP toolkit was further expanded.** After the 2012 events, when FXI was still substantial (point 4, Figure 1), the response to the later risk aversion episodes focused on new MPP measures, including to reduce dollarization (point 5, Figure 1). The success achieved in reducing dollarization supported less FXI, some relaxation of MPPs, and a more intense use of the policy rate (point 6, Figure 1). Inflation performance was good relative to other EMEs although target misses were more frequent than in Chile and Brazil.

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[10] Latest data shows that credit and deposit dollarization in Peru have declined to about 27 and 35 percent from more than 65 and 55 percent, respectively in the early 00s.

F. Overall Performance (2002-19)

20.   Although the use of instruments has been largely determined by the nature of the shocks, Peru's policy framework has moved gradually away from its reliance on FXI toward an increased use of traditional tools—the policy rate—and MPPs (Figure 1). This change can be explained by the success achieved in stabilizing inflation and reducing dollarization, which has improved the effectiveness of the interest transmission channel and mitigated the financial stability risks associated with exchange rate movements. The latter have also become less correlated with inflation dynamics (Annex I).

21.   With increasing success in preserving financial stability, the overall macroeconomic performance was also good. With a strong and resilient financial system, Peru was one of the best EME performers in terms of output growth, inflation, and inflation volatility. Output volatility, however, was higher than in most EMEs (Figure 5).[11]

Output Growth and Inflation: Selected Countries, 2002-19

Source: Central Bank of Peru; World Economic Outlook; Haver Analytics; IMF staff calculations.

Output and Inflation Volatilities: Selected countries, 2002-19 1/

1/ Growth and output volatilities are calculated based on 8 quarters standard deviations.

Source: Central Bank of Peru; World Economic Outlook; Haver Analytics; IMF staff calculations.

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[11] Please see Ghazanchyan et al., (2019), forthcoming, for more details on cross country evidence on the effectiveness of the combination of instruments and macroeconomic performance.

22.   FXI may have helped stabilize output fluctuations, but the benefits of FXI would have dissipated as dollarization declined. Model simulations show that FXI can mitigate output responses to both real and financial shocks when balance sheet effects resulting from dollarization are associated with exchange rate movements.12 Using the FPAS model, we simulated two shocks to: (i) the foreign interest rate and (ii) terms of trade.13 When the foreign interest rate increases (declines) with a capital outflow (inflow) or terms of trade deteriorate (improve), the FXI can reduce the impact of shocks on the output gap and inflation based on the assumption that the balance sheet effects of the exchange rate fluctuations are large (see also Ostry, (2012)). However, with dollarization declining, the positive impact of FXI would correspondingly diminish.

Peru: Impact of Foreign Exchange Intervention
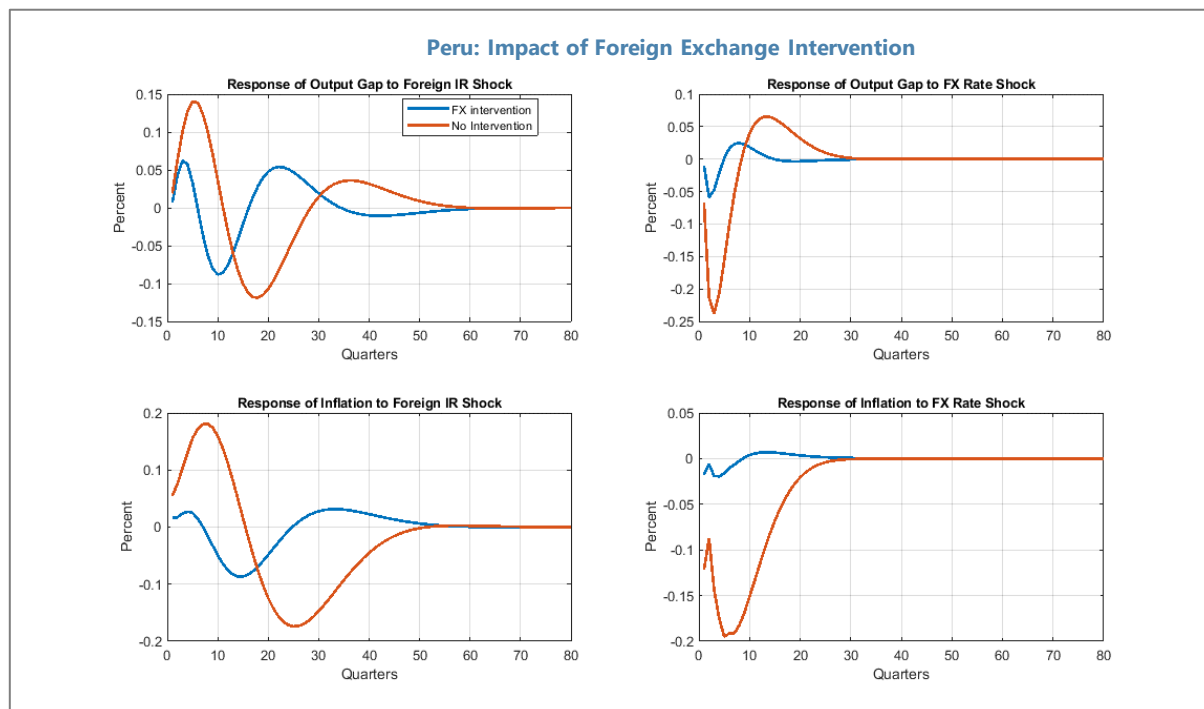
23.   FXI and MPPs may have contributed to attaining low and stable inflation.14 Augmented Taylor rules—including terms for the REER, real credit, and the US policy rate—show that the policy rate in Peru was more expansionary and less volatile than predicted by the rules.15 Significant coefficients for FXI and a variable for financial stability proxied by the domestic lending-deposit

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[12] Simulations using the Forecasting and Policy Analysis System (FPAS) model (see Berg et al., 2016). For the detailed discussion and results for Peru, see Ghazanchyan et al. (2019, forthcoming).

[13] Shocks are 1-percent deviations from baseline values.

[14] Following Ostry (2012), we have also estimated the following Taylor rule $i_t - \pi_{t+4} = \beta_0 + \beta(i_{t-1} - \pi *_{t-1}) + \beta_2(\pi e_{t+4} - \pi *_{t+4}) - \beta_3(\log(REERt)) - \log(REERHPt)) + \beta_4 YGAP_{t-1} - \beta D_{08:4-09:2} + \varepsilon t,$ where the dependent variable is the "target real interest rate" (the policy interest rate, it minus the four-quarter ahead inflation target) and where REER is the log of the real effective exchange rate (an increase is an appreciation of the domestic currency), REER is the level implied by a rolling HP filter, YGAP is the output gap, D08:4-09:2 is a dummy variable for the GFC. We extended this equation to include the credit gap (the results for credit gap are not significant) and lending market interest rate spread. For more general discussion see Ostry (2012).

[15] Similar results were obtained by using the specification by Velarde (2015) with a neutral rate of 3.2 percent.

interest rate spread suggest that, without these policies, the reference rate would have had to be higher on average and more volatile in order to attain the inflation target.[16]

Peru: Taylor Rules versus Actual, Policy Rates (Percent)

Source: Central Bank of Peru; IMF staff calculations.
TR = rbar(0)+policy rate(-1) +0.5*(inflation gap) +0.5*(output gap)
TRA = rbar(0)+ policy rate(-1) +0.5*(inflation gap) +0.5*(output gap)+
   0.1*usa_fedfunds+0.5*(reer gap) + 0.5*(credit gap)
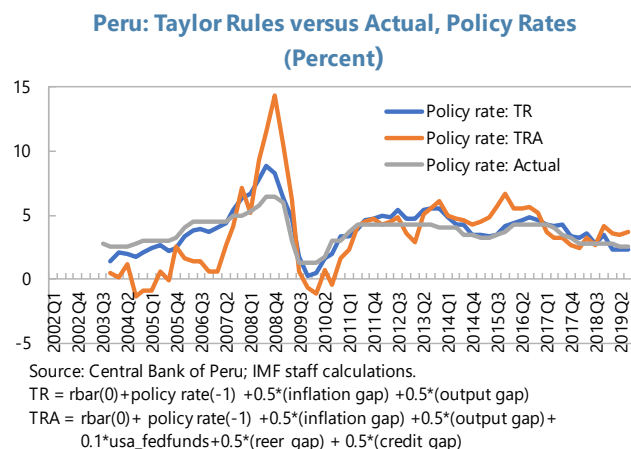
Taylor Rules in Peru: OLS Regressions

Dependent Variable: Policy rate - Inflation Target 1/

	(1)	(2)	(3)	(4)
Lagged (policy rate - inflation target)		0.9339***	0.7444***	0.7428***
Expected inflation - inflation target	1.3356***	0.2817*	0.102	0.2856*
REER deviation from trend			-4.2255	-4.4529*
Lagged output gap			0.2551***	0.2471***
Domestic interest rate spread (lending minus deposit rate)				0.0528***
Dummy for global financial crisis	0.7313	-1.2338***	-0.8604***	-1.0524***
Constant	0.8661	0.0266	0.4201	-0.5718
Observations	63	62	62	62
Adjusted R-squared	0.3622	0.8274	0.8712	0.8776

1/ *, ** and *** denote statistical significance at the
10, 5 and 1 percent level, respectively. Sample: 2003q4-2019q1.
REER is defined such that an increase denotes an appreciation of the currency.

Source: IMF staff calculations.

24.   Despite episodic reductions in RRs, Peru's MPPs have been mostly tightening. Alam and others (2018) classified Peru's MPPs as tightening and a large part of them as capital-related measures followed by provisioning and dollarization measures. They have also been designed for resilience building rather than cyclical reasons. Most of the MPPs adopted have never been removed, which makes it difficult to evaluate their effectiveness.

Peru: Macroprodential Measures, Prevalence of Use by Instrument
(Percent of total, 1996-present)

Source: Alam and others (2018).

Peru: Type of Macroprudential Measures 1/

Source: Alam and others (2018); IMF staff calculations.
1/ In percent. All loosening measures except the one in 2019:Q1 related to FX position are changes in the RRs.

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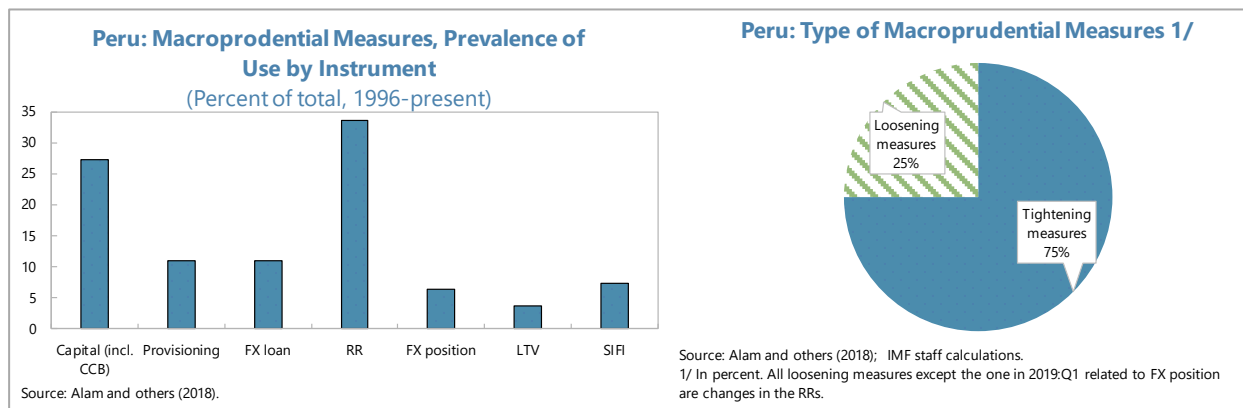
[16] We used both credit gap and lending-deposit interest rate spread as proxies for financial stability with the former being insignificant in the regressions. The lending-deposit interest rate spread is another measure of credit condition in the financial system.

25. **MPPs seem to have been successful at dampening the credit cycle, especially in 2012-19, but the evidence on their impact is inconclusive.** Fang et al., (2018) find no effects of higher capital requirements on credit in Peru. Following Boar et al. (2017), we estimated a regression equation of MPPs on output and output volatility that shows no impact of MPPs on real GDP growth in the short run.[17] MPPs increase output volatility (at the 10-percent significance level only) which can be reversed with deeper financial development and more capital account openness. In the longer run (using 2- and 5-year averages), the impact of MPPs on growth and its volatility dissipates.

Do Macroprudential Policies Reduce Output Volatility and Enhance Output Growth? 1/

Dependent Variables	Real GDP Growth		Output Volatility	
	Coeff.	P-value	Coeff.	P-value
MPPs	0.64	0.59	1.37	0.06*
FD	-1.78	-0.31	-0.43	0.9
OPEN	3.95	0.25	-0.73	0.7
FD x MaP x OPEN	-0.86	0.59	-1.78	0.07*
Other controls (including GFC)	yes	yes	yes	yes
Observations	62	62	62	62
R-squared	0.75	0.75	0.75	0.75

1/ *, ** and *** denote statistical significance at the
10, 5 and 1 percent level, respectively. Sample: 2003q4-2019q1.
Source: World Economic Outlook; Sahay et al. (2015); Chinn and Ito (2006). IMF Staff calculations.

G. Conclusions

26. **Since the adoption of inflation targeting in 2002, Peru's multi-instrument policy framework has gradually reduced its reliance on FXI and increased its use of the policy rate and a rapidly expanding macroprudential toolkit.** The evolution of the framework is described in this paper by movements within a triangular space, where the vertices represent the instruments and the sides the trade-offs between policy objectives. The main reason for these changes is the success attained in gaining credibility, stabilizing inflation, limiting the impact of large capital flows, and reducing dollarization, thereby enhancing the effectiveness of the traditional monetary policy transmission mechanism.

27. **The evolution of this framework is marked by several external shocks.** The first period (2002-2007) was characterized by a commodity price boom and large capital inflows. The policy reaction focused on large FX purchases while monetary policy was tightened to cement low inflation, and a more systematic MPP framework started to emerge. In the second period (2008-11), the reaction to the GFC included monetary policy easing, large FX sales, and increased use of MPPs. In recent years (2012-19), Peru experienced unfavorable terms of trade and financial market volatility connected with risk-off episodes. The use of MPPs increased further, including to reduce dollarization. With the success of these measures, the use of FXI declined gradually, while the policy rate was used more frequently to attain the inflation target.

28. **While further developments in this direction are expected as dollarization declines, some general lessons may be derived from this experience.** Our analysis shows that Peru's macroeconomic performance compares well with that of other EMEs, particularly on inflation. It also

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[17] The variable of interest in the specification is the macroprudential measure MPP and its impact on real GDP growth and its volatility. FD indicates the degree of financial development (FD, from Sahay et al. (2015)) with higher values indicating higher degree of financial development, and openness, OPEN, measures capital account openness (from Chinn and Ito (2006)) with higher values indicating more openness. The regressions also include interactions of these three variables. Xt includes a set of control variables such as the average number of years of schooling, real government consumption, the inflation rate, the real interest rate, the effective exchange rate, and a global financial crisis dummy.

indicates that FXI may have contributed to stabilizing output fluctuations (although the benefits of FXI would have declined over time with de-dollarization); FXI and MPPs may have helped monetary policy achieve its objectives; and MPPs seem to have had some role in dampening credit cycles but perhaps also contributing to output fluctuations. Nonetheless, the evidence presented here is merely suggestive and the absence of a clear counterfactual makes it difficult to draw definite conclusions. Thus, further analysis is necessary to fully understand the interaction of different instruments, which could open new possibilities for a broader definition of the policy stance and improved combinations of instruments and policies.

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Annex I. Policy Goals and Trade-Offs

1.   **Stabilizing financial and foreign exchange market conditions may have conflicted with the goals of price and output stability in Peru.** Broader financial stability concerns at times can outweigh price stability concerns where monetary policy actions may not be enough to have an impact (Agénor and Silva, 2019; Malovaná and Frait, 2017). Following Choi and Cook (2018), we document frequencies in Peru during the period after the adoption of inflation targeting, 2012–19 at which stabilizing volatility in capital flows, real credit and exchange rate were not correlated with inflationary and output gap dynamics echoing policy challenges.

2.   **Our methodological strategy focuses on frequencies and the significance of co-movements in macroeconomic variables.**[1] For business cycle considerations, the expectation is that output gap moves in the same direction as inflation except at times of supply shocks. For the exchange rate, depreciation periods will be associated with higher inflation and appreciation periods with lower inflation. For financial stability, credit expansions precede high inflation calling for policy rate hikes and, conversely, when inflation is considerably below the target range, credit conditions are more likely to be contractionary (possibly owing to reduced demand for credit). For capital flows, inflows will be associated with higher inflation and outflows with lower inflation, other things being equal.

3.   **While real credit and capital flows were generally correlated with inflation developments in Peru, exchange rate movements were not correlated with inflation in most periods owing to interventions**.[2] While the real credit was off sync in the aftermath of the

Peru: Correlations, Selected Macroeconomic Variables 1/ 2/								
Dependent variable	Period: 2002q1-2019q1		Period: 2002q1-2007q4		Period: 2008q1-2011q4		Period: 2012q1-2019q1	
	Independent variables		Independent variables		Independent variables		Independent variables	
	Inflation status 3/	Inflation gap	Inflation status	Inflation gap	Inflation status	Inflation gap	Inflation status	Inflation gap
Output gap	0.41***	0.53***	0.19	0.31*	1.04***	0.94***	0.08	0.05
Change in ER	0.9*	0.55	0.08	0.06	-0.19	-0.46	2.62***	3.69***
Change in Real credit	2.35***	2.99***	0.75	1.41	1.74	2.18**	2.56***	2.66***
Share of net capital flows in GDP	1.29***	1.24***	1.33**	1.40**	0.31	0.32	2.09**	2.69**

Source: IMF Staff calculations.
1/ The table shows coefficient estimates from a simple regression of the inflation gap (inflation minus its target value) separately from also the status index of inflation relative to target.
2/ ***, **, and * indicate significance at the 1, 5, and 10 percent levels, respectively.
3/ The inflation status is calculated as follows: It equals -2 when headline inflation is below the target lower bound, -1 when headline inflation is below target but within the target range, 1 when headline inflation is above target but within the range, and 2 when inflation is above the target upper bound.
To capture the co-movement of macroeconomic variables with policy tools and external conditions, we followed a strategy similar to Choi and Cook (2018) and compared inflation movements with output gap, the exchange rate, capital flows and real credit by running statistical tests to check for the significance of correlations of these variables with inflation.

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[1] To capture the frequencies and comovements for each macroeconomic variable of interest, we constructed the standard deviation of it over the period from the inception of the IT regime (2002) to the second quarter of 2008 (the set of the Lehman Brothers crisis). If, for example, the output gap in a given quarter is above (below the negative of) the pre-crisis standard deviation, we characterized that quarter as a boom (recession). To compare inflation movements with other variables, we constructed a discrete variable for headline inflation status which equals -2 when headline inflation is below the target lower bound, -1 when headline inflation is below target but within the target range, 1 when headline inflation is above target but within the range, and 2 when inflation is above the target upper bound. Similarly, we measured depreciation (appreciation) quarters when the year-on-year growth of the exchange rate against the U.S. dollar was higher (lower) than the rate measured as one-standard deviation above (below) the average for the period between the inception of an IT regime and the second quarter of 2008. The same technique was used for real credit booms and busts. Our capital flow measure is the change in capital flows in GDP when inflow means capital flows are more (less) than pre-crisis mean plus (minus) one pre-crisis standard deviation. With dummy variables representing the status changes for all the variables, we also run statistical tests to check for the significance of correlations of these variables with inflation and inflation status.

[2] Independent shocks could shift the direction of macroeconomic variables and not necessarily the combination of policies. We only propose that the policy makers when facing the trade-offs between alternative goals, were not fully able to achieve them with the currrent set of instruments.

adoption of the IT framework it was broadly in line with inflation in all other sub-periods. Except the brief period of 2008-2011, capital flows were largely in line with the movements of inflation though not with the exchange rate. In addition, where large negative output gaps were present (the pre-crisis period) and associated with higher inflation perhaps due to supply shocks, the BCRP responded with policy hikes, which otherwise could have stayed neutral. The closer link of capital flows with inflation in Peru suggests that inflation was more correlated with financial rather than real shocks. These observations also bond well with our findings on Peru's relatively better inflation performance compared to output with respect to other emerging market countries facing similar shocks.

Peru: Correlations with Selected Macroeconomic Variables 2012-19

Headline Inflation and Exchange Rate
(Y-y change, 2002-07, percent) 1/

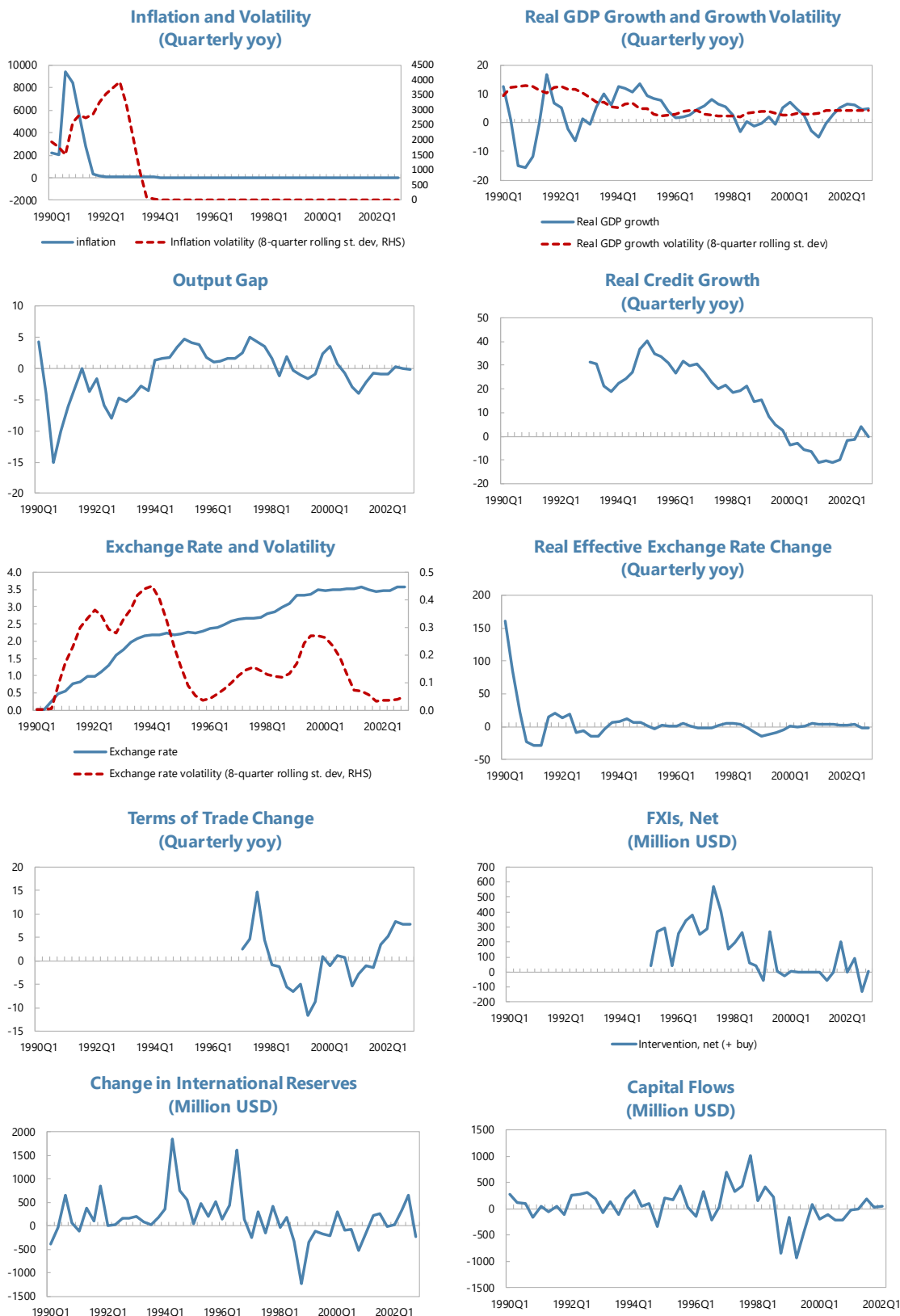1/ Betwwen 2002-07, only in 57 percent of cases exchange rate movements were consistent with inflation dynamics meaning that when inflation was at the upper end of the range it would be associated with more depreciation.

Headline Inflation and Capital Flows in GDP
(Y-y change, 2002-07, percent) 1/

1/ Between 2002-2007, more than 80 percent of the time capital flows were consistent with inflation dynamics meaning that when inflation was at the upper end of the range it would be associated with higher capital flows.

Headline Inflation and Real Credit Growth
(Y-y change, 2002-07, percent) 1/

1/ Between 2002-07, slightly less than half of the time real credit movements were consistent with inflation dynamics meaning that when inflation was at the upper end of the range it would be associated with

Headline Inflation and Exchange Rate
(Y-y change, 2008-2011, percent) 1/

1/ Between 2008-2011, 40 percent of the time exchange rate movements were consistent with inflation dynamics meaning that when inflation was at the upper end of the range it would be associated with more depreciation.

Headline Inflation and Capital Flows in GDP
(Y-y change, 2008-11, percent) 1/

1/ Between 2008-2011, more than 80 percent of the time capital flows were consistent with inflation dynamics meaning that when inflation was at the upper end of the range it would be associated with higher capital flows.

Headline inflation and Real Credit Growth
(Y-y change, 2008-11, percent) 1/

1/ Between 2008-11, 80 percent of the time real credit movements were consistent with inflation dynamics meaning that when inflation was at the upper end of the range it would be associated with higher credit growth.

Headline Inflation and Exchange Rate
(Y-y change, 2012-2019, percent) 1/

1/ Between 2012-2019, 65 percent of the exchange rate movements were consistent with inflation dynamics meaning that when inflation was at the upper end of the range it would be associated with more currency depreciation.

Headline Inflation and Capital Flows in GDP,
(Y-y change), 2012-2019, percent) 1/

1/ Between 2012-2019, 80 percent of the capital flows were consistent with inflation dynamics meaning that when inflation was at the upper end of the range it would be associated with higher capital flows.

Headline Inflation and Real Credit Growth
(Y-y change, 2012-2019, percent) 1/

1/ Between 2012-2019 only 93 percent of the time real credit movements were consistent with inflation dynamics meaning that when inflation was at the upper end of the range it would be associated with higher credit growth.

Source: World Economic Outlook; Haver Analytics; IMF staff calculations.

Figure 1. Peru: Selected Macroeconomic Variables (1990-2002)

Inflation and Volatility
(Quarterly yoy)

- inflation
- Inflation volatility (8-quarter rolling st. dev, RHS)

Real GDP Growth and Growth Volatility
(Quarterly yoy)

- Real GDP growth
- Real GDP growth volatility (8-quarter rolling st. dev)

Output Gap

Real Credit Growth
(Quarterly yoy)

Exchange Rate and Volatility

- Exchange rate
- Exchange rate volatility (8-quarter rolling st. dev, RHS)

Real Effective Exchange Rate Change
(Quarterly yoy)

Terms of Trade Change
(Quarterly yoy)

FXIs, Net
(Million USD)

- Intervention, net (+ buy)

Change in International Reserves
(Million USD)

Capital Flows
(Million USD)

Source: Haver Analytics, BCRP.

Figure 2. Peru: Selected Macroeconomic Variables (2002-2007)

Inflation and Volatility
(Quarterly yoy)

Inflation
Inflation volatility (8-quarter rolling st. dev, RHS)

Real GDP Growth and Volatility
(Quarterly yoy)

Real GDP growth
Real GDP growth volatility (8-quarter rolling st. dev)

Output Gap

Real Credit Growth
(Quarterly yoy)

Exchange Rate and Volatility

Exchange rate
Exchange rate volatility (8-quarter rolling st. dev, RHS)

Real Effective Exchange Rate
(Quarterly yoy)

Policy Rate
(In percent)

FXIs, net
(Million USD)

Intervention, net (+ buy)

Change in International Reserves
(Million USD)

Terms of Trade
(Quarterly yoy)

Source: Haver Analytics, BCRP.

Figure 3. Peru: Selected Macroeconomic Variables (2008-2011)

Inflation and Volatility
(Quarterly yoy)

Real GDP Growth and Growth Volatility
(Quarterly yoy)

Output Gap

Real Credit Growth
(Quarterly yoy)

Exchange Rate and Volatility

Real Effective Exchange Rate Change
(Quarterly yoy)

Marginal Reserve Requirement
(In percent)

FXIs, Net
(Million USD)

Policy Rate
(In percent)

Terms of Trade Change
(Quarterly yoy)

Change in International Reserves
(Million USD)

Capital Flows
(Million USD)

Source: Haver Analytics, BCRP.

Figure 4. Peru: Selected Macroeconomic Variables (2012-2019)

Inflation and Volatility
(Quarterly yoy)

Real GDP Growth and Growth Volatility
(Quarterly yoy)

Output Gap

Real Credit Growth
(Quarterly yoy)

Exchange Rate and Volatility

Real Effective Exchange Rate Change
(Quarterly yoy)

Marginal Reserve Requirement
(In percent)

FXIs, Net
(Million USD)

Policy Rate
(In percent)

Terms of Trade Change
(Quarterly yoy)

Change in International Reserves
(Million USD)

Capital Flows
(Million USD)

Source: Haver Analytics, BCRP.

Figure 5. Peru and other EMEs: Selected Macroeconomic Variables, 2002-19 1/

Output growth and inflation, 2002-19

Output and inflation volatilities, 2002-19

Output growth and inflation, 2002-07

Output and inflation volatilities, 2002-07

Output growth and inflation, 2008-11

Output and inflation volatilities, 2008-11

Output growth and inflation, 2012-19

Output and inflation volatilities, 2012-19

Source: Central Bank of Peru; World Economic Outlook; Haver Analytics; IMF staff calculations.

1/ Growth and output volatilities are calculated based on 8 quarters standard deviations.

PERU'S INFLATION TARGETING FRAMEWORK—HOW FAR FROM ORTHODOXY?[1]

We benchmark Peru's multi-instrument inflation targeting framework with Chile's—a regional peer that follows an orthodox inflation targeting regime. These frameworks have performed similarly in terms of output growth and inflation, and their volatilities. We find that Peru's framework appears to differ from the benchmark primarily along two dimensions: policy rate setting and real exchange rate outcomes. Policy rate decisions in Peru have been affected by reserve requirement settings, particularly in response to capital flow shocks. Policy rate decisions, foreign exchange intervention, and reserve requirements seem to explain differences in real exchange rate outcomes. Nonetheless, deviations from orthodoxy were largely modest and transitory.

A. Introduction

1.   It is well documented that Peru relies on a multi-instrument policy framework to manage macroeconomic fluctuations (e.g., Armas and Vega, 2018). [2] Peru's inflation targeting framework uses a traditional policy rate complemented by two other main policy instruments: foreign exchange intervention (FXI) and reserve requirements (RRs). As in the traditional inflation targeting practice, Peru's central bank adjusts its policy rate to bring inflation back to the target range. FXI is used to manage exchange rate fluctuations in order to mitigate balance sheet risks associated with the country's still high degree of financial dollarization. Finally, RRs are used as a tool to reduce financial dollarization, as well as to partially offset the impact of changes in external credit conditions.

2.   It is much less understood, however, to what extent this multi-instrument framework drives Peru's policies and economic outcomes away from an orthodox model. For instance, does the coexistence of multiple objectives hamper the implementation and performance of the inflation targeting framework? Or, does the deployment of multiple instruments generate distortions that can cause misalignments and sow the seeds for vulnerabilities to emerge in the short or medium terms? More generally, how far are Peru's policy instruments and/or economic outcomes from those of a traditional inflation targeting framework, which relies only on adjustments to the monetary policy rate and on a freely-floating exchange rate?

3.   In this chapter we try to shed light on this issue by benchmarking Peru with Chile—a regional peer that uses an orthodox inflation targeting framework. Chile is a particularly useful benchmark for several reasons. Both countries are inflation targetters and share important similarities, namely in their export structure dominated by mining and agricultural products).

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[1] Prepared by Pedro Rodriguez.

[2] In the remaining of this work we use the term policy framework to refer to the set of objectives and instruments used by the central banks to conduct their monetary and exchange rate policies. This definition does not include macroprudential policies and capital flow measures.

However, at the same time they have important differences in their policy frameworks, with Chile relying almost exclusively on a flexible exchange rate regime and adjustments to the monetary policy rate.

B.   Analytical Strategy

4.   We focus our attention on the main differences in the management of monetary instruments and economic outcomes. As illustrated in the next section, the differences in monetary policy management go beyond the obvious discrepancy in the number of instruments used in each country and extend to how intensively the monetary policy rate is used. In addition, while growth and inflation outcomes appear relatively similar, the behavior of the real exchange rate differs. In this context, we explore: (i) to what extent does the use of FXI and RRs affect the adjustment of the monetary policy rate? and (ii) to what extent does Peru's framework generate policy-induced deviations of the real exchange rate (RER)? The first question goes to the core of the discussion on whether a framework with multiple objectives and multiple instruments can affect the capacity of the central bank to properly implement its *de jure* monetary framework. The second question also goes to a central issue, namely, whether the deployment of multiple instruments can generate distortions—such as real exchange rate misalignments—which could eventually translate into misallocation of resources or a vulnerable external position.

C.   Economic Developments and Policy Instruments—An Overview for Peru and Chile

Economic Developments

5.   Peru and Chile both exhibited strong economic performance in the period under study, with perhaps the most salient difference being their (real and nominal) exchange rate developments. More specifically, as illustrated in Figure 1 for the period January 2002-March 2019:

- Terms of trade had very similar trends and cycles, as well as almost identical volatility (both in terms of standard deviation and coefficient of variation). Net capital inflows were on average somewhat higher for Peru, with a monthly average equivalent to 0.2 months of imports vis-à-vis an average of nearly zero for Chile. Both series had a similar volatility (measured in terms of standard deviation and range, since the coefficient of variation is not very appropriate in this case given the nearly zero mean for Chile).

- Real GDP growth was on average higher for Peru (5.3 versus 3.9 percent) while inflation was on average lower (2.7 versus 3.2 percent). Volatility was lower for Peru for both series (as measured by the coefficient of variation). In addition, one can observe a wider range for inflation in Chile, which is driven by the fluctuations observed in the months around the global financial crisis (GFC).

- Exchange rate volatility was also lower for Peru. Chile's RER exhibited a coefficient of variation of 5.6 and a range of about 30 points, while both figures were lower for Peru (with the former at

4.1 and the latter at 17). These results were primarily the reflection of higher nominal exchange rate volatility, with Chile's nominal exchange rate exhibiting a coefficient of variation of 13.5 and a range of 46, and the values for Peru being 9.1 and 31, respectively. It is striking, at least ex-post, that deviations between the two nominal series tended to be corrected by adjustments in Chile's nominal exchange rate and that the inflexion points of the two series are largely the same.

Policy Instruments

6.   As anticipated in the previous sections, the behavior of policy instruments differed in a fundamental way—with a more active use of the policy rate in Chile and FXI and RRs in Peru. As illustrated in Figure 2, the monetary policy rates had very similar cycles (both in nominal and real terms) and averages (although the average real rate was about 40 basis points higher in Peru). However, volatility was higher in the case of Chile, suggesting a more active use of this instrument. On the other hand, volatility of FXI and RRs was significantly higher in Peru, with Chile barely using these instruments (FXI was used in just three episodes of relatively small scale while reserve requirements were not changed at all).

Other Policy and Structural Differences

7.   Factors other than policy instruments may play a role in explaining policy differences and outcomes. In particular,

- *Fiscal FX transactions*. Government ownership of mining/hydrocarbon resources is higher in Chile than in Peru (where it is mainly private). During the commodity boom, Chile's government accumulated a large stock of external assets, which alleviated pressures on the FX market.

- *Restrictions to capital flows*. While Chile had already eliminated some of the capital control measures imposed in the 1990s, it seems to have nonetheless remained more restrictive in this area than Peru (see, for instance, the index developed in Fernandez, Klein, Rebucci, Schindler, and Uribe (2016)). This could explain why capital flows were lower and less volatile in Chile than in Peru.

- *Structure of the financial sector*. Banks are relatively more dominant in Peru's financial sector than in Chile's, which may explain why RRs could be more effective in the former than in the latter.

Figure 1. Peru and Chile: Selected Macroeconomic Series

Peru and Chile: Terms of Trade
(Index, 2007=100)

Peru and Chile: Capital Inflows
(In months of imports of G&S)

Peru and Chile: GDP growth
(In percent)

Peru and Chile: Inflation
(In percent)

Peru and Chile: Real Exchange Rates
(Index [Jan 2002=100], increase denotes appreciation)

Peru and Chile: Nominal Exchange Rates
(Index [Jan 2002=100, LC/USD], increase denotes depreciation)
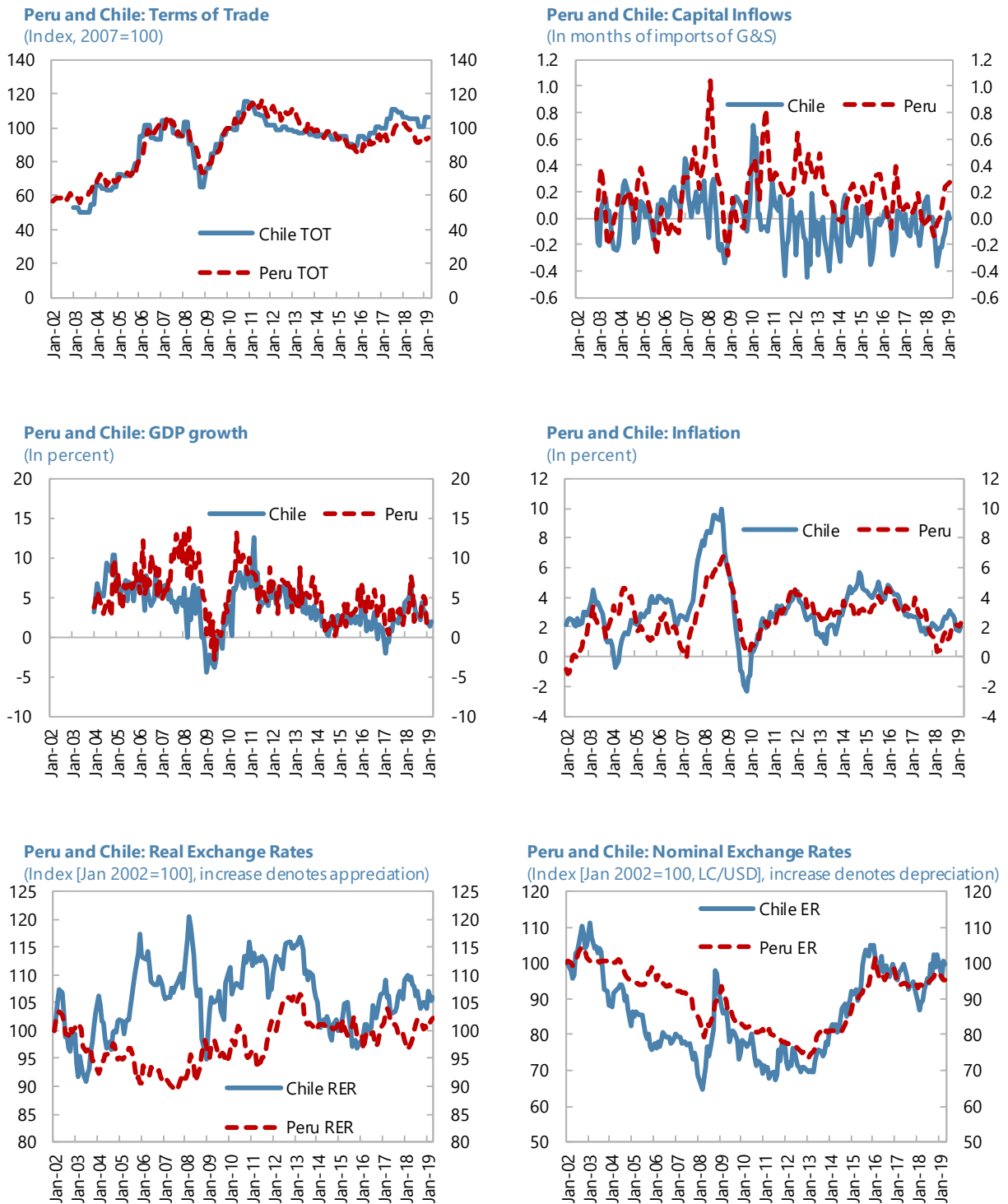
Sources: BCRP, Haver, IMF INS database, and IMF staff estimates.

Figure 2. Peru and Chile: Policy Instruments

Peru and Chile: Nominal Monetary Policy Rates
(In percent)
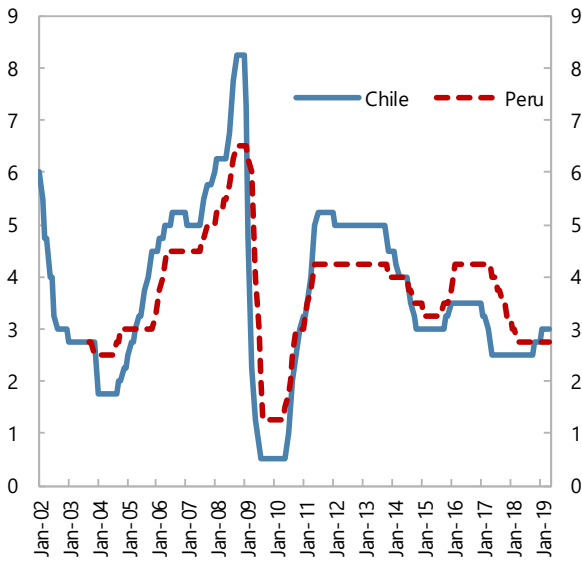
Peru and Chile: Real Monetary Policy Rates
(In percent)
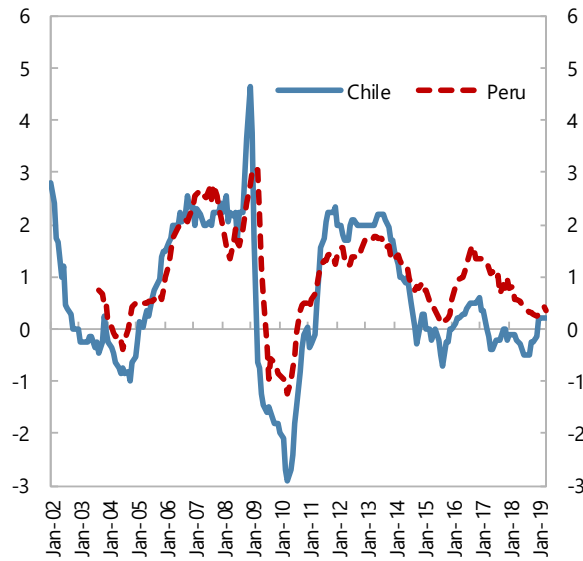
Peru and Chile: Foreign Exchange Intervention
(In months of imports of goods and services, positive denotes USD purchases)
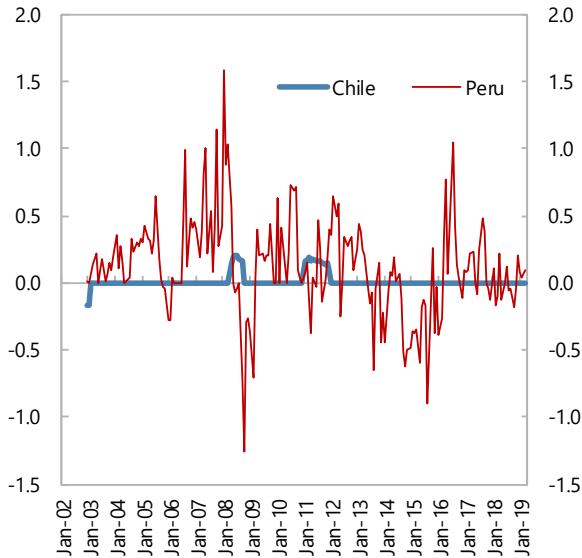
Peru and Chile: Reserve Requirements
(In percent)
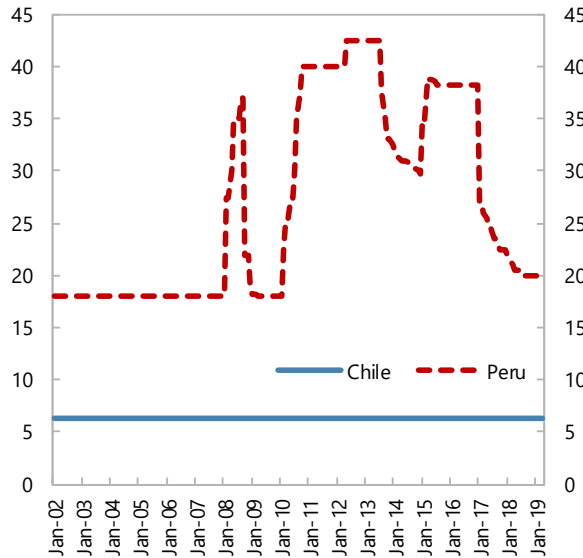
Sources: BCRP, Haver, Larrain and Saravia (2018), and IMF staff estimates.

8. `**The empirical analysis conducted below, however, remains relevant and may be relatively robust to these factors.** The potential impact of fiscal interventions poses perhaps the most significant hurdle for our analysis, as they may have exchange rate implications not captured by our variables. However, it is important to note that some FX transactions by Peru's Fiscal Stabilization Fund may have also contributed to mitigate pressures on the FX market. In addition, the tax stability arrangements between Peru and mining companies may have had a similar effect by limiting the companies' tax liabilities and the amount of FX they needed to sell. This factor would bias our results towards non-significance. The other two factors mentioned above—restrictions to capital flows and structure of the financial sector—can be considered in our empirical analysis as country-specific factors. To the extent that their time variability is limited, then their impact would be captured by the constant term in our regression (see specification in the next section).

D. Estimation Strategy and Data

9. **In order to estimate the policy questions raised in section B, we analyze the deviations of the relevant Peruvian variables vis-à-vis their Chilean counterparts.** For this, our starting point is to assume that the relevant variables for each country behave as denoted in equation (1) below. By taking differences for the two countries we arrive at equation (2), which indicates that the difference in the variable of interest (*Y*) can be explained by a set of economic fundamentals (*X*) and a set of policy instruments (*Z*). One advantage of using the formulation in equation (2) over the formulation in equation (1) is that the former helps control for the impact of unobservable common shocks (i.e., the *v* term in equation (1)).

$$Y_{i,t} = \alpha_i + \beta X_{i,t} + \gamma Z_{i,t} + v_t + u_{i,t} \tag{1}$$

$$Y_{i,t} - Y_{j,t} = (\alpha_i - \alpha_j) + \beta(X_{i,t} - X_{j,t}) + \gamma(Z_{i,t} - Z_{j,t}) + (u_{i,t} - u_{j,t}) \tag{2}$$

All variables are measured monthly. The sample period is January 2003-March 2019, but most data used in the regressions start only in September 2003, which is the first month when the policy rate for Peru becomes available. The real policy rate is calculated by subtracting 12-month inflation expectations from the nominal policy rate. Finally, the FXI variable is deflated by imports of goods and services (hence, the unit of measure becomes central bank intervention in months of imports) to account for differences in size of the economies (both over time and between each other) and facilitate the analytical interpretation of the associated coefficient (for details on data sources and definitions, see Annex I).

For the rest of the analysis, we use the term "gap" to denote the differences between Peru's economic variables with respect to their Chilean counterparts. Naturally, the policy rate gap and the real exchange rate gap will occupy a central place in the analysis given the two questions we are tackling. But other gaps (inflation, terms of trade, FXI, etc.) will also be considered.

E. Analysis and Regression Results

Policy question 1: *to what extent does the use of FXI and reserve requirements affect the adjustment of the monetary policy rate?*

10.   Before evaluating the regression results, it is useful to analyze the interest rate gap.
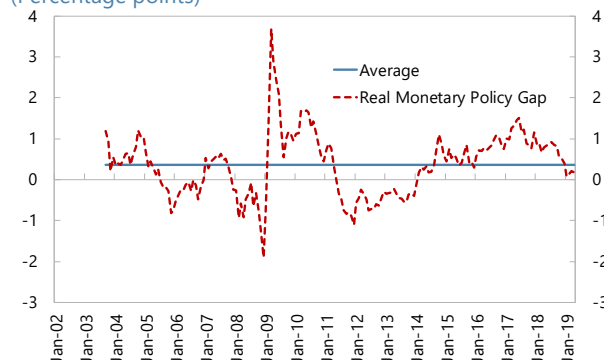
The real interest rate gap is stationary and has an average of around 0.4 percentage points, reflecting the previously mentioned fact that the average real policy rate was higher in Peru by that amount. In addition, there were very large gaps (in both directions) around the GFC, but these were short lived (text chart).

Peru and Chile: Real Monetary Policy Rate Gap
(Percentage points)

Sources: Haver and IMF staff estimates.

11.   The results in Table 1 show that the real interest rate gap is affected by both fundamentals and one policy instrument—RRs. Table 1 shows the results of a regression in which the real interest rate gap is explained by: (i) the inflation gap—under the hypothesis that the country with relatively higher (lower) inflation will tend to increase (reduce) its real rate in order to maintain inflation within the inflation target; and (ii) the policy instrument gaps—which are used to address the policy question of interest. The results indicate that a higher inflation gap will indeed induce the country to set a higher real interest rate—with the coefficients (Table 1, third column) indicating that a one percentage point increase in the inflation gap will translate into a 0.11

percentage points increase in the real policy rate gap. The results also indicate that reserve requirements appear to be a substitute for policy rate adjustments (given the negative sign of the coefficient). A 10-percentage point increase in reserve requirements translates into a reduction of 0.2 percentage points in the real policy rate. This link is also well illustrated in the text chart, which shows that periods of high (low) real interest rate gap were associated with period of low (high) RR gap (please note the inverted scale in the chart), particularly

Peru and Chile: Real Monetary Policy Rate and Reserve Requirements
(In percent points and in percent [RHS])

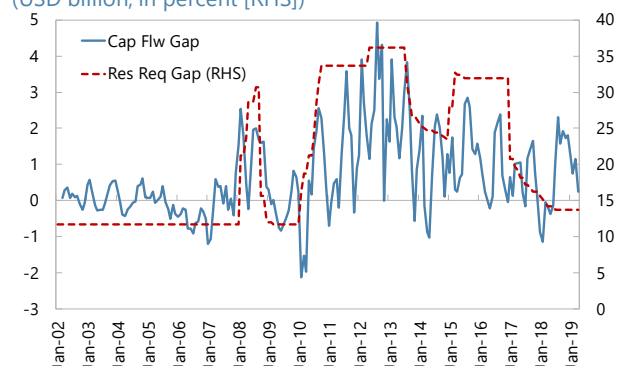Sources: Haver and IMF staff estimates.

before 2015. On the other hand, FXI does not appear to influence the interest rate setting, as the coefficient of this variable is not statistically significant.
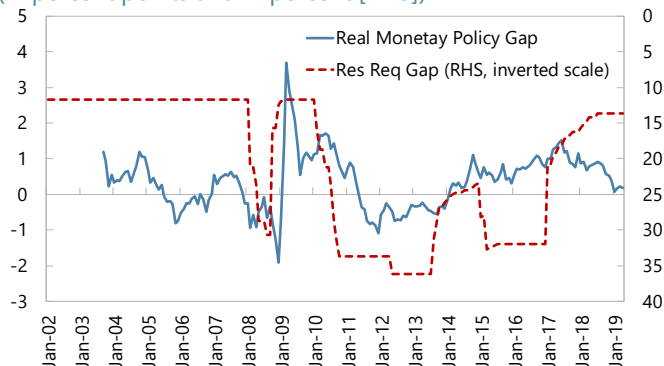
Understanding the Link between the Real Policy Rate and RRs

12.   The importance of RRs may be related to the source of the shocks faced by Peru. As illustrated in the text chart, reserve requirements were highly correlated with the capital flows gap. Hence, when faced with the need to tighten monetary conditions in a context of capital inflows, Peru may have preferred to use reserve requirements rather than the policy rate—as increasing the latter could have triggered additional capital inflows.

Peru and Chile: Capital Inflows and Reserve Requirements
(USD billion, in percent [RHS])

Sources: Haver, BCRP, and IMF staff estimates.

13.   We can use the relationship between RRs and capital flows to test the robustness of our previous results to some forms of endogeneity problems arising from correlation of the regressors with the disturbance term. Policy insttruments are endogenous by nature since they reflect the auhtorities' decision making process, which takes into account all the available information and encompasses all the existing instruments. As a result, the error term of the dependent variable (in this case the real policy rate gap) could possibly be contemporaneously correlated with the independent variable (in this case the RRs gap). In order to address this possible problem, we instrument the RRs with lagged values (three, six, and nine month lags) of the capital flows gap, which should not be correlated with the error term. The results, which are shown in the fourth column of Table 1, show that the instrumented RR remains a significant explanatory variable—with its coefficient actually increasing—of the real policy rate gap.

14.   The relationship between RRs and capital flows may, however, point towards other forms of endogeneity. If capital flows also impacted the real policy gap, then the link between RRs and the real policy rate would be driven by their common dependence on a third variable (in this case the capital flows gap) rather than by a direct effect of one variable over the other. If we include the capital flows gap as a control variable, the RR gap loses its significance (Table 1, fifth column). This likely reflects endogeneity between the RR and the capital flows gap, as well as their their high correlation (0.58). While the endogeneity problems make it difficult to disentangle the precise link between RRs and the policy rate, the analysis above, nonetheless, suggests that RRs seems to have played an important role to respond to capital inflows and that their use seems to have influenced the intesnsity in the use of the policy rate. We return to endogeneity issues later in the chapter.

Table 1. Peru and Chile: Regression Analysis. Estimating the Effect of Policy Instruments on the Real Monetary Policy Rate Gap					
Dependent Variable is Real Monetary Policy Rate Gap					
	(1)	(2)	(3)	(4)	(5)
Inflation Gap	0.1046***	0.1043***	0.1119***	0.1401***	0.1138***
	(0.0335)	(0.0336)	(0.0324)	(0.0306)	(0.0316)
FXI Gap		0.0958	-0.0373	-0.1989	0.0060
		(0.1417)	(0.1387)	(0.1331)	(0.1360)
RR Gap			-0.0216***		-0.0103
			(0.0055)		(0.0066)
RR Gap IV				-0.0475***	
				(0.0076)	
Capital Flow Gap					-0.1549***
					(0.0507)
R-square	0.0481	0.0503	0.1153	0.2013	0.1523
Observations	195	187	187	187	187

Source: Author's calculations.
Notes: Robust Least Squares regressions for the period Dec. 2002-Mar. 2019.
But most regressions start in September 2003, when Peru's policy rate
becomes available.
Robust standard errors in parentheses. *, **, ***,
denote significance at 10, 5, and 1 percent, respectively.

Policy question 2: _to what extent does Peru's framework generate policy-induced deviations of the real exchange rate (RER)?_

15. **Before conducting the regression analysis, it is interesting to analyze the patterns of the gaps:**

- The real exchange rate gap measures deviations of Peru's RER vis-à-vis Chile's, which means that upward movements denote relative appreciation of Peru's RER and downward movements

relative depreciations (Figure 3, upper chart).[3] This gap displays stationary behavior, with deviations from its mean reaching over 12 percentage points several times (and almost 20 points in a couple of cases). The gap was relatively more volatile in the earlier part of the sample, but nonetheless has exhibited significant volatility in the later part.

- The real exchange rate gap appears to be correlated with the foreign exchange intervention gap and the interest rate gap. Regarding the latter, the middle chart of Figure 3 illustrates that periods of relative appreciation (depreciation) of Peru's RER are correlated with periods of relatively higher (lower) policy rates, although they have diverged recently. Regarding the link with the FXI gap, the lower chart of Figure 3 illustrates that periods of relative appreciation (depreciation) of Peru's RER are correlated with periods of relatively higher FX sales (purchases).

The fundamentals in our estimation include only the gap in the terms of trade, while the policy variables include: (i) the real policy rate gap, the FXI gap, and the RR gap.

16.   Regression results confirm the importance of policy instruments in determining the real exchange rate gap. As illustrated in Table 2, the terms of trade gap does not play a major role since it is never significant in the specifications. On the other hand, all the policy gaps have the correct sign and are statistically significant at the one percent level. More specifically,

- Increases in the policy rate gap are estimated to lead to appreciations of the real exchange rate. The quantitative impact appears significant, with the coefficient estimated in equation (4) suggesting that a one percentage point increase in the policy rate gap would lead to an almost 3½ percentage points appreciation of the real exchange rate.

- Decreases in the FXI gap (i.e., sales of foreign exchange) lead to appreciations of the currency. The quantitative impact also appears significant, with foreign exchange sales in the order of one month of imports of goods and services (i.e., the equivalent to almost two percent of GDP) leading to an appreciation of the real exchange rate in the order of over 5 percentage points (based on the estimated coefficient in equation 4).

- Increases in the RR gap lead to appreciations of the real exchange rate, although the quantitative impact appears more moderate. In particular, the estimated coefficient in equation (4) implies that a 10 percent increase in the reserve requirements leads to a 1.8 percent appreciation of the real exchange rate. Furthermore, as indicated in the analysis of the impact of reserve requirements on interest rate setting, higher reserve requirements will lead to a lower policy rate (hence offsetting the impact of reserve requirements on the real exchange rate).

17.   Endogeneity issues appear less of a concern in this part of the analysis. The inclusion of the capital flows gap as a regressor has the same impact on the significance of RRs as in Table 1 but does not have a material effect on the other two variables (the real interest rate gap and the FXI gap).

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[3] The real exchange rate gap is measured as the difference in the logarithms of the real exchange rate indexes. Hence, the gap can be interpreted as a percent deviation from its benchmark.

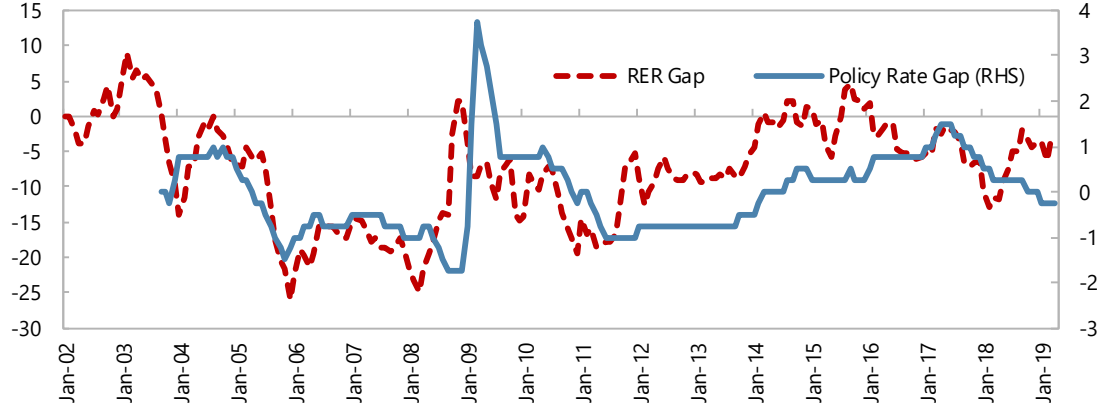## Figure 3. Peru and Chile: Real Exchange Rate Gap and its Determinants

Peru and Chile: Real Exchange Rate Gap
(Difference of RER indexes, Peru minus Chile, increase denotes relative appreciation of Peru versus Chile)
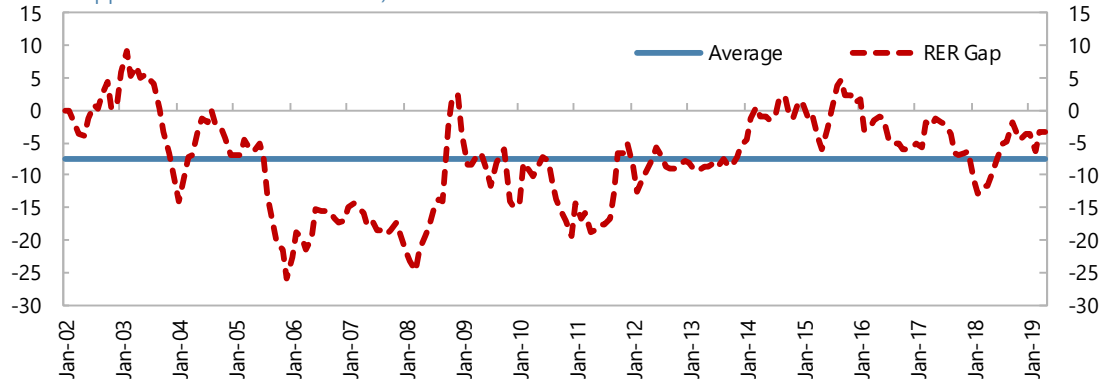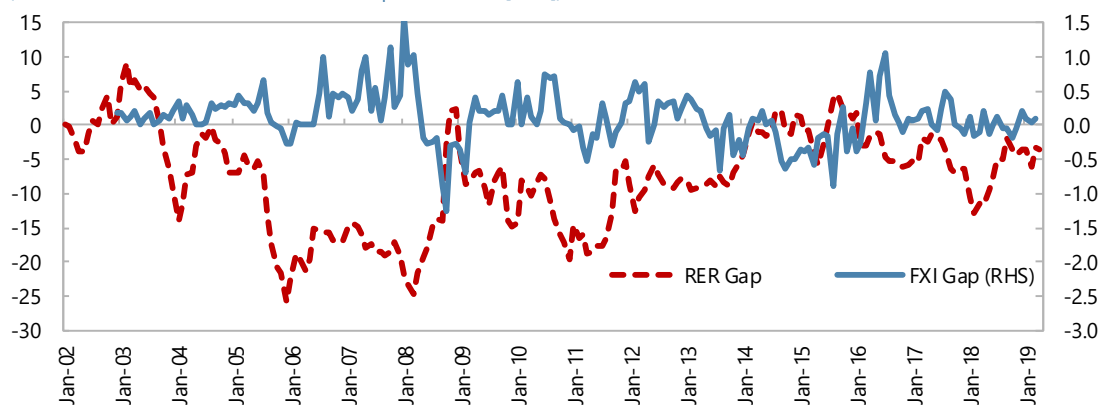

Peru and Chile: Real Exchange Rate and Policy Rate Gaps
(Difference of RER indexes, percent [RHS])

Peru and Chile: Real Exchange Rate and FXI Gaps
(Difference of RER indexes, months of imports of G&S [RHS])

Source: IMF staff estimates.

Table 2. Peru and Chile: Regression Analysis. Estimating the Effect of Policy Instruments on the Real Exchange Rate Gap

Dependent Variable is RER Gap

	(1)	(2)	(3)	(4)	(5)
TOT Gap	0.0862	0.0642	0.0502	0.0353	0.0374
	(0.0726)	(0.0768)	(0.0723)	(0.0692)	(0.0681)
Real Pol. Rate Gap		2.6304***	2.7407***	3.5684***	4.0637***
		(0.7165)	(0.6750)	(0.6609)	(0.6625)
FXI Gap			-6.0190***	-5.1560***	-5.4552***
			(1.2809)	(1.2430)	(1.2280)
RR Gap				0.1805***	0.0843
				(0.0513)	(0.0597)
Capital Flow Gap					1.3589***
					(0.4680)
R-square	0.0069	0.067	0.1605	0.2053	0.2378
Observations	195	187	187	187	187

Source: Author's calculations.
Notes: Robust Least Squares regressions for the period Dec. 2002-Mar. 2019.
But most regressions start in September 2003, when Peru's policy rate begins
to be a policy variable. Robust standard errors in parentheses.
*, **, ***, denote significance at 10, 5, and 1 percent, respectively.

F.   Other Linkages

18.   In addition to the findings discussed above, it is also useful to document other linkages. We focus below on exploring the behavior of the credit growth gap and its linkages with other domestic gaps and instruments. This may not only help shed light on the functioning of Peru's policy framework, but also expand our understanding of macrofinancial links.

Credit Growth Gap

19.   Credit developments are highly correlated with growth developments but less so with inflation developments. As illustrated in the upper panel of Figure 4, the behavior of the real credit growth gap is highly correlated (correlation of 0.55) with the behavior of the GDP growth gap, with trends being quite synchronized. On the other hand, the real credit growth gap shows a weak and negative correlation with the inflation gap (correlation of -0.26), suggesting that the inflation gap has unlikely been related with credit-fueled economic overheating.

20.   The link of the credit growth gap with policy instruments is relatively weak. In particular, the links appear to be quite period-specific and it is difficult to identify more general patterns (Figure 5). For instance, Peru increased RRs in the years before the global financial crisis (GFC) when the credit gap was highly positive, and subsequently reduced RRs when credit decelerated. However, other periods of RR tightening do not appear correlated with developments of the real credit gap (but, as identified before, they appear highly correlated with changes in the capital flows gap). The large and positive credit gap before the GFC also took place in a period with negative policy rate gap, which may suggest that easier monetary conditions in Peru contributed to that gap. Subsequently, both the interest rate and credit gaps have narrowed, but it is difficult to identify strong similarities in the patterns of those two series. The same can be said about the link of the FXI gap with the credit gap. The pre-GFC period shows an increase in the credit gap accompanied by FX purchases, but the subsequent period shows a gradually narrowing credit gap while the FX gap oscillated at high frequency.

G. Conclusions

21.   Peru's multi-instrument inflation targeting framework appears to have caused deviations vis-à-vis a more orthodox framework primarily along two dimensions: policy rate setting and real exchange rate outcomes. Peru and Chile's policy frameworks performed similarly in terms of output growth and inflation and their volatility, the latter being only slightly lower in Peru for both series. On the other hand, Peru's (real and nominal) monetary policy rate as well as its (real and nominal) exchange rates were significantly less volatile and this result appears to have been influenced by the effect of policy instruments on those variables. For the case of the real policy rate, the most relevant instrument appears to have been the RRs (although largely dependent on developments in capital flows). For the case of the real exchange rate, the most relevant instruments appear to have been the real policy rate and FXI, although the RRs may also have played a role (again dependent on developments of capital flows).

22.   Nonetheless, the deviations from orthodoxy were modest and transitory. For the case of the (real) policy rate, part of the deviations can be explained by fundamental factors (i.e., different inflation developments) and part could be attributed to the use of reserve requirements, which may have partially offset the need to adjust interest rates during periods of high capital flows. This latter

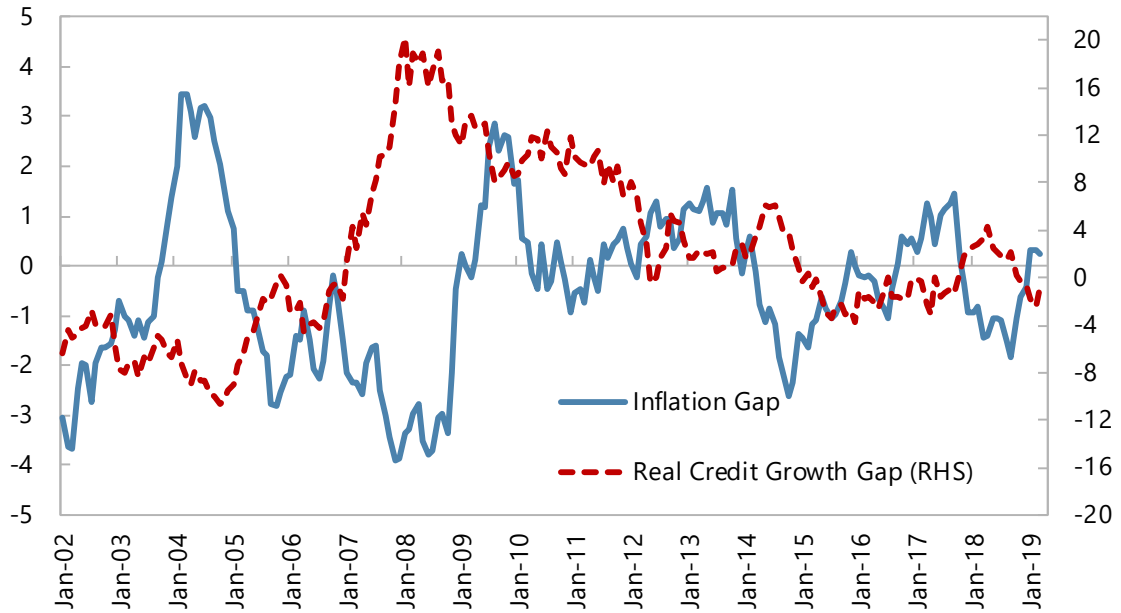# Figure 4. Peru and Chile: Linkages of the Real Credit Gap

Peru and Chile: Real GDP Growth and Credit Growth Gaps
(In percent points)

Real GDP Growth Gap

- - - Real Credit Growth Gap (RHS)
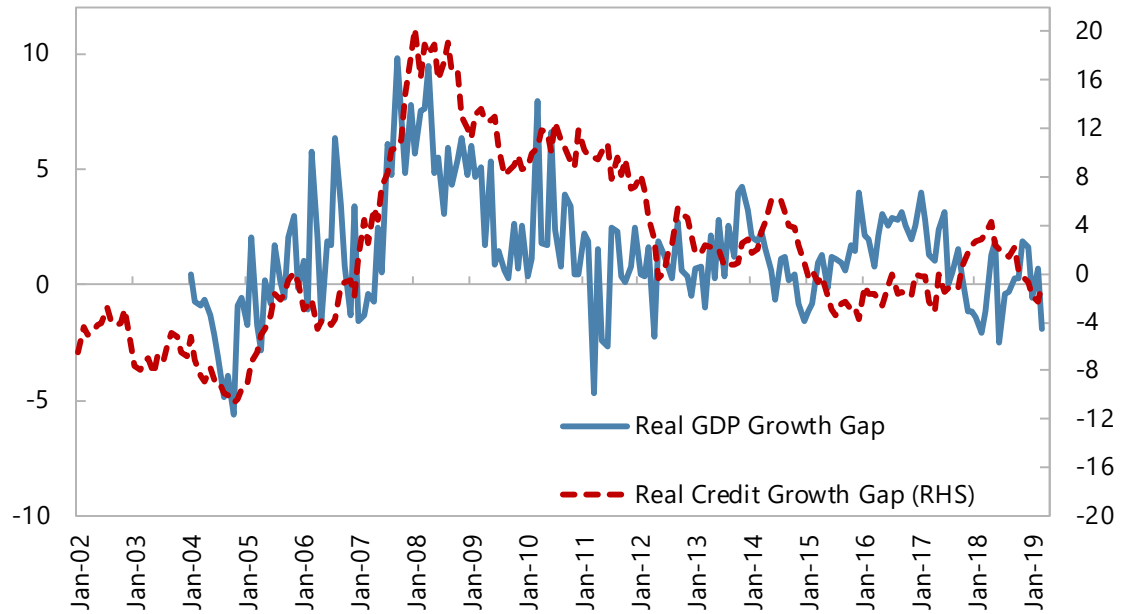
Peru and Chile: Inflation Gap and Real Credit Growth Gap
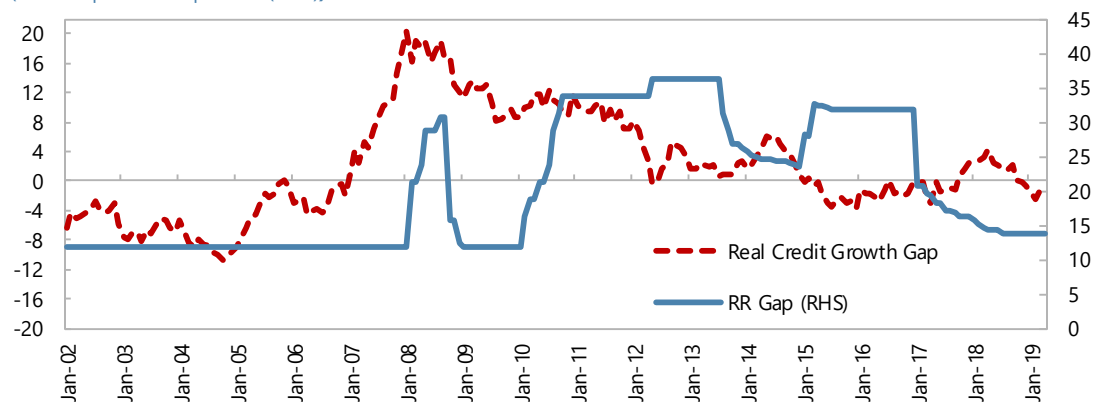(In percent points)

Inflation Gap

- - - Real Credit Growth Gap (RHS)

Source: IMF staff estimates.

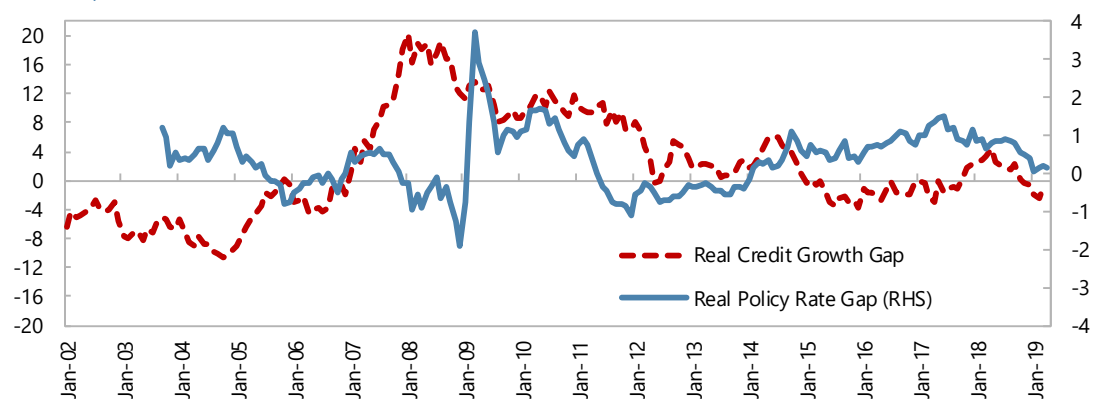**Figure 5. Peru and Chile: Linkages of the Real Credit Gap and Policy Instruments**

Peru and Chile: Real Credit Growth and RR Gaps
(Percent points and percent (RHS))

Peru and Chile: Real Credit Growth and Real Policy Rate Gaps
(Percent points)

Peru and Chile: Real Credit Growth and FXI Gaps
(Percent points and months of imports of G&S [RHS])
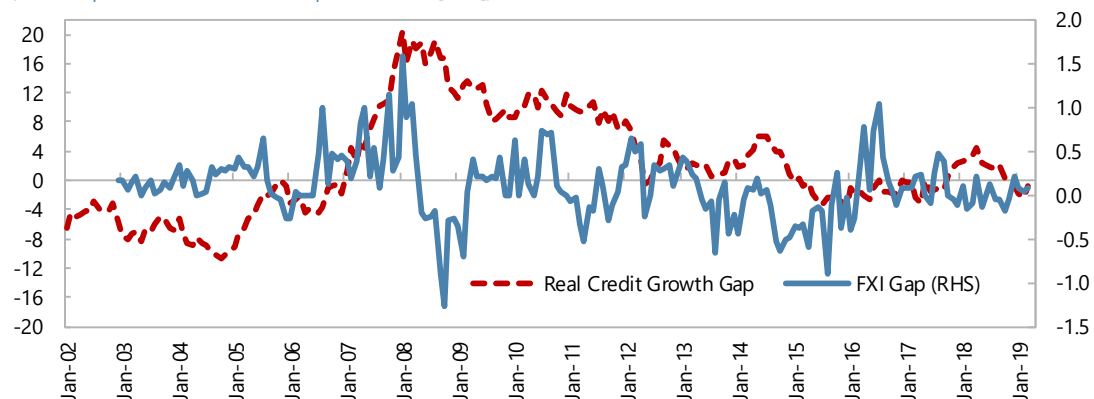
Source: IMF staff estimates.

effect is, however, moderate with a 10 percentage points increase in reserve requirements leading to the real interest rate being 0.2 percentage points lower than its orthodox benchmark. For the case of the real exchange rate, the role of the policy variables appears to be stronger, with all the three policy variables playing a role in explaining deviations of the real exchange rate from its benchmark. However, also in this case the deviations were transitory and of moderate magnitude. For instance, the average monthly FX sale episode was around 0.25 months of imports, which translates into an appreciation of the real exchange rate in the order of 1.3 percent.

23.   It is less clear how credit developments influenced the management of the multi-instrument framework. Real credit gaps appear to have been highly correlated with real GDP gaps, but only weakly correlated with inflation gaps. Also, the real credit gap is only weakly correlated with the use of different policy instruments.

24.   Further work appears warranted to better understand the impact of policy instruments on economic outcomes. One important area for further research is related with better understanding the endogeneity linkages among outcomes and instruments (Appendix II provides some initial work in this regard). In addition, it would be useful to expand the analysis to include other countries as well as to explore the impact of some of the gaps on economic vulnerabilities and welfare. Furthermore, the analysis of the links between the gaps and policy instruments may usefully be complemented with country-specific studies, which would allow us to relax the assumption of identical coefficients made in our empirical regression analysis.

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Fernandez, A., M. Klein, A. Rebucci, M. Schindler, and M. Uribe (2016) "Capital Control Measures: A New Dataset", *IMF Economic Review*, Vol. 64 (3), pp. 548-574

Larrain C. and D. Saravia (2018), "Interventions in Chile", in M. Chamon, D. Hofman, N. Magud, and A. Werner (Eds) *Foreign Exchange Intervention in Inflation Targeters in Latin America*, Washington D.C., International Monetary Fund, pp. 115-135.

Annex I. Data Sources and Definitions

Variables	Source	Transformations
Nominal exchange rate index	Bilateral exchange rates with respect to the U.S. dollar come from Haver	Indexes are calculated by IMF staff.
Real exchange rate	IMF INS database	
Inflation, Inflation expectations	Haver	
Real GDP growth	Haver	
Real Credit growth	Nominal figures come from Haver (for Chile) and Central Bank of Peru (for Peru)	Nominal figures are transformed into real figures by subtracting contemporaneous headline inflation
Monetary policy rate	Haver	The real policy rate is calculated by subtracting 12-month inflation expectations from the nominal policy rate.
Reserve Requirements	Peru and Chile central banks	For Peru, the data corresponds to the marginal reserve requirements. For both countries, the figure used in the chart and in the calculations corresponds to the simple average of the reserve requirements for domestic and foreign currency.
FX Intervention	For Chile, data come from Larrain and Saravia (2018). For Peru, data come the Central Bank of Peru	Divided by (12-month rolling) imports of goods and services.
Terms of trade	Haver	
Capital flows	Haver (for Chile) and Central Bank of Peru (for Peru)	Both series reflect the BOP financial account. Data are monthly for Chile. For Peru, quarterly data is transformed into monthly by taking the period average. For the charts and the calculations, three months rolling averages are used. In some charts data are divided by (12-month rolling) imports of goods and services.

All variables are measured monthly. The sample period is January 2003-March 2019. Gaps are calculated by taking differences between the Peru variable and the corresponding Chile variable. For the real exchange rate gap and the terms of trade gap, natural logs are taken to the REER and TOT indexes before taking the difference. For the capital flows gap, the difference is taken directly to the figures in USD billions (this variable works better in the instrumental variables than the series divided by imports of goods and services, but the behavior of the two series is quite similar).

Annex II. Addressing Endogeneity through VAR Analysis

1.   **One way to address endogeneity problems is to treat all variables as endogenous and estimate the model through a VAR**. We explore this approach below but restrict our analysis to assessing to what extent the results obtained in the main text are also present in the VAR analysis. A more comprehensive VAR analysis, including the analysis of impulse response functions, is left for future work.

2.   **Table A.1 presents the results of the VAR estimation**. While the interpretation of the coefficients in the VAR is different from those in the equations presented above, there are several interesting results to highlight:

- First, the equation for the real policy rate (first column) shows that the inflation gap is a significant explanatory variable and has the same sign as in the regressions presented in Table 1. The RR gap also has the same sign, but the significance in this equation falls slightly short of the standard significance levels.

- Second, the equation for the real exchange rate gap (fifth column) shows that the FXI gap is highly significant and has the same sign as in Table 2. The real policy rate also exhibits similar results as those in Table 2, but the significance level is borderline. Interestingly, the terms of trade gap, which was not significant in Table 2, is significant in this estimation.

Table A1. Peru and Chile: VAR Estimation Dependent
(Variables indicated at the top of the column)

	IRATEGAPR	FXIGAP	RRGAP	INFGAP	REERGAP	GDPGGAP	CREDGGAP	CAPFLWGAP
IRATEGAPR(-1)	0.8071	0.0252	-0.0770	0.0279	**0.4680**	-0.2436	0.0508	-0.1885
	-0.0425	-0.0392	-0.2290	-0.0648	-0.2909	-0.2534	-0.1768	-0.1050
	[18.9788]	[0.64328]	[-0.33610]	[0.43040]	[1.60895]	[-0.96134]	[0.28755]	[-1.79469]
FXIGAP(-1)	-0.0982	0.5718	1.7498	-0.0804	**-1.7758**	0.5563	0.3903	0.3085
	-0.0715	-0.0659	-0.3850	-0.1090	-0.4891	-0.4261	-0.2974	-0.1766
	[-1.37301]	[8.67847]	[4.54466]	[-0.73781]	[-3.63046]	[1.30576]	[1.31262]	[1.74685]
RRGAP(-1)	**-0.0050**	-0.0034	0.9884	-0.0032	0.0124	-0.0075	0.0017	0.0305
	-0.0034	-0.0031	-0.0182	-0.0052	-0.0231	-0.0201	-0.0140	-0.0083
	[-1.48227]	[-1.09408]	[54.3697]	[-0.62432]	[0.53716]	[-0.37344]	[0.12240]	[3.65425]
INFGAP(-1)	**0.0454**	0.0059	-0.0243	0.9373	0.0469	-0.2573	-0.0491	-0.0282
	-0.0190	-0.0175	-0.1024	-0.0290	-0.1300	-0.1133	-0.0791	-0.0470
	[2.39025]	[0.33837]	[-0.23766]	[32.3371]	[0.36047]	[-2.27152]	[-0.62163]	[-0.60082]
REERGAP(-1)	0.0103	-0.0023	0.0208	0.0082	0.8706	0.0215	-0.0148	0.0253
	-0.0049	-0.0045	-0.0261	-0.0074	-0.0332	-0.0289	-0.0202	-0.0120
	[2.12204]	[-0.51527]	[0.79617]	[1.10515]	[26.2172]	[0.74393]	[-0.73514]	[2.11139]
GDPGGAP(-1)	0.0146	0.0032	-0.1201	-0.0089	0.0776	0.3763	0.1430	-0.0466
	-0.0120	-0.0110	-0.0643	-0.0182	-0.0817	-0.0712	-0.0497	-0.0295
	[1.22509]	[0.29195]	[-1.86647]	[-0.48851]	[0.94997]	[5.28572]	[2.87686]	[-1.57861]
CREDGGAP(-1)	0.0051	-0.0012	0.0727	0.0094	-0.0632	0.1125	0.9367	0.0221
	-0.0052	-0.0048	-0.0279	-0.0079	-0.0355	-0.0309	-0.0216	-0.0128
	[0.98624]	[-0.25960]	[2.60284]	[1.19185]	[-1.78111]	[3.63986]	[43.4409]	[1.72219]
CAPFLWGAP(-1)	-0.0358	-0.0163	0.0050	0.0632	0.1858	0.0421	-0.0966	0.5196
	-0.0260	-0.0240	-0.1401	-0.0397	-0.1780	-0.1550	-0.1082	-0.0643
	[-1.37421]	[-0.68133]	[0.03552]	[1.59224]	[1.04418]	[0.27144]	[-0.89273]	[8.08604]
C	0.2795	0.1023	0.2103	0.0471	-1.3417	0.8080	-0.1596	-0.0547
	-0.0930	-0.0857	-0.5006	-0.1418	-0.6359	-0.5539	-0.3866	-0.2296
	[3.00666]	[1.19450]	[0.42007]	[0.33224]	[-2.10990]	[1.45871]	[-0.41283]	[-0.23841]
TOTGAP	-0.0061	0.0008	-0.0374	0.0024	**0.0652**	-0.0126	0.0017	-0.0048
	-0.0044	-0.0041	-0.0238	-0.0068	-0.0303	-0.0264	-0.0184	-0.0109
	[-1.37469]	[0.19608]	[-1.56861]	[0.35015]	[2.15258]	[-0.47701]	[0.09214]	[-0.43742]
R-square	0.8252	0.3937	0.9664	0.9048	0.8929	0.4538	0.9615	0.5736
Observations	182	182	182	182	182	182	182	182

Source: Author's calculations.
Notes: Standard errors in parentheses, t-statistics in brackets.
Estimations are for the period Dec. 2002-Mar. 2019. But most regressions start in September 2003, when Peru's policy rate becomes available.