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Macro-Structural Policies and Income Inequality in Low-Income Developing Countries

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EXECUTIVE SUMMARY

Despite strong growth over the past two decades, income inequality remains high in many low-income developing countries (LIDCs). As shown by earlier work, including by the IMF, high levels of inequality can impair both the future pace and the sustainability of growth and macroeconomic stability, thereby also limiting countries' ability to reach the Sustainable Development Goals.

This note explores how policies and reforms aimed at boosting growth affect the extent of income inequality in LIDCs and how complementary policy measures can be used to offset adverse distributional effects of such reforms. It examines: (i) the distributional consequences of selective economic reforms and macro-structural policies that are generally considered to be growth-enhancing; (ii) the channels and mechanisms through which inequality is likely to be affected, given structural characteristics common to most LIDCs; and (iii) the scope for complementary policies to ensure that a reform package can boost growth without widening inequality. The study complements recent work on the inequality-growth trade-offs (including Ostry, Berg, and Tsangarides, 2014; and Organization for Economic Cooperation and Development (OECD), 2015), and by using a more granular model-based analysis to identify the mechanisms through which specific reforms affect growth and inequality.

The note identifies macro-distributional challenges that can be expected to confront LIDCs, given structural characteristics common to these economies. Specifically, the note examines how features such as high levels of informality, limited geographic or inter-sectoral labor mobility, large inter-sectoral productivity differences, lack of access to finance, and low levels of infrastructure can make growth-inequality trade-offs particularly challenging for these economies. The main focus is on identifying the key channels through which growth-oriented reforms can influence income distribution, rather than identifying the universe of reforms that could have adverse distributional effects. For illustrative purposes, the note zooms in on a set of macro-structural reforms that have been regarded as growth-promoting in LIDCs (see IMF, 2015a)—specifically, selected fiscal reforms (tax policy measures, higher public infrastructure investment); financial sector reforms; and reforms to the agricultural sector.

The findings confirm that these macro-structural policies can have important distributional consequences in LIDCs, with the impact dependent both on the design of reforms and on country-specific economic characteristics. Results from cross-country statistical analysis and detailed country-case studies suggest that: (i) the distributional impact of tax policies depends not only on the specific tax instruments chosen (with indirect taxes usually seen as being regressive and direct income taxation usually seen as progressive), but also on how the additional budgetary resources are deployed; (ii) better and more infrastructure investment can both boost growth and lower inequality levels; (iii) financial sector reforms can exacerbate inequality if financial access is limited to a small share of the population and labor mobility is constrained; and (iv) reforms that

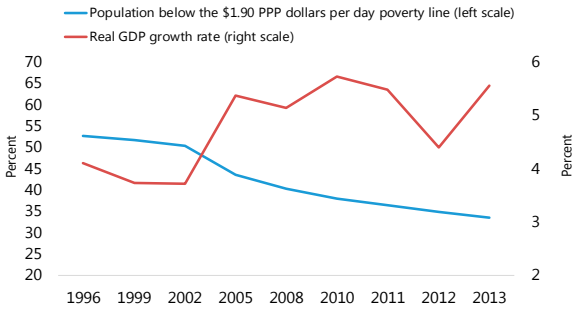
boost agricultural output can worsen income inequality in situations where the agricultural sector is large and productivity gains benefit mostly the rural better-off.

Accompanying measures can make reforms supportive of growth while limiting adverse distributional effects. Some reforms may boost growth and welfare for all with distributional consequences that may not be undesirable from an economic and/or social point of view. Other reforms can bring economic gains only to a few with distributional consequences that may be considered unwelcome by societies. While there is no one-size-fits-all recipe, the note explores how targeted policy interventions, implemented in conjunction with pro-growth reforms, can be deployed to contain any adverse distributional effects of the reform measures—recognizing that societal views on what constitutes an undesirable distributional outcome will differ from country to country. The analysis focuses on the macroeconomic mechanisms through which such interventions can contain or offset any adverse distributional impact of pro-growth reforms; the note does not examine how these interventions can best be implemented in the presence of weak domestic administrative capacity or political economy constraints. Some policy interventions cited, such as conditional cash transfers, can be challenging to administer in countries with weak capacity, while measures to enhance labor mobility, such as strengthening land ownership rights, can take time and be politically very difficult to implement.

INTRODUCTION

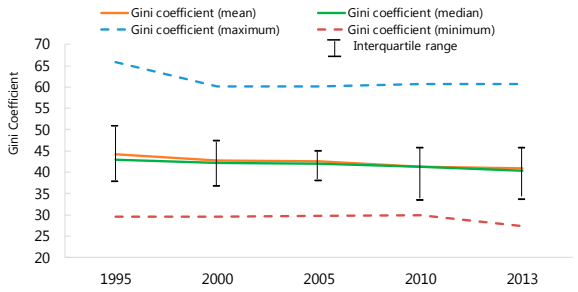
1. Income inequality in low-income developing countries (LIDCs) has remained stubbornly high over the past two decades despite sustained growth and declines in poverty levels (Figures 1–2).[2] The experience of LIDCs mirrors that of many emerging markets (EMs), with inequality levels for both groups remaining much higher than in advanced economies (AEs) (Figure 3).[3]

Figure 1. Real GDP Growth and Headcount Poverty in Low-Income Developing Countries, 1996-2013



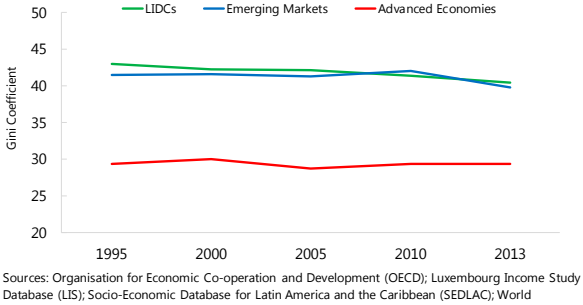
Sources: World Economic Outlook (WEO); PovcalNet; IMF staff calculations.
Note: PPP = purchasing power parity.

Figure 2. Income Inequality across Low-Income Developing Countries, 1995-2013



Sources: Socio-Economic Database for Latin America and the Caribbean (SEDLAC); World Development Indicators (WDI); IMF staff calculations.
Note: Calculation is based on 40 low-income developing countries.

Figure 3. Income Inequality by Country Group, 1995-2013
(Median)



Sources: Organisation for Economic Co-operation and Development (OECD); Luxembourg Income Study Database (LIS); Socio-Economic Database for Latin America and the Caribbean (SEDLAC); World Development Indicators (WDI); Eurostat; IMF staff calculations.
Note: Calculation is based on 31 advanced economies, 48 emerging markets and 40 low-income developing countries.

2. This pattern of robust growth accompanied by little decline in inequality in LIDCs is a concern. On average, economies with lower income inequality experience longer spells of sustained growth (Ostry, Berg, and Zettelmeyer, 2012), as well as higher growth rates (Dabla-Norris and others, 2015). Widening inequality can also weaken support for growth-enhancing reforms and may spur governments to adopt populist policies, threatening economic and political stability (Rodrik, 1999). Furthermore, this pattern would limit countries' ability to eradicate extreme poverty by 2030 (World Bank, 2016) and, more generally, to reach the Sustainable Development Goals.

3. This note examines the distributional effects of a specific set of policies and reforms aimed at raising growth in LIDCs and identifies options that governments may consider to mitigate growth-inequality trade-offs. It analyzes the channels and mechanisms through which inequality is likely to be affected by reforms given the specific economic characteristics of LIDCs and

[2] Throughout this note, income inequality is measured by the Gini coefficient for disposable income.

[3] Since the global financial crisis, growth seems to have become less inclusive in LIDCs than in the first years of the millennium—evidence for a small group of LIDCs for which data are available suggests that growth was considerably higher for the bottom three deciles of the income distribution compared to the rest of the income distribution over the period 2000–07 than in 2008–13.

examines accompanying policy measures that can make the reforms palatable from both growth and distributional perspectives.[4] It uses a two-pronged approach—empirical analysis to identify broad trends in inequality after the implementation of specific macro-structural reforms, and case studies, based on a dynamic general equilibrium framework that incorporates features common to LIDCs, to examine the mechanisms through which income distribution is affected. The two approaches are complementary. The empirical analysis has the advantage of "letting the data speak" but sheds light only on the observed historical association between major reforms and levels of inequality; it cannot be used to assess the distributional impact of specific reform packages. The case studies provide valuable insights into how reforms can affect inequality and how adverse effects might be mitigated—but the results are dependent on both the modeling methodology employed and the parameter values that are selected.

4. The note complements recent work on income inequality and growth-inequality trade-offs, including by Ostry, Berg, and Tsangarides (2014), the OECD (2015), and Ostry, Berg and Kothari (2016). It provides a more granular model-based analysis of the mechanisms through which reforms can result in growth-equality trade-offs and explores mitigating policy measures to address such trade-offs. The focus is, however, narrower: the analysis looks only at LIDCs and at a set of growth-promoting macro-structural reforms that are generally regarded as policy priorities for these countries given their stage of development (IMF, 2015a). These reforms include structural fiscal policies, such as measures to boost domestic resource mobilization and public infrastructure investment; financial sector reforms; and reforms to the agricultural sector. The choice of these policy areas does not imply that important reforms in individual countries should be exclusively focused on or limited to those areas.[5] The emphasis here is more on uncovering the different channels through which such reforms can affect growth and income distribution in LIDCs and the reasons why growth-inequality trade-offs can materialize.

5. The rest of the note is structured as follows. The second section discusses the mechanisms through which these policies and reforms may affect inequality in LIDCs and how country-specific features relevant for this group—such as large differentials in productivity across sectors of economic activity, limited labor mobility across sectors, higher levels of informality, limited and inefficient infrastructure, and limited access to financial services—can influence these mechanisms. It then analyzes the distributional consequences of major reform events in LIDCs over the past three decades. The third section discusses the results from a set of individual country-case studies. Finally, the note discusses the main policy takeaways of relevance for ensuring that pro-growth policies and reforms can also be inclusive in LIDCs.

[4] Societal views on whether a shift in the distribution of income is unwelcome will vary from country to country.

[5] For example, other reforms, such as capital account and trade liberalization, are also found to be associated with important growth-inequality trade-offs (IMF, 2015a; Ostry, Prati, and Spilimbergo, 2009; and Ostry, Berg and Kothari, 2016).

MACRO-STRUCTURAL POLICIES AND INEQUALITY: EMPIRICAL EVIDENCE

The distributional impact of pro-growth policies and reforms is complex, depending on both the reform design and on country-specific economic characteristics as well. Empirical evidence from the past three decades suggests that specific structural fiscal policies and reforms to finance and agriculture have typically been associated with distributional changes, with the impact linked to specific economic characteristics, such as the level of informality or the efficiency of public infrastructure investment.

6. This section discusses the mechanisms through which macro-structural policies and reforms may affect inequality in LIDCs and presents new empirical evidence on the distributional consequences of major reform events over the past three decades. The analysis assesses the distributional consequences of major reforms in LIDCs using the approach in Furceri and Loungani (2016). Major reform events are identified as large changes in policy indicators—such as the indicators of the degree of agricultural and financial regulation in Ostry, Prati, and Spilimbergo (2009)—or as "unexpected" changes in public investment spending (IMF, 2014b; Furceri and Li, forthcoming).[6] Reforms in taxation are identified as changes in direct and indirect tax rates. Two econometric specifications are used. The first establishes whether these major reform events or shocks are followed by significant changes to levels of income inequality. The second is used to analyze whether these effects vary with the characteristics of the economy, such as the levels of informality or financial inclusion (see Appendix 1).[7]

7. Structural reforms can have an impact on income distribution through a number of channels, some of which are particularly relevant for LIDCs.[8]

[6] Examining the behavior of inequality before and after reforms requires exact information about the date on which the reforms were implemented, which is generally difficult to obtain as it would require information on dates of policy decrees or legislative changes. To infer the timing of major policy changes, we identify major reform events by assuming that a major reform event takes place when, for a given country at a given time, the annual change in the policy indicators (see Ostry, Prati, and Spilimbergo, 2009) exceeds by two standard deviations the average annual change over all observations. The results are also robust to other thresholds such as one or three standard deviations. Public investment shocks are identified as the forecast error of public investment spending relative to GDP. This procedure overcomes the problem of fiscal foresight because it aligns the economic agents' and the econometrician's information sets and it is less prone to reverse-causality issues compared to other approaches used in the literature (see IMF, 2014b, for a discussion).

[7] These results should be treated as associations rather than as causal effects, given standard limitations on identifying reforms that are truly exogenous in nature or concerns relating to omitted-variables in empirical analyses (for example, reforms and inequality may both be driven by other factors such as past output growth). However, robustness checks that include all the reforms simultaneously in the regression or include lagged economic growth as an explanatory variable do not substantially affect the results. The baseline specification also includes past changes in inequality to control for other factors that may influence inequality.

[8] Distinguishing between the different measures and definitions of inequality is also important to shed light on the channels through which structural reforms influence income distribution (OECD, 2015). That said, the focus here is on income inequality as measured by the widely used Gini coefficient. While many reforms—such as infrastructure investment and reforms to the agricultural and financial sector—are likely to have similar effects on gross and net income inequality, fiscal policy measures—such as direct and indirect taxes—affect directly the distribution of income and, therefore, tend to have larger effects on net income inequality.

- Reforms that tend to increase inter-sectoral productivity differentials can increase inequality, in particular in countries where the productivity gap across sectors is large and labor mobility is constrained. This is because poor individuals usually work in low productivity sectors and cannot move easily and work in higher-productivity sectors and take advantage of higher wages, exacerbating inequality across sectors.

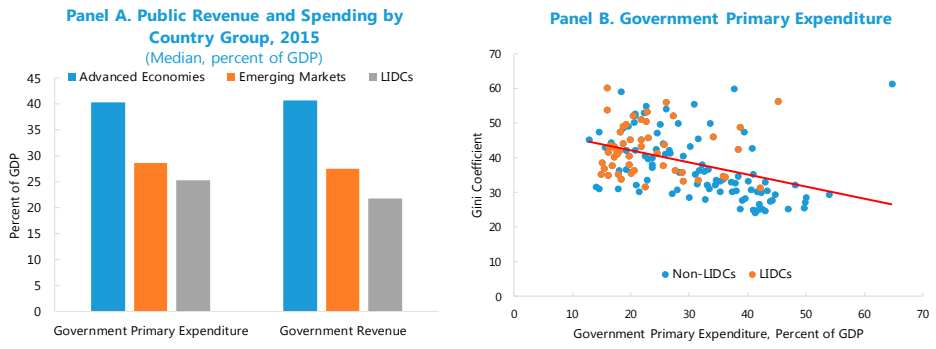
- Reforms that increase the relative prices of tradable to non-tradable goods can also have significant distributional effects. Since low-income individuals work mostly in the non-tradable sectors in LIDCs, reforms that reduce (or increase) the prices of non-tradable goods relative to tradable goods would affect the profits and wages of low-income workers leading to an increase in inequality.

- Reforms that reduce the costs of borrowing can increase inequality if financial access is limited, as is the case in many LIDCs. This is because only high-income individuals and high-productivity sectors can access credit and invest in these countries. Limited labor mobility exacerbates this effect by reducing the ability of workers to take advantage of the opportunities created in higher-productivity sectors.

A. Fiscal-Structural Reforms

8. Boosting budgetary revenues is a policy priority in most LIDCs, to enable governments to provide essential public services. LIDCs still have fiscal revenues at about 20 percent of GDP, much lower than in AEs and EMs (Figure 4, Panel A), limiting their ability to finance public spending, which is a primary tool for governments to affect income distribution (Clements and others, 2015; Ostry, Berg, and Tsangarides, 2014; Figure 4, Panel B). Strengthening domestic resource mobilization is a key objective for developing countries in the Addis Ababa Action Agenda (AAAA) and further emphasized by the Group of Twenty (G20) action plan on the 2030 agenda for sustainable development. Against this backdrop, two prominent measures for resource mobilization are considered below to examine how they have typically affected income distribution in LIDCs.

Figure 4. Public Revenue and Spending



Sources: World Economic Outlook (WEO); Organisation for Economic Co-operation and Development (OECD); Luxembourg Income Study Database (LIS); Socio-Economic Database for Latin America and the Caribbean (SEDLAC); World Development Indicators (WDI); Eurostat; IMF staff calculations.

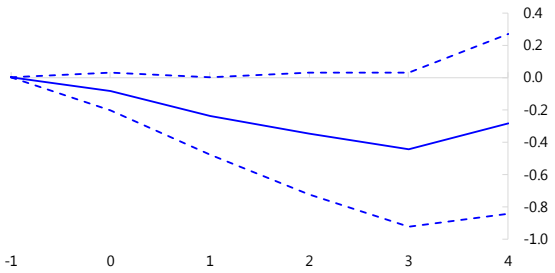
Policies for Domestic Resource Mobilization

Direct taxes

9. Increases in direct taxes have the potential to be progressive, but they can also introduce economic inefficiencies. Direct taxes can target the income of specific individuals and organizations and apply higher rates to those with higher incomes, thus helping redistribute income and reduce inequality. However, high marginal tax rates on income can hamper efficiency by reducing the incentives to entrepreneurship and to human and physical capital accumulation (Clements and others, 2015).

10. Empirical evidence suggests that major direct tax reforms in LIDCs have been associated, on average, with a decrease in inequality (Figure 5).[9] This is consistent with the role played by redistribution policies in lowering inequality (Clements and others, 2015; Ostry, Berg, and Tsangarides, 2014). The effect, however, is not precisely estimated, suggesting that there has been wide variation in the inequality response to direct tax increases, as shown later in the case studies.

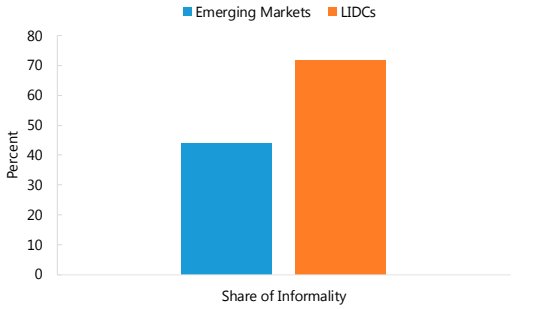
Figure 5. Impact of Personal Income Tax Reforms on Inequality
(Percent change in Gini coefficient for disposable income)



Source: IMF staff calculations.
Note: *t*=0 is the year of the shock; solid blue lines denote the impulse responses to one-standard-deviation shock to the change of personal income tax rate, and dashed lines denote 90 percent confidence bands. See Appendix 1 for details on reforms.

11. The impact on inequality can also be affected by the presence of a large informal sector. The larger is the informal sector—as is the case in many LIDCs (Figure 6)—the smaller is the tax base, which means that tax rates have to be higher in order to attain revenue targets. Higher rates result in greater efficiency losses, through the impact on work and investment incentives. In addition, the structures that sustain a large informal sector may lead to tax avoidance in the form of a shift to the informal sector, motivating the use of indirect taxes in these economies.[10]

Figure 6. Size of Informal Sector by Country Group
(Median, percent)



Sources: International Labour Organization (ILO); IMF staff calculations.
Note: Share of informality is measured by the ILO's estimate of informal employment as a share of total non-agricultural employment. The calculation is based on latest available data.

[9] Inequality is measured by the Gini coefficients on disposable income (market income after tax and transfers). Tax reforms are identified as periods corresponding to changes in the statutory rate of the tax under consideration (U.S. Agency for International Development Collective Taxes Database).

[10] Empirically, informality does not seem to have played a (statistically significant) role in affecting the effect of direct tax reforms on inequality.

Indirect taxes

12. Domestic resource mobilization in LIDCs often relies on consumption taxes, which are generally regressive. Assessing the distributional impact of an increase in taxes such as the value-added tax (VAT) requires understanding the distributional impact of the public spending that a higher rate could enable (as illustrated in the case studies). That said, to disentangle the forces at play, this section focuses on the impact of taxation in the absence of additional spending. Since the poor spend a larger share of income on consumption goods compared with better-off households, an increase in the VAT rate tends to widen consumption inequality (Stiglitz and Emran, 2007; Lustig, Pessino, and Scott, 2014). Moreover, by increasing the prices of taxed goods, a VAT hike would tend to reduce overall consumption and aggregate demand. This contraction in demand, in turn, would reduce the prices of non-tradable goods while the prices of tradable goods would remain broadly stable (the latter [before tax] are mostly determined by international markets). The decline in the relative prices of non-tradable goods translates into lower revenues for producers and reduced employment in the non-tradable sector, which typically employs low-skilled workers who have lower incomes, and thus increases income inequality across sectors.

13. The implications of a large informal sector for the distributional impact of higher consumption taxes depend on different offsetting forces. On the one hand, as for the case of direct taxation, a larger informal sector implies a lower tax base and, therefore, a need for higher tax rates to reach revenue targets. This accentuates the regressivity of an indirect tax reform. On the other hand, while higher VAT rates would reduce overall demand and everybody's income, the demand for informal goods would contract less than for formal (taxed) goods, shielding the income of the producers of informal goods. This would reduce income inequality.[11] However, this shift in demand towards non-tradable goods tends to cause a redistribution of productive resources from formal (relatively high productivity) to informal (relatively low productivity) activities, thus depressing economic growth.[12,13] The overall impact of higher VAT or consumption tax rates, therefore, depends on the interaction of these various opposite effects and on the initial level of inequality, the sizes of the formal and informal sectors, and the sizes of the tradable and non-tradable sectors.[14]

[11] "Formal goods" refers to goods that are formally taxed, in contrast to "informal goods," on which taxes are evaded. The effect of a VAT hike on consumption inequality depends also on whether the poor spend a larger share of informal goods than better-off households. In countries where this is the case—for example, the Dominican Republic (Jenkins, Jenkins, and Kuo, 2006)—an increase in the VAT rate may actually reduce consumption inequality.

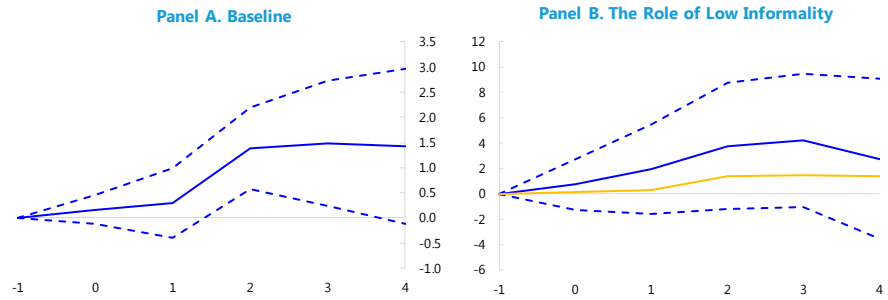
[12] Keen (2008) formulates a model in which the VAT hike reduces aggregate output in the presence of informality.

[13] It should be noted that the relevant factor at play is the marginal rather than the average productivity (see the appendix in Kwon, Narita, and Narita, 2015). Because of tax avoidance, marginal productivity in the informal sector is lower than in the formal sector; therefore, a shift of resources to the informal sector would reduce aggregate output.

[14] Keen (2009) provides a discussion on the regressivity of the VAT in developing countries, where he argues that the presence of informality and small traders play a role in reducing it.

14. Empirical evidence suggests that, on average, VAT rate increases adopted in LIDCs over the past two decades have been associated with higher inequality.[15] A one-standard deviation increase in the VAT rate is associated with an increase in the Gini coefficient of about 0.2 percent one year after the tax increase. Five years after the tax increase, the increase is about 1.5 percent (Figure 7, Panel A).[16] This effect tends to be greater in countries with a small share of informal sector (Figure 7, Panel B).[17] This would suggest that informality could have a role in reducing the regressivity of the VAT; however, the presence of high informality can create important inequality-growth trade-offs, as discussed in the following section.

Figure 7. Impact of VAT Reforms on Inequality
(Percent change in Gini coefficient for disposable income)



Source: IMF staff calculations.
Note: t=0 is the year of the reform. Solid blue lines denote the impulse responses to a one-standard-deviation shock to the change in the value-added tax (VAT) rate, and dashed lines denote 90 percent confidence bands. Solid yellow lines denote the unconditional (baseline) response presented in Panel A. Informality is measured using the informal sector employment as a share of total non-agricultural employment. See Appendix 1 for details on reforms.

Public spending in infrastructure investment

15. Deficient physical infrastructure is widely viewed as a major constraint on growth in LIDCs (IMF, 2014a). The quantity, quality, and accessibility of economic infrastructure in LIDCs lag considerably behind those in AEs and EMs, and this is seen as a binding constraint on growth (IMF, 2017).[18]

16. Infrastructure investment can have distributional consequences. On the one hand, increased public investment tends to reduce inequality within sectors by boosting productivity (IMF, 2014b, 2015a). It can also affect within-sector inequality by impacting demand for employment, the effect of which is larger for unskilled and low-income workers, who are more sensitive to demand fluctuations. On the other hand, it can affect inequality between sectors if the infrastructure investment has differential effects across sectors. For example, if gains are mostly captured by high-

[15] While the results should capture only the effects of VAT hikes on "income" inequality through lower demand and non-tradable good prices, they are likely to capture also the effect on consumption inequality, as for many LIDCs, inequality is typically measured using expenditure surveys (see Solt 2016 for a discussion).

[16] Tax reforms are identified as periods corresponding to changes in the statutory rate of the tax under consideration (U.S. Agency for International Development Collective Taxes Database).

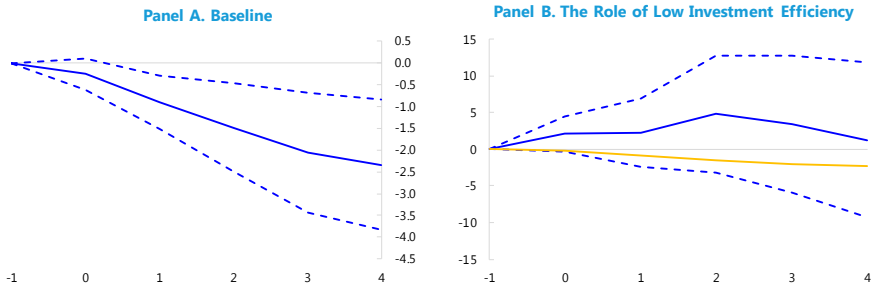
[17] Informality is measured by the share of informal employment in total non-agriculture employment (International Labour Organization).

[18] Economic infrastructure includes electricity, transportation, water and sanitation, and telecommunications facilities.

productivity sectors, divergence in sectoral productivity increases, negatively affecting inequality across sectors. This occurs, in particular, when labor mobility is limited and workers cannot take advantage of higher wages in higher-productivity sectors, as is the case for many LIDCs. Policies to facilitate labor mobility can help reduce this growth-inequality trade-off in the medium-long term, as illustrated in the next section. Moreover, the benefits of higher public investment in infrastructure crucially depend on its efficiency (IMF, 2014b, 2015b).

17. On average, public investment expansions were associated with lower inequality in LIDCs over the last three decades.[19] In particular, an exogenous increase in public investment of 1 percent of GDP results in a reduction of the Gini coefficient of about 0.3 percent one year after the increase and about 2.3 percent five years after the increase (Figure 8, Panel A). The effect is also economically significant, given the high persistence over time in the Gini coefficient.[20] The results (not reported here) suggest that the increases in demand and employment are key factors in explaining the reduction in inequality. In addition, evidence suggests that investment efficiency matters: public investment shock do not lead to a reduction in inequality in countries with low public investment efficiency (Figure 8, Panel B).[21]

Figure 8. Impact of Public Investment on Inequality
(Percent change in Gini coefficient for disposable income)



Source: IMF staff calculations.
Note: *t*=0 is the year of the reform. Solid blue lines denote the response to reforms, and dashed lines denote 90 percent confidence bands. Solid yellow lines denote the unconditional (baseline) response presented in Panel A. The measure of investment efficiency is from the World Economic Forum's *Global Competitiveness Report* and was also used in the April 2014 *Fiscal Monitor* and in the October 2014 *World Economic Outlook*. See Appendix 1 for details on reforms. The analysis using the Gini coefficient for market income provided similar results.

[19] Public investment shocks are identified, following the approach proposed by Abdul, Furceri and Topalova (2016), as the forecast errors in public investment—that is the difference between the actual public investment and the public investment expected by analysts as of October (WEO forecasts) of the same year—that is orthogonal to forecast errors in output.

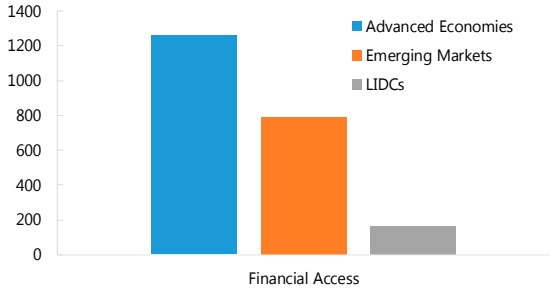
[20] In particular, the magnitude of the medium-term effect is approximately equivalent to one standard deviation of the average change in the Gini coefficient (2.4 percent) in the sample.

[21] Public investment efficiency is proxied by a survey-based measure of the wastefulness of government spending, from the World Economic Forum's (WEF's) *Global Competitiveness Report*. Similar results are obtained when using alternative proxies based on "government efficiency" or "overall quality of infrastructure," both also from the WEF's *Global Competitiveness Report*. None of these measures is perfect; the wastefulness and efficiency measures do not specifically refer to infrastructure spending, while the infrastructure measure reflects overall provision of infrastructure, which could be poor due to low efficiency but also because of inadequate spending.

B. Financial Sector Reforms

18. Financial sector reforms have the potential to lower the cost of capital and boost growth, although they can increase inequality. Where financial access is limited, as in the case of many LIDCs (Figure 9), financial reforms that reduce the costs of capital, but do not increase access to financial services for a broader part of the population, benefit mostly the better-off households and firms, who can take advantage of cheaper credit and invest, leading to greater inequality.

Figure 9. Financial Access by Country Group
(Median)

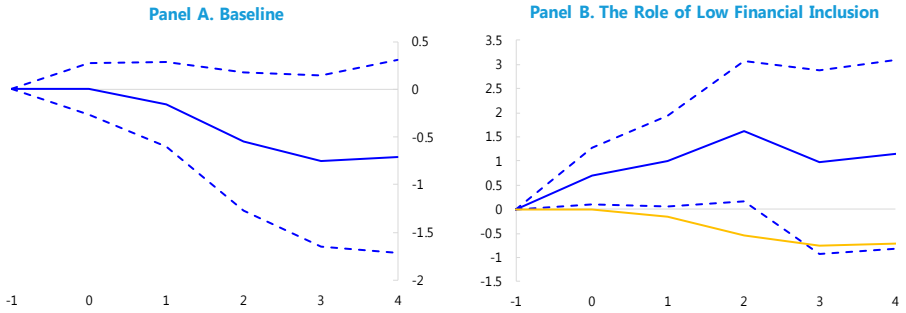


Sources: Global Financial Development Database (GFDD); IMF staff calculations.
Note: Financial access is measured by bank accounts per 1,000 people.
The calculation is based on 2014 or latest available data.

19. Reforms that increase access to financial services may lower inequality while boosting growth. Greater financial access can help people build buffers for smoothing out income fluctuations, reducing both income and consumption inequality. In addition, higher savings result in higher resources that can be channeled to private investment with a positive effect on growth.

20. On average, financial sector reforms implemented in LIDCs over the past three decades have not had a statistically significant effect on inequality (Figure 10, Panel A).[22] Looking beyond the average effect, financial reforms appear to be associated with rising inequality in LIDCs with limited financial inclusion (Figure 10, Panel B).

Figure 10. Impact of Domestic Financial Reforms on Inequality
(Percent change in Gini coefficient for disposable income)



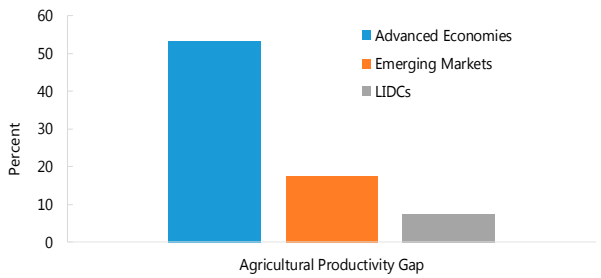
Source: IMF staff calculations.
Note: *t*=0 is the year of the reform. Solid blue lines denote the impulse responses to a one-standard-deviation shock to the change in the domestic financial reform indicator, and dashed lines denote 90 percent confidence bands. Solid yellow lines denote the unconditional (baseline) response presented in Panel A. Financial inclusion is measured by the share of adults (age 15 and above) in the population who hold accounts at a formal financial institution. See Appendix 1 for details on reforms. The analysis using the Gini coefficient for market income provided similar results.

[22] The following areas of reform are identified: (i) interest rate controls, such as floors or ceilings; (ii) credit controls, such as directed credit, and subsidized lending; (iii) restrictions on bank competition, such as limits on branches and barriers to entering the banking sector, including licensing requirements or limits on foreign banks; (iv) the degree of state ownership; and (v) the quality of banking supervision and regulation, including power of independence of bank supervisors, adoption of a Basel I capital adequacy ratio, and the framework for bank inspections.

C. Agricultural Sector Reforms

21. Reforms to boost agricultural productivity have the potential to induce structural transformation and higher growth in many LIDCs, although they can also have distributional consequences. Reforms to agriculture can facilitate structural transformation and boost growth (Gollin, 2010), especially given their large productivity gap between agriculture and other sectors (Adamopoulos and Restuccia, 2014; Figure 11). But agriculture reforms can also have different distributional consequences. For example, increasing agricultural productivity through agricultural services or research and development (R&D) to develop and disseminate improved seed varieties would benefit agricultural workers, reducing sectoral inequality. In contrast, eliminating inefficient subsidies or price controls may improve agricultural productivity and output, but it can increase poverty and inequality if the agricultural sector employs a large number of poor and low-productivity farmers. This is because the reform would benefit mostly high-productivity farmers, who are usually better integrated into the market and able to switch crops as relative prices change. Agriculture reforms could also exacerbate inequality if labor mobility is limited: if workers cannot move to sectors with higher incomes, wages do not equalize across sectors and inequality would widen.[23] Finally, the effect of agriculture reforms on inequality and growth depends importantly on complementary policies, as illustrated in the next section. For example, reforms to infrastructure through investment in electrification and irrigation can boost agricultural productivity with beneficial effects on both growth and inequality. These measures, however, can take time to bear fruit; if administrative capacity and fiscal considerations are not a constraint, governments could consider cash transfers to the rural poor as an option to help mitigate the negative distributional impact of reform during the transition.

Figure 11. Agricultural Productivity Gap by Country Group
(Median, percent)



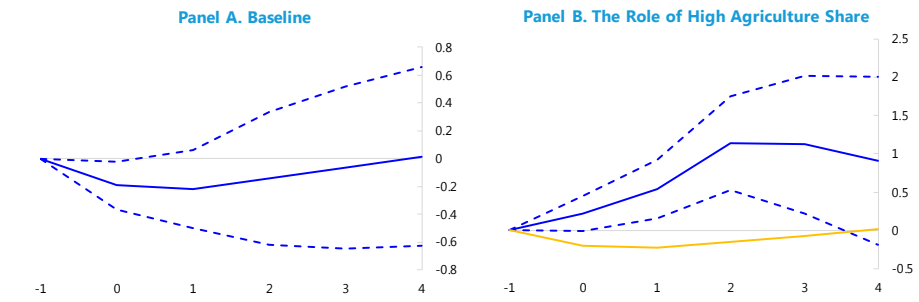
Sources: World Development Indicators (WDI); IMF staff calculations.
Note: Agricultural productivity gap is proxied by the ratio of labor productivity in the agricultural sector to that in the non-agricultural sector. The calculation is based on 2014 or latest available data.

22. Empirically, reforms aiming at reducing government interventions in the agricultural sector do not appear to be significantly correlated with inequality, but the relation differs

[23] Gollin, Lagakos, and Waugh (2014) provide evidence of misallocation of labor and limited labor mobility in LIDCs. A large sectoral productivity gap in LIDCs suggests that individuals face important constraints that prevent them from moving across sectors, such as poorly defined land property rights, difficulties in financing the acquisition of skills, and underdeveloped financial markets preventing agents from financing the costs associated with migration. Young (2013) shows that the large differences in income between rural and urban areas can account for a large fraction of inequality within countries and also across countries. Young also presents evidence that the differential in incomes is due to self-selection based on skills. Skills are costly to acquire and such costs may limit people from obtaining skills in a world with financial frictions.

widely across countries (Figure 12, Panel A).[24] In particular, agriculture reforms tend to increase inequality in countries with a relatively large share of employment in agriculture (Figure 12, Panel B). This suggests that reforms—such as the removal of subsidies—are significantly associated with a reduction in the income of workers, who are unable to move to higher productivity sectors, increasing inequality across sectors.

Figure 12. Impact of Agriculture Reforms on Inequality
(Percent change in Gini coefficient for disposable income)



Source: IMF staff calculations.
Note: t=0 is the year of the reform. Solid blue lines denote the impulse responses to a one-standard-deviation shock to the change in the agriculture reform indicator, and dashed lines denote 90 percent confidence bands. Solid yellow lines denote the unconditional (baseline) response presented in Panel A. Agricultural share is measured by the employment in agriculture (as share of total employment). See Appendix 1 for details on reforms. The analysis using the Gini coefficient for market income provided similar results.

MACRO-STRUCTURAL POLICIES AND INEQUALITY: LESSONS FROM CASE STUDIES

Country case studies provide granular insights on the economic and distributional impact of reform packages. They also deepen the understanding of how and to what extent policy measures can mitigate the potentially negative distributional impact of such reforms. The seven case studies discussed here tend to reinforce the message that structural policies and reforms can have significant distributional effects. They also offer options that can make reforms palatable from both a growth and a distributional perspective.

23. This section examines the macroeconomic and distributional effects of reform packages. Making use of a dynamic general equilibrium framework, this section presents the medium-term effect of structural policies and reforms that countries have recently adopted (or could adopt) to support growth, and of measures that can mitigate the possible negative distributional effects of such reforms. The reforms considered center on measures to mobilize

[24] Agricultural sector reforms are identified as periods corresponding to large increases in the Ostry, Prati, and Spilimbergo (2009) agriculture liberalization indicator. The index measures reductions in public intervention in the agricultural sector, including removal of export marketing boards, and reductions in the incidence of administered prices. Overall, 19 reforms are identified in LIDCs over the period 1980–2013. As shown in the next section, other agriculture reforms not considered in the empirical analysis—such as infrastructure investment in rural areas and R&D to develop and disseminate improved seed varieties—can benefit agricultural workers and reduce inter- and intra-sectoral inequality.

domestic resources (Honduras, Guatemala, Uganda, and Republic of Congo);[25] financial sector reforms (Ethiopia and Myanmar); and reforms to agriculture (Malawi) (Table 1). Selected economic and social indicators for these countries are reported in Table 2.

Table 1. Macro-Structural Policies Considered in the Simulation Analysis [1]

Country	Reform Objective(s)	Main Reform Measure(s)	Other Measures	Overall Reform Package
Honduras	Address macroeconomic imbalances and restore sustainable growth	(i) Increase VAT rate from 15 to 18 percent; and (ii) recurrent public spending cuts (6 percent of GDP)	Expand the conditional cash transfer program "Vida Mejor" by 0.5 percent of GDP	Higher VAT rate plus expansion of cash transfer program
Guatemala	Increase domestic revenues to finance higher investment/social spending	Increase revenue-to GDP ratio by 1 percent of GDP by: (i) changing the PIT structure (from a flat tax to a two-rate tax: the rate increases to 10 percent for the highest income bracket and remains at 5 percent for all other income levels); or (ii) increasing VAT rate from 13 to 16 percent	Channel higher revenue to (i) investment spending or (ii) the cash transfer program	Scenario 1: PIT reform plus higher investment spending; scenario 2: PIT reform plus expansion of cash transfer program
Uganda	Increase domestic revenues to finance higher investment in infrastructure and human capital	Increase revenue-to GDP ratio by 1 percent of GDP by: (i) increasing PIT rates (currently 10-40 percent depending on the income level) and CIT rate (currently 30 percent); or (ii) increasing VAT effective rate (estimated at 8 percent; current statutory rate 18 percent) through tax administration measures	Increase infrastructure investment spending by 1 percent of GDP	Increase VAT effective rate and increase investment spending
Republic of Congo	Domestic resource mobilization (2 percent of GDP) to finance higher and more efficient investment spending	Increase revenue-to-GDP ratio by 2 percent of GDP per year by: (i) increasing fuel prices; (ii) increasing VAT rate by 5 percentage points	Increase investment spending by 2 percent of GDP and increase its efficiency	Increase energy prices plus increase investment spending and its efficiency
Ethiopia	Financial sector reforms to stimulate the private sector's contribution to growth	(i) Increase deposit rates (currently estimated at about 150 percent below market rate); and (ii) reduce share of credit to the public sector in total credit from two-thirds to half	(i) Increase access to deposits for 25 percent of the rural population; (ii) increase sectoral labor mobility (2 percent of the rural population employed in agriculture moves to work in urban and higher-productivity sectors); (iii) expansion of the cash transfer program by 1 percent of GDP	Higher deposit rates; reduction of the share of credit channeled to public sector; expansion of cash transfers; increase in financial access and labor mobility
Myanmar	Enhance financial deepening and increase infrastructure to stimulate private sector activities	(i) Increase deposit rates from (currently fixed) 8 percent to 9 percent; and (ii) reduce share of credit to the public sector in total credit by a third	Increase investment spending in infrastructure by 1 percent of GDP in rural areas	Higher deposit rates; reduction of share of credit channeled to public sector; higher investment in infrastructure
Malawi	Enhance productivity and diversification in agriculture	(i) Reduction of the subsidized rate of the maize fertilizer from 100 to 80 percent; and (ii) reduction of the procurement costs (by 25 percent)	(i) Introduction of cash transfers to rural poor (0.5 percent of GDP); and (ii) higher spending in agricultural R&D (0.5 percent of GDP)	Reduction of agricultural subsidies; increase in spending on agricultural R&D; introduction of cash transfers

Note: CIT = corporate income tax; PIT = personal income tax; R&D = research and development; VAT = value-added tax.
[1] Honduras implemented the reform in 2013; the reform packages for other countries are potential measures not necessarily considered by the authorities.

[25] Although Guatemala is not a low-income developing country in the IMF's definition, the analysis is of interest because of the similarities with/differences from the other country cases.

Table 2. Selected Economic and Social Indicators, 2015 or Latest Available

	Honduras	Guatemala	Uganda	Republic of Congo	Ethiopia	Myanmar	Malawi
Real GDP Growth (Percent)	3.6	4.1	4.8	2.3	10.2	7.3	2.9
Poverty Rate (Percent of Population) [1]	16.0	59.3 [2]	34.6	37.0	33.5	25.6 [2]	70.9
Gini Index	50.6	53.0	42.4	40.2	33.2	29.0	46.1
Public Debt (Percent of GDP)	46.0	24.2	34.4	70.6	56.1	34.3	82.0

Sources: World Economic Outlook (WEO); World Development Indicators (WDI); Socio-Economic Database for Latin America and the Caribbean (SEDLAC); PovcalNet; Asian Development Bank; IMF staff calculations.

[1] Poverty rate is measured by percent of population with an income of less than $1.90 per day (2011 PPP).

[2] Guatemala and Myanmar's poverty rates are measured by percent of population that lives below the national poverty line.

24. The dynamic general equilibrium framework applied in the case studies captures some of the key structural characteristics of LIDCs.[26] The framework is based on a small and open economy model with different economic sectors (agriculture, manufacturing, services, energy, commodities for exports) and their respective productivity levels.[27] It assumes different types of workers, rural and urban, and skilled and unskilled. The key parameters of the model are estimated using country-specific household level data.[28] The analytical framework also incorporates other features common in LIDCs. For example, it includes activities and goods that cannot be easily monitored and therefore taxed (informal sector). It also reproduces diverse types of credit constraints so that only certain groups of people or types of firms can access credit or savings. Furthermore, it assumes that only the government has access to external capital markets.

25. The framework captures both inequality across sectors and inequality within sectors. Inequality across sectors depends on the mobility of workers across sectors. Within-sector inequality is caused by the fact that, although households of a given type and location may be ex ante identical, their individual productivity is subject to shocks over time, affecting the income households can generate in any given period.[29] As a result, households end up with different incomes. Furthermore, government policies and financial sector features affect different groups of the economy differently, driving both macroeconomic performance and distributional outcomes.

[26] A detailed discussion of the main features of the framework is provided in Appendix 2.

[27] In small and open economies, the sectors that produce a tradable good are not exposed to fluctuations in prices coming from domestic demand but only to fluctuations in international markets.

[28] When micro-data are not available, parameters are calibrated to reproduce moments of the key economic variables.

[29] A key source of within-sector inequality in rural areas is land holdings. In LIDCs land is frequently not allocated through market forces and land ownership works only imperfectly. The analytical framework takes land allocations as given, and their distribution helps the model match observed inequality in rural areas.

A. Reforms for Enhancing Domestic Resource Mobilization

Honduras[30]

26. To address large macroeconomic imbalances, Honduras embarked on a reform strategy in 2013 centered on public resource mobilization. At the time, Honduras faced a difficult macroeconomic situation: growth had slowed significantly, the fiscal accounts had weakened, and the public debt-to-GDP ratio had increased by 15 percentage points over three years, reaching 45 percent of GDP in 2013. The reform package, the main elements of which are described in detail in Table 1, sought to boost tax revenues through an increase in the VAT rate and cut non-priority recurrent spending to contain the growth of public debt.[31] It also included an expansion of the conditional cash transfer program Vida Mejor, aimed at protecting the most vulnerable from the potential negative effects of the tax reform while improving their labor skills. Following the reform package, sovereign spreads declined by about 400 basis points from their 2013 peak of 770 basis points, reducing domestic borrowing rates. Also, growth increased by almost 1 percent over two years, reaching 3.6 percent in 2015 (IMF, 2016a) (Table 2).

27. Simulations suggest that the reform has been associated with an increase in output (Figure 13, Panel A).[32] The VAT hike is estimated to have had a direct negative impact on consumption and output, which in the case of Honduras tends to be larger because of the presence of a large informal sector (a lower tax base requires higher tax rates to reach a particular revenue target).[33] The negative impact, however, was more than compensated for by the significant reduction in sovereign spreads following the fiscal consolidation. Lower borrowing costs stimulated investment and led to an overall positive output effect.[34]

28. Simulations also suggest that the tax reform was overall progressive (Figure 13, Panel A). While the direct impact of the VAT hike on income inequality was neutral, once the concomitant impact of reduced sovereign spreads is incorporated, the reform impact was progressive. The direct impact of the VAT reform was neutral, because the negative impact of lower

[30] The analysis draws on IMF (2016a).

[31] The reform package also included measures in other areas such as fiscal, monetary, and exchange rate policy frameworks; public financial management; tax administration; the financial system; the electricity and telecommunications sectors; social security and pensions; and private-public partnerships.

[32] The analysis reproduces the main macroeconomic and microeconomic features of the economy. Features that are of particular relevance for the analysis include: (i) the presence of a large informal sector (estimated at 53 percent of GDP) producing mostly non-tradable goods; (ii) price controls on selected food items; and (iii) limited financial access.

[33] The reduction in demand for formal goods is estimated to be almost twice as much as the fall in the demand for informal goods, thus inducing a redistribution of resources from formal (high productivity) to informal (low productivity) activities and further depressing economic growth.

[34] The reduction in sovereign spreads was exogenously incorporated in the simulations assuming that it translated into a one-to-one reduction in borrowing costs. This is a simplifying assumption, as borrowing costs' response could actually be smaller and more gradual.

overall demand was offset by a shift in demand from tradable to non-tradable/informal (non-taxed) goods, including food, for which the prices are controlled, thus shielding the income and consumption of poor urban and rural low-income workers. Lower sovereign spreads boosted investment with the gains mostly going to high-income individuals (who have access to credit), which would exacerbate inequality. But this is more than offset by second-round effects. Higher investment resulted in a larger demand for labor in the manufacturing sector, increasing labor opportunities for the urban poor (which is a relatively large part of the urban sector in Honduras), in turn decreasing urban poverty and inequality.

29. The expansion of the cash transfer program is estimated to have boosted consumption and reduced income inequality. Cash transfers can create trade-offs between reducing poverty/inequality and economic efficiency, as they transfer income from higher-income individuals, who save a higher share, to lower-income individuals, who mostly consume and save a lower share. However, for the case of Honduras, it is estimated that such a trade-off is minimized in the medium term, as the cash transfer program is conditional on households' enrolling their children in school, thus increasing their skills and labor productivity.

Guatemala[35]

30. Increasing budget revenues to finance pro-growth and pro-poor spending is a key priority for Guatemala. With tax revenues at about 10 percent of GDP in 2015, the authorities are considering options for resource mobilization. Alternative combinations of tax and spending policies analyzed in this note are summarized in Table 1.[36]

31. Simulations suggest that changes to the PIT rate would have smaller negative effects than VAT hikes.[37] Increasing direct taxation would reduce incentives for the better-off to save and invest, with a modest negative impact on economic activity. At the same time, increasing direct taxation reduces inequality, though only marginally, reflecting the limited tax progression across income levels (Figure 13, Panel B). In contrast, VAT hikes are likely to have significant negative effects. Also, the conventional wisdom that a VAT is less distortionary in economic terms than the PIT may not apply in this case due to the presence of a large informal sector and weak controls. In fact, not only final products, but also intermediate products, could evade taxation, in part because many goods do not have multiple production stages and the issuance of VAT invoices is not enforced. At the same time, many of the goods produced by the formal and informal sectors are

[35] This case study draws on IMF (2016b).

[36] The analysis considers changes in PIT vis-à-vis changes to the VAT that would be needed in order to increase revenue collection by 1 percent of GDP. In particular, it is estimated that the PIT rate needs to increase from 7 to 10 percent for the highest income bracket (the PIT is currently a two-rate tax) and the VAT rate by 4 percentage points (from the current rate of 12 percent). Also, the reform package envisages using the additional resources for investment or spending in social protection.

[37] The analysis reproduces the main macroeconomic and microeconomic features of the economy. Features that are of particular relevance for the analysis include: (i) the presence of a large informal sector producing mostly non-tradable goods; (ii) a small share of skilled labor; and (iii) a large share of the population below the poverty line.

close substitutes. So the VAT reform would reduce the demand for formal goods with the corresponding decline in their prices and, thereby, reduce the marginal returns of formal sector firms, distorting consumption allocations and investment decisions. In contrast to Honduras, a VAT reform in Guatemala would not lead to a substantial reduction in spreads, since fiscal policy has been traditionally prudent and sovereign spreads are among the lowest in the region (the sovereign spread was 230 basis points as of October 2016). Also, unlike in Honduras, the impact of lower private demand on food prices, which are not fixed by the government, would induce a sharp reduction in the incomes of agriculture workers, increasing poverty.

32. Using the additional revenues raised by the PIT for higher infrastructure spending would more than mitigate the negative impact of the PIT reform on output and offset the progressivity of the reform; an expansion of cash transfers, in contrast, would improve inequality, but at some economic costs. Higher investment spending would boost output, because of Guatemala's high infrastructure gap and the relatively high rate of return of public capital. At the same time, if productivity increases proportionally across sectors, higher investment spending would slightly increase inequality, offsetting the progressivity of the PIT reform. Larger cash transfers, in contrast, would help reduce inequality but also lead to a reduction in savings and investment, with a negative impact on economic activity.[38]

Uganda[39]

33. The government is considering a mix of tax policy measures and administrative reforms to achieve a targeted increase in revenue to finance additional spending on physical and human capital (IMF, 2015c).[40] The tax revenue-to-GDP ratio, currently at 13 percent of GDP, is one of the lowest in the region. With the objective of boosting revenues, the analysis here considers the potential economic and distributional impacts of an increase in the rates of the VAT, the PIT, and the corporate income tax (CIT) (see Table 1).[41]

34. Model simulations show that increasing the VAT rate would be slightly progressive and would raise revenue with a smaller negative impact on economic activity than PIT and CIT

[38] The effect is estimated to be larger in Guatemala than in Honduras, as the augmentation of the cash transfers in Guatemala would be twice as large as that in Honduras.

[39] This case study builds on IMF (2015c).

[40] Tax policy changes under consideration include: increase in excise taxes; expansion of the coverage of the value-added tax; and introduction of various environmental levies. Proposed administrative reforms include strengthening monitoring and enforcement through improving data quality and integrity for the taxpayer registration database and taxpayers' accounts. These tax reforms envisage an increase in effective tax rates.

[41] The analysis reproduces the following features of the economy: (i) the presence of a large informal sector (85 percent in the agricultural sector and 30 percent in the rest of the economy), as estimated by the Uganda Bureau of Statistics; (ii) low tax efficiency, even in the formal sector, estimated based on a low tax-to-GDP ratio—11 percent in fiscal year 2012/13; (iii) the level of inequality—40 percent in the Gini index nationwide, 34 percent in the rural area, and 41 percent in the urban area—and the poverty rate at 19.7 percent (based on the 2012/13 Uganda National Panel Survey).

hikes. This is because of the relatively high statutory PIT and CIT rates in Uganda as compared to other LIDCs (Figure 13, Panel C).[42] Also, the presence of a large informal sector (larger than in Honduras and Guatemala) would shield the income of producers of informal goods, making the tax slightly progressive.

35. Government expenditure plays an important role in mitigating the negative impact of domestic resource mobilization. Channeling all the additional revenue to infrastructure investment would enhance productivity, albeit totally offsetting the progressive effect of the VAT hike.[43] Instead, the VAT reform could reduce inequality, while still boosting growth (though to a lesser extent), if a part of spending were reallocated from additional infrastructure investment to targeted cash transfers.[44]

Republic of Congo

36. To maintain macroeconomic stability and support their development plans, the authorities are considering measures to boost non-oil revenues. Following the drop in oil prices that began in 2014, GDP growth more than halved to 2.3 percent in 2015 and the fiscal deficit almost doubled, reaching 18.5 percent of GDP. The authorities are contemplating various options to strengthen the country's fiscal position, including through increased tax revenues or higher domestic energy prices, which are fixed by the government.[45] The reform package considered here envisages that the additional resources would be channeled to increase infrastructure investment spending; it is also assumed that measures are taken to increase the efficiency of public investment (see Table 1).

37. Simulation results suggest that, in contrast to an increase in the VAT rate, increasing energy prices would be slightly progressive with no significant impact on economic growth. Higher energy prices would reduce the demand for energy and overall demand, with a negative impact on GDP growth. At the same time, a reallocation of resources from energy-intensive sectors to less energy-intensive activities would increase economic efficiency, broadly offsetting the negative impact of the reform on GDP growth. Since mostly higher-income households and firms consume energy, increasing energy prices would be progressive, lowering inequality (Figure 13,

[42] It is estimated that the PIT rates should increase by 34 percentage points and the CIT rates by 12 percentage points to attain an increase in the revenue-to-GDP ratio of 1 percent of GDP, reflecting the high informality level, while the VAT rate hike needs to be 2 percentage points.

[43] Productivity elasticity is assumed to be 0.2, which is in the same range used by Berg and others (2013) with respect to an increase in public investment.

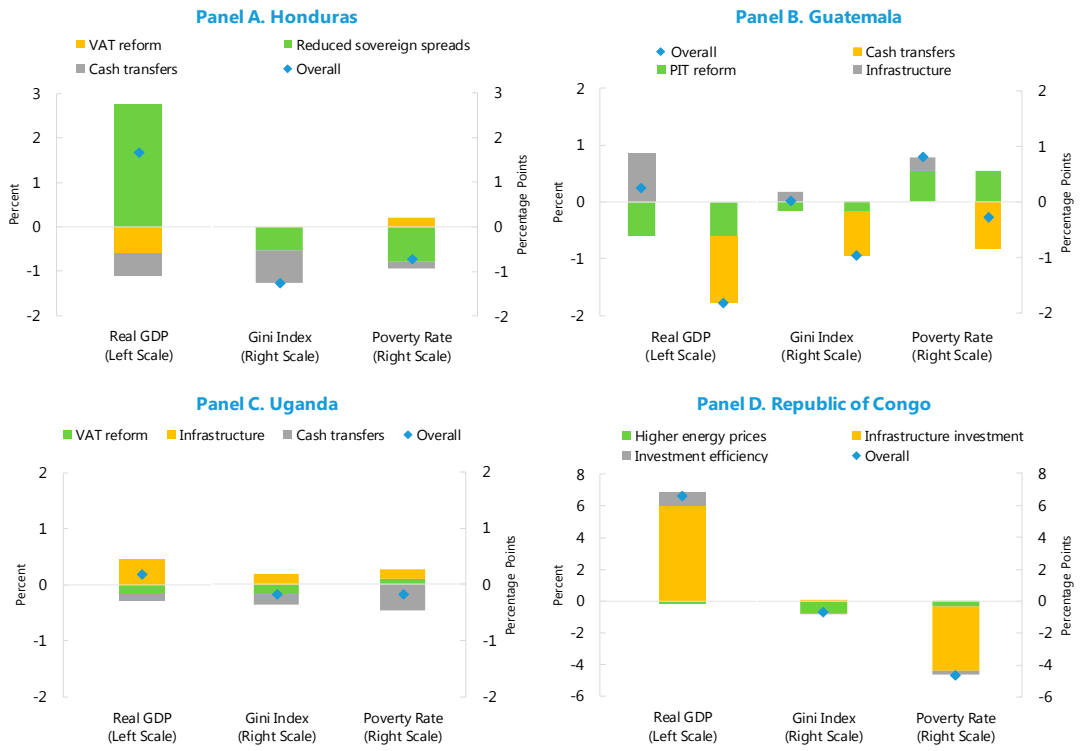
[44] Cash transfers are usually superior to indirect methods such as price subsidies in providing benefits. Better targeting of transfers reduces their fiscal cost and the tax levels required to finance them, thus achieving distributional objectives. However, they can be challenging to administer (IMF, 2014c). See Monchuk (2014) for a review of social safety nets, including cash transfers, in African countries.

[45] Following the drop in international oil prices, the implicit subsidies to domestic fuel prices have been eliminated and the administrative prices for fuel products are currently generating resources, which are channeled to the national oil company (SNPC), which administers the domestic fuel prices. In order to ensure that part of those resources are made available to the government, dividends from the SNPC have to be transferred to the budget.

Panel D). Poverty would fall because the agricultural export sector, a low energy-intensive sector, would expand, increasing the demand for agricultural inputs, thus pushing up agricultural-goods prices and the incomes of rural workers. In contrast, increasing the VAT rate would reduce private consumption and demand and increase inequality.

38. Additional investment spending on infrastructure and improving its efficiency would boost growth and reduce poverty, with no significant impact on inequality. Spending the additional resources on investment in infrastructure and increasing its efficiency by 20 percent could increase GDP by almost 7 percent, while the impact of the reform package on inequality would be broadly neutral if productivity increases proportionally across sectors.

Figure 13. Economic and Distributional Impact of Reforms for Domestic Resource Mobilization
(Cumulative change over 5 years)



Sources: World Economic Outlook (WEO); Socio-Economic Database for Latin America and the Caribbean (SEDLAC); World Development Indicators (WDI); IMF staff calculations.
Note: VAT = value-added tax.

B. Financial Sector Reforms

Ethiopia[46]

39. The financial sector in Ethiopia is relatively underdeveloped, with policies oriented towards funding public enterprises. The government-owned Commercial Bank of Ethiopia

[46] This case study builds on IMF (2015d).

accounts for approximately 60 percent of financial system assets, while about two-thirds of total bank credit is channeled to finance government-owned enterprises. Interest rates on deposits are negative in real terms.[47] Against this backdrop, the reform considered here is expected to increase deposit rates and reduce the share of funds that banks have to channel to the public sector to 50 percent (details of the reform are reported in Table 1).

40. Simulation results suggest that the reform can boost private sector activity and economic growth.[48] Higher deposit rates would increase private saving, expanding available lending resources. Private sector credit would therefore increase,[49] pushing down lending rates and increasing investment—which would more than triple—contributing to economic growth. This would also boost tax revenues, allowing the government to reduce borrowing and contain the cost of public debt financing (Figure 14, Panel A).

41. The reform, however, is likely to increase inequality. Given limited financial access, the reform would benefit mostly the manufacturing and modern services sectors, increasing profitability and wages. Since rural-urban mobility is limited, agricultural workers have little opportunity to shift to higher-productivity activities and sectors, so wages would not equalize, increasing inequality across sectors. Also, inequality would increase because firms that export agricultural goods would switch to (more profitable) manufacturing goods, lowering the demand for agricultural inputs (more than offsetting higher domestic demand), thus reducing the income of small farmers.

42. Complementing the financial sector reform with measures to improve financial access and increase sectoral labor mobility would mitigate the negative distributional effect of the reform. Households with access to formal saving would have greater ability to smooth their consumption over time. Policy aimed at fostering labor mobility, such as strengthening land rights, improving infrastructure and housing, and providing accessible training and education to equip the labor force with the needed skills, would increase labor supply for the manufacturing and services sectors, inducing a narrowing of wage differentials and reducing inter-sectoral inequality. Furthermore, this mobility would make inexpensive labor available in these sectors, facilitating a structural transformation of the economy.

[47] The average rate for savings deposits is 5.38 percent, while inflation is at about 8 percent.

[48] A number of relevant features of the Ethiopian economy are captured by the dynamic general equilibrium model, including the following: (i) the agricultural sector is large, representing almost 50 percent of GDP, and agricultural products are exported mostly by large firms; (ii) manufacturing and modern service industries have access to bank credit; (iii) only urban households (a fourth of the total population) have access to bank deposits; and (iv) rural-urban immigration is very limited (De Braun, Mueller, and Lee, 2014).

[49] The assumption of the model is that any increase in saving generates larger credit in the economy (private sector credit would increase, while credit to the public sector would remain broadly the same in nominal terms). However, recent evidence for countries in the region suggests that banks often prefer to hold excess liquidity instead of expanding credit.

43. Cash transfers could help protect the most vulnerable.[50] While addressing labor mobility and financial inclusion takes time and may be difficult or even infeasible from a political economy point of view, redistribution policies such as enlarging the existing cash transfer program would help mitigate the negative distributional impact of the financial reform in the short term with only a marginal negative impact on growth.

Myanmar

44. With a view to fostering inclusive growth, Myanmar's reform strategy includes measures to enhance financial deepening, stimulate private sector activities, and increase investment in infrastructure. The financial sector in Myanmar is heavily dominated by public banks and highly regulated, with almost half of total credit channeled to the public sector. The reform package considered here includes measures to increase credit to the private sector and reduce the infrastructure gap (details are reported in Table 1).[51]

45. Increasing credit to the private sector would boost urban economic activity and growth and reduce poverty and inequality.[52] An increase in interest rates on deposits, together with a reduction in the share of credit channeled to the public sector, would boost private sector credit, lowering borrowing costs and stimulating private investment in the industrial sector and GDP.[53] Higher capital accumulation in the industrial sector would increase the demand for labor and wages, with a spillover effect on the wages in non-capital-intensive sectors, such as agricultural exports. Unlike in the case of Ethiopia, labor mobility from rural to urban areas appears to be less constrained in Myanmar, so higher urban wages would promote migration to urban areas, reducing inequality across sectors.[54] Furthermore, a larger urban and richer population would increase the demand and prices for agricultural goods and, in turn, the wages and income of rural workers, resulting in a further decrease in inequality levels (Figure 14, Panel B).

[50] The Ethiopian conditional cash transfer program Productive Safety Net is the second-largest program of its kind in Africa and has proved to be highly successful in reducing poverty.

[51] Measures that could help foster private sector credit in Myanmar include: (i) the introduction of a credit information system; (ii) the liberalization of interest rates on deposits in the longer term; (iii) the uniform application of regulations to private and public banks; and (iv) the introduction of unsecured lending. See Nehru (2015) for a discussion of these and other measures that could help develop the financial sector in Myanmar.

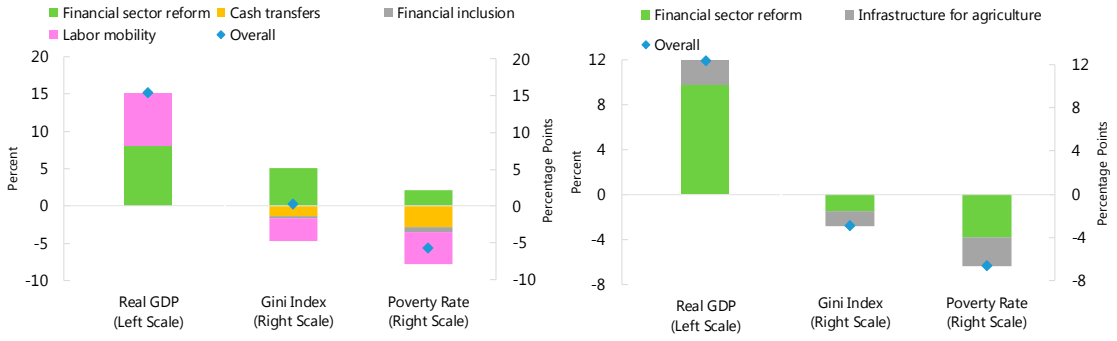
[52] The analysis reproduces the main macroeconomic and microeconomic features of the economy of Myanmar. Features that are of particular relevance for the analysis include: (i) an economy with a fixed nominal interest rate on savings (8 percent); (ii) a high level of inflation (9.5 percent); (iii) large participation of state banks in the process of financial intermediation; and (iv) low levels of credit to the rural sector.

[53] Credit to the public sector would decline in nominal terms; private sector credit would increase both in nominal terms and as a share of total credit because total credit is expected to expand.

[54] Artuç, Lederman, and Porto (2014) estimate that labor mobility costs in China (which broadly resembled Myanmar's economic and social features when it was at a similar development stage) are less than two-thirds of the costs in the sub-Saharan African region. Also, Sugiyarto (forthcoming) argues that, in the coming decades, Myanmar will become one of the fastest-urbanizing countries in the region.

46. Higher spending on infrastructure in rural areas could further strengthen the positive economic and distributional effects of the financial sector reform. Higher infrastructure investment spending to increase agricultural productivity, such as investment in rural roads, electrification, and irrigation, would boost growth while reducing inequality and rural poverty.

Figure 14. Economic and Distributional Impact of Financial Sector Reforms
(Cumulative change over 5 years)



Sources: World Economic Outlook (WEO); World Development Indicators (WDI); IMF staff calculations.

C. Agricultural Sector Reform

Malawi[55]

47. To enhance productivity and diversification in the agricultural sector, Malawi is considering a reform of its agricultural subsidies. In 2005, Malawi introduced subsidies on maize fertilizers to help support small farmers, reduce poverty, and address food security problems. However, because of its poor design and targeting, the program resulted in an overproduction of maize without addressing food security (Chibwana and others, 2010). The reform considered here centers on a reduction in the subsidy program, coupled with administrative reforms that would reduce procurement costs (Table 1 describes the reform measures in detail).

48. The reform is expected to generate some gains in efficiency and a slight rise in output, but would increase inequality.[56] The reform would reduce incentives to produce maize and create a more efficient allocation of resources through a shift in production from maize to other higher-

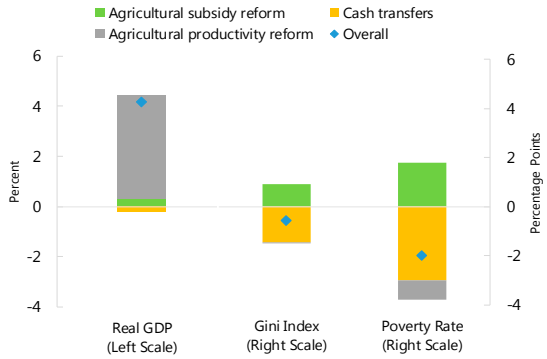
[55] This section draws on IMF (2015e).

[56] A number of key features of the Malawian economy are incorporated into the analytical framework. The agricultural sector in Malawi is large, and about a third of GDP is agriculture; further, this sector employs mostly small and low-productive farmers. Commodity exports, mostly tobacco, are traded at internationally determined prices. Finally, subsidies to maize fertilizers are provided through coupons, which are often sold in the secondary market. Subsidies, therefore, function as "cash transfers," which represent an important form of income for many small farmers.

value agricultural goods, which would also stimulate exports. Inputs for exporters would be cheaper (as their supply rises), increasing the income of these agents. This would translate into a higher capital stock for the economy, higher output, and higher private consumption (Figure 15). At the same time, the reform would increase inequality. Since the subsidy system works as a cash transfer, reducing subsidies would lead to an important reduction in the income of small and poor farmers, exacerbating poverty and inequality.

49. Cash transfers to the rural poor can help mitigate the impact of the subsidy reform on poverty and inequality in the short term, while higher spending in agricultural R&D would boost agricultural productivity in the longer term. Well-targeted cash transfers would be a very efficient way to reach households most affected by the reform. At the same time, increasing spending for agricultural R&D would also increase the productivity of small farmers, boosting agricultural profitability and income. An increase in agricultural R&D, combined with an expansion of the cash transfer program, would reduce inequality. These measures would also amplify the impact of the subsidy reform on private investment and boost GDP and, in turn, bring additional revenues.

Figure 15. Economic and Distributional Impact of Reform to Agriculture in Malawi
(Cumulative change over 5 years)



Sources: World Economic Outlook (WEO); World Development Indicators (WDI); IMF staff calculations.

HOW TO MAKE GROWTH MORE INCLUSIVE: POLICY LESSONS

50. The distributional impact of macro-structural policies and reforms in LIDCs is complex. The impact depends on the policy and reform design and the interplay with country-specific economic characteristics—including inter-sectoral productivity differences, the extent of labor mobility, limited infrastructure, level of informality, and level of access to financial services. Multiple transmission channels and second-round effects are at play.

51. Pro-growth reforms that create distributional trade-offs can be complemented by policies that limit the adverse distributional effects of these reforms. While there is no one-size-fits-all recipe, governments concerned about the likely distributional impact of reforms can adjust specific features of reform design and/or introduce targeted accompanying measures to make pro-growth reforms more inclusive. Specifically:

- **On program design**, **reforms to boost growth or productivity can be calibrated to improve income distribution.** For example, resource mobilization measures can reduce inequality if the additional resources are channeled into highly progressive spending. Infrastructure investment,

if executed efficiently, can increase output and reduce inequality. Reforms to infrastructure, through investment in electrification and irrigation, and to the agricultural sector, through investment in agricultural R&D and on agricultural services, can boost productivity while reducing sectoral productivity gaps, with beneficial effects on both growth and equality. Reforms that boost financial deepening and access to financial services can foster inclusive growth.

- **On accompanying measures, the analysis underscores that, where specific growth-promoting reforms face a growth-inequality trade-off, a wider policy package can be designed to include measures that alleviate these trade-offs.** Some of these complementary policies can have an immediate impact, such as conditional targeted cash transfers—which can also increase productivity in the longer term if well-designed. Other measures, such as accessible education to equip the labor force with the right skills, will clearly take time to bear fruit. Some key structural reforms, such as regulatory simplification to reduce informality or policies to enhance labor mobility, such as strengthened property rights, can be politically difficult to carry out but can boost productivity and growth for all.

Appendix 1. Empirical Methodology and Episodes of Reforms

Methodology

In order to estimate the dynamic response of inequality, the analysis follows the local projection method proposed by Jordà (2005) to estimate impulse-response functions. This approach has been advocated by Stock and Watson (2007) and Auerbach and Gorodnichencko (2012), among others, as a flexible alternative to vector autoregression (autoregressive distributed lag) specifications, since it does not impose dynamic restrictions. It is also particularly suited to estimating nonlinearities in the dynamic response—such as, in our context, interactions between reform shocks and macroeconomic conditions and policies.

The baseline specification is:

$$y_{t+k,i} - y_{t-1,i} = \alpha_i + \gamma_t + \beta_k R_{i,t} + \theta X_{i,t} + \varepsilon_{i,t} \quad (1)$$

in which y is the log of the Gini coefficient (data source is Solt, 2016); α_i are country fixed effects, included to take account of differences in countries' average inequality growth rates; γ_t are time fixed effects, included to take account of global shocks; $R_{i,t}$ denotes the reform shock in the area considered; and $X_{i,t}$ is a set of control variables including three lags of reform shocks, as well as lags of inequality growth.

This baseline specification is then extended to allow the response to vary with the state of the country-specific economic characteristic (e.g., public investment efficiency, informality, financial inclusion) as follows:

$$y_{i,t+k} - y_{i,t-1} = \alpha_i + \gamma_t + \beta_k^L F(z_{i,t}) R_{i,t} + \beta_k^H (1 - F(z_{i,t})) R_{i,t} + \theta Z_{i,t} + \varepsilon_{i,t} \quad (2)$$

with

$$F(z_{it}) = \frac{\exp(-\gamma z_{it})}{1 + \exp(-\gamma z_{i,t})}, \quad \gamma > 0$$

in which $z_{i,t}$ is an indicator of the state of the economic characteristics normalized to have zero mean and unit variance, and $Z_{i,t}$ is the same set of control variables used in the baseline specification but now also including $F(z_{i,t})$.

Reforms

Reforms (with the exception of public investment shocks and tax reforms) are identified as episodes for which, for a given country at a given time, the annual change in the reform indicator exceeds by two standard deviations the average annual change over all observations. The number of reform identified with this procedure is presented in Table A1.

Tax reform indicators (VAT reform and PIT reform)

The tax reform indicators are measured as the (lagged changes) of the value-added tax (VAT) rate or the personal income tax rate. We take the VAT rate adjustment and the personal income tax rate adjustment, respectively. The source is the IMF Tax Rate Database (DART), which makes use of data from the other data sets to construct revenue performance indicators. It covers most IMF member countries that have a VAT.

Public infrastructure investment

Government investment shocks are identified as the difference between actual public investment and the public investment expected by analysts as of October (based on the IMF's *World Economic Outlook*) of the same year (Furceri and Li, forthcoming). Data cover a sample of 24 low-income developing countries (LIDCs) from 1995 to 2014.

Domestic financial liberalization

The financial reform index is a composite of five sub-indices on: (i) interest rate controls, such as floors or ceilings; (ii) credit controls, such as directed credit, and subsidized lending; (iii) restrictions on bank competition, such as limits on branches and barriers to entering the banking sector, including licensing requirements and limits on foreign banks; (iv) the degree of state ownership; and (v) the quality of banking supervision and regulation, including the power of independence of bank supervisors, adoption of a Basel I capital adequacy ratio, and the framework for bank inspections. Each of these sub-indices is aggregated with equal weights (Ostry, Prati, Spilimbergo, 2009; Abiad, Detragiache, and Tressel, 2008).

Agriculture reform indicator

This index aims to capture the extent of government intervention in the market for the main agricultural export commodity in each country. Each country-year pair is assigned one of four degrees of intervention: (i) maximum (public monopoly or monopsony in production, transportation, or marketing); (ii) high (administered prices); (iii) moderate (public ownership in relevant producers, concession requirements); or (iv) no intervention (Ostry, Prati, Spilimbergo, 2009; IMF Index of Agricultural Regulation).

Table A1.1. Summary of Identified Reforms in Low-Income Developing Countries

	No. of Episodes	No. of Countries	Sample Coverage
Agricultural Reforms	20	17	1961-2003
Financial Reforms	50	19	1974-2005
Tax Reforms			
Value-Added Tax	80	29	1995-2015
Personal Income Tax	528	55	1982-2015

Appendix 2. Modeling Methodology[57]

A small open economy populated by a continuum of heterogeneous households who live indefinitely and face idiosyncratic shocks is considered. All types of households have the same preferences over the consumption of food, c^f, manufacturing, c^m, and services, c^s. Services and food are non-tradable, while manufacturing goods are tradable, and also the numeraire. The prices of these goods are denoted by p^s for services, p^m for manufacturing, and p^a for food.

The framework considered here is a continuum of infinitely-lived agents with productivity risk. The model is a small open economy with three different agent types: large farmers, rural households, and urban households. The total mass of agents is normalized to equal 1. Rural households own a small plot of land and have the occupational choice problem of choosing the amount time to devote to producing food (which requires labor and land) and the amount of time working for large farmers for a competitive wage w^r. Low-skill urban households work in household enterprises producing services (which use only labor as an input), while high-skill urban households work for firms in the manufacturing sector earning a competitive wage w. Households cannot move across rural and urban sectors and do not accumulate human capital.

Large farmers own a large plot of land where they can produce food for the domestic market or exports. They hire labor from small farmers and also accumulate capital, both of which are used to produce agricultural goods for export. Large farmers' capital k_t^f follows a standard law of motion of capital, where x_t^f is investment and δ corresponds to the depreciation rate:

$$k_{t+1}^f = x_t^f + (1-\delta)k_t^f$$

Finally, there are competitive firms that produce manufacturing goods using capital and labor as an input. Manufacturing can also be used indistinctly for investment by large farmers or for consumption. Markets are incomplete; urban and rural households can save at a risk-free interest rate r. Entrepreneurs can borrow at a rate $(1+\varphi)r$ where φ captures the risk premium in lending. We assume that the capital account is closed and the trade balance is always zero.[58]

The government collects value-added taxes on food τ^a and manufacturing goods r^m, trade taxes r^*, corporate taxes τ^f, and labor income taxes τ^w. The government spends part of its resources on manufacturing goods and gives or collects lump-sum taxes that are specific to each household type.

[57] The version of the model described in this appendix corresponds to the most basic structure of the economy considered in the case study analysis. Different aspects of this model are modified in the various case studies to properly capture the most relevant aspects of the economy under study and the relevant policy questions for such economy.

[58] The assumption of a closed capital account is consistent with the observation of a low average level of access to international credit markets by private households in low-income countries (see for example IMF, 2015f; Araujo and others, 2015; and IMF, 2016c). In the context of this model such an assumption implies that the trade balance is always zero. For steady-state analysis, such as the ones presented in this note, relaxing this assumption does not have an important quantitative or qualitative impact on the results.

Urban Households' Problem

Urban households are endowed with one unit of time. There are two types of households in urban areas: low-skilled u^l and high-skilled u^h households. $\mu^{u,l}$ share of urban households is low-skill, producing services $y^{u^l,s}$ in household enterprises, and $\mu^{u,h}$ share of urban households is high-skill, working on manufacturing for a wage w^m.[59] Households that live in urban areas maximize the expected present value of utility from stochastic consumption sequences. Urban households face idiosyncratic shocks to their productivity $\epsilon^{u,l}$ and $\epsilon^{u,h}$, which follow a first-order autoregressive (AR(1)) process, and can save in risk-free bonds $b^{u,l}$ and $b^{u,h}$, for low-skilled and high-skilled urban households, respectively. The problem of a low-skilled urban households is given by:

$$\max_{c_t^{u^l,a},c_t^{u^l,s},c_t^{u^l,m}} \mathrm{E}\sum_{t=0}^{\infty}\beta^t u\left(c_t^{u^l,a}, c_t^{u^l,s}, c_t^{u^l,m}\right)$$

$$s.t.$$

$$(1+\tau_t^a)p_t^a c_t^{u^l,a} + (1+\tau_t^m)p_t^m c_t^{u^l,m} + p_t^s c_t^{u^l,s} + b_{t+1}^{u,l}$$

$$= p_t^s y_t^{u^l,s} + (1+r_t)b_t^{u,l} + T^{u,l}\left(p_t^s y_t^{u^l,s}\right)$$

$$y_t^{u^l,s} = \epsilon_t^{u,l} z^s$$

$$c_t^{u^l,a}, c_t^{u^l,s}, c_t^{u^l,m} \geq 0$$

The problem of a high-skilled urban household is given by:

$$\max_{\{c_t^{u^h,a},c_t^{u^h,s},c_t^{u^h,m}\}} \mathrm{E}\sum_{t=0}^{\infty}\beta^t u(c_t^{u^h,a}, c_t^{u^h,s}, c_t^{u^h,m})$$

$$s.t.$$

$$(1+\tau_t^a)p_t^a c_t^{u^h,a} + (1+\tau_t^m)p_t^m c_t^{u^h,m} + p_t^s c_t^{u^h,s} + b_{t+1}^{u,h}$$
$$= (1-\tau_t^w)\epsilon_t^{u,h} w_t^m + (1+r_t)b_t^{u,h} + T^{u,h}\left(\epsilon_t^{u,h} w_t^m\right)$$

$$c_t^{u^h,a}, c_t^{u^h,s}, c_t^{u^h,m} \geq 0$$

where β is the household's discount factor, which is common to all households in the economy; z^s is the services sector's average labor productivity; and $T^{u,l}\left(p^s y^{u^l,s}\right)$ and $T^{u,h}\left(\epsilon_t^{u,h} w_t^m\right)$ are lump-sum taxes from the government which are specific to each type of household and depend on the household's income.

Rural Households' Problem

Households that live in rural areas maximize the expected present value of utility from stochastic consumption sequences. The superscript *r* denotes rural households' allocations. Rural households

[59] Household's enterprises represent the informal sector of the economy. In line with the characterization of the service sector as the informal sector in the economy, services are assumed to be non-taxable goods.

are endowed with one unit of labor and with a small plot of land d^r. They choose how many hours to work on their own plot (h^r) and how many to work for large farms ($1-h^r$) for a wage w^r. They face idiosyncratic shocks to their productivity on their own plot, ϵ^r, which follow an AR(1) process, and can save in a risk-free bond b^r. The maximization problem of a rural household is given by:

$$\max_{\{c^{u,a},c^{u,m},c^{r,s},h^u\}} \mathrm{E}\sum_{t=0}^{\infty}\beta^t u(c_t^{r,a},c_t^{r,s},c_t^{r,m})$$

$$s.t.$$

$$(1+\tau_t^a)p_t^a c_t^{r,a}+(1+\tau_t^m)p_t^m c_t^{r,m}+p_t^s c_t^{r,s}+b_{t+1}^r$$

$$=(1-\tau_t^w)\epsilon_t^r w_t^f(1-h_t^r)+p_t^a y_t^a+(1+r_t)b_t^r+T^r\left(p_t^a y_t^a+\epsilon_t^r w_t^f(1-h_t^r)\right)$$

$$y_t^a=z^a\epsilon_t^r(d^r)^{\alpha_1^a}(h_t^r)^{1-\alpha_1^a}$$

$$h_t^r\in[0,1]$$

$$c_t^{r,a},c_t^{r,s},c_t^{r,m}\geq 0$$

The calibration of the idiosyncratic shocks, ϵ^r, will be such that as in the data, low-productivity households devote the majority of their time to working for big farms, while high-productivity households spend more time working on their own farms. z^a is the small farms' average factor productivity. $T^r\left(p_t^a y_t^a+\epsilon_t^r w_t^f(1-h_t^r)\right)$ are lump-sum taxes from the government to rural households and depend on household income.

Large Farms' Problem

Farmers that own larger plots of land also maximize their present discounted utility. They do not face any idiosyncratic risk, and the economy is assumed to be in a stationary state so that prices are constant through time. Hence, they do not face any uncertainty. Large farmers produce two goods, domestic food and exports. The production of exports requires land d^*, capital k^f, and labor h^*, while the production of food only requires land d^a and labor h^a. It is assumed that there is no land market, and consequently the allocation of land between domestic and export goods is fixed. Large farmers choose how much labor to hire to produce for the domestic and the external markets and how much capital to accumulate. The problem of a larger farmer is given by:

$$\max_{\{c_t^{f,a},c_t^{f,s},c_t^{f,m}h_t^a,h_t^*,k_{t+1}^f\}} \mathrm{E}\sum_{t=0}^{\infty}\beta^t u(c_t^{f,a},c_t^{f,s},c_t^{f,m})$$

$$s.t.$$

$$(1+\tau_t^a)p_t^a c_t^{f,a}+(1+\tau_t^m)p_t^m c_t^{f,m}+p_t^s c_t^{f,s}+p_t^m k_{t+1}^f-(1-\delta)p_t^m k_t^f$$

$$=Y_t^*+T^f(Y_t^*)$$

$$\pi_t^a=p_t^a z^a(d^f)^{\alpha_1^a}(h_t^a)^{1-\alpha_1^a}-w_t^f h_t^a$$

$$\pi_t^*=p_t^* z(d^*)^{\alpha_1^*}(h_t^*)^{\alpha_2^*}(k_t^f)^{(1-\alpha_1^*-\alpha_2^*)}-w_t^f h_t^*$$

$$Y_t^*=(1-\tau_t^r)\pi_t^a+(1-\tau_t^*)\pi_t^*$$

$$h_t^a,h_t^*\geq 0$$

In addition to paying consumption taxes, large farmers also pay taxes both on their land and capital incomes obtained in the domestic market, taxed at a rate τ^r, and on exports, taxed at a rate τ^*.

Firm's Problem

There is a competitive firm that rents capital k^m, hires effective hours of labor h^m, and buys tradable intermediate goods q^m to maximize profit. The firm's problem is given by:

$$\max_{\{k_t^m, h_t^m, q_t^m\}} \mathrm{E} \sum_{t=0}^{\infty} \beta^t (z^m (k_t^m)^{\alpha_1^m} (h_t^m)^{\alpha_2^m} (q_t^m)^{1-\alpha_1^m-\alpha_2^m} - w_t^m h_t^m - (1+\varphi) r_t k_t^m - (1+\tau_t^m) q_t^m$$

where φ is the risk premium paid by firms, τ^m is the consumption tax rate on intermediate goods, and z^m is the total factor productivity in the manufacturing sector.

Government Budget Constraint

The government collects taxes and spends its revenue on manufacturing G and lump-sum transfers to households $\{T^r(.), T^u(.), T^f(.)\}$. In equilibrium the government budget constraint must hold. The expression of the government budget constraint is given by:

$$\tau_t^a p_t^a C_t^a + \tau_t^m C_t^m + \tau_t^* \pi_t^* + \tau_t^r \pi_t^r + \tau_t^w (\mu^{u,h} w_t^m \int \epsilon_t^{u,h} \Gamma(b_t^{u,h}, \epsilon_t^{u,h}) + \mu^r w_t^f \int (1-h_t^r) \epsilon_t^r \Gamma(b_t^r, \epsilon_t^r))$$

$$= G_t + \mu^r \int T^r (p_t^a y_t^a + \epsilon_t^r w_t^f (1-h_t^r)) \Gamma(b_t^r, \epsilon_t^r) + \mu^{u,h} \int T^{u,h} (\epsilon_t^{u,h} w_t^m) \Gamma(b_t^{u,h}, \epsilon_t^{u,h})$$

$$+ \mu^{u,l} \int T^{u,l} \left(p_t^s y_t^{u^l,s}\right) \Gamma(b_t^{u,l}, \epsilon_t^{u,l}) + \mu^f T^f$$

where $\tau_t^a p_t^a C_t^a + \tau_t^m C_t^m + \tau_t^*$ correspond to consumption tax revenues; $\tau^* \pi^*$ are trade tax revenues; $\tau^r \pi^r$ are corporate income tax revenues; and $\tau_t^w (\mu^{u,h} w_t^m \int \epsilon_t^{u,h} \Gamma(b_t^{u,h}, \epsilon_t^{u,h}) + \mu^r w_t^f \int (1-h_t^r) \epsilon_t^r \Gamma(b_t^r, \epsilon_t^r))$ are labor income tax revenues. The government's budget constraint implies that the revenue from consumption, trade, corporate and labor income taxes must be equal to government spending on manufacturing, transfers to households, and subsidies for food.

Market Clearing

In this economy four markets clear in equilibrium. The market-clearing conditions depend on the endogenous distribution of shocks and asset holdings $\Gamma(\cdot,\cdot)$ and on the share of each type of household: urban households, skilled $\mu^{u,h}$ and unskilled $\mu^{u,l}$; rural households μ^r; and large farms μ^f. Since labor markets are segmented between urban and rural workers, there are two labor market-clearing conditions, one for each sector.

i. Urban labor market

$$\mu^{u,h} \int \epsilon^{u,h} \Gamma(b^{u,h}, \epsilon^{u,h}) = h^m$$

ii. Rural labor market

$$\mu^r \int \epsilon^r h^r \Gamma(b^r, \epsilon^r) = \mu^f (h^a + h^*)$$

Interest rates must clear the capital market so that total households' asset holdings are equal to the capital demanded by manufacturing firms.

iii. Capital market

$$k^m = \mu^{u,l} \int b^{u,l} \Gamma(b^{u,l}, \epsilon^{u,l}) + \mu^{u,h} \int b^{u,h} \Gamma(b^{u,h}, \epsilon^{u,h}) + \mu^r \int b^r \Gamma(b^r, \epsilon^r)$$

Finally, the relative price of services and food must be such that the corresponding markets of such non-tradable goods clear.

iv. Services market

$$\mu^{u,l} \int c^{u^l,s} \Gamma(b^{u,l}, \epsilon^{u,l}) + \mu^{u,h} \int c^{u^h,s} \Gamma(b^{u,h}, \epsilon^{u,h}) + \mu^r \int c^{r,s} \Gamma(b^r, \epsilon^r) + \mu^f c^{f,s}$$

$$= \mu^{u,l} \int \epsilon^{u,l} z^s \Gamma\left(b^{u,l}, \epsilon^{u,l}\right)$$

v. Food market

$$\mu^{u,l} \int c^{u^l,a} \Gamma(b^{u,l}, \epsilon^{u,l}) + \mu^{u,h} \int c^{u^h,a} \Gamma(b^{u,h}, \epsilon^{u,h}) + \mu^r \int c^{r,a} \Gamma(b^r, \epsilon^r) + \mu^f c^{f,a}$$

$$= \mu^{u,r} \int \epsilon^r z^a (h^r)^{1-\alpha^\alpha} \Gamma(b^r, \epsilon^r) + \mu^f z^a (d^f)^{\alpha_1^\alpha} (h^a)^{1-\alpha_1^\alpha}$$

Stationary Equilibrium

A competitive equilibrium for this economy is constituted by a stationary distribution of assets holdings and idiosyncratic shocks $\{\Gamma\}$ and sequences of service and agricultural prices, manufacturing and rural wages, and interest rates $\{p^s, p^a, w, w^f, r\}$, together with allocations of consumption, investment, time use, and bond holdings for each type of household, such that—given manufacturing prices and exported goods prices $\{p^m, p^*\}$, sectoral productivity, idiosyncratic shocks, government spending, and predetermined taxes $\{\tau^m, \tau^a, \tau^w, \tau^f, \tau^*\}$ and transfers $\{T^r, T^u, T^f\}$—the stochastic sequence of allocations solve their respective constrained optimization problem, clear markets, and satisfy the government budget constraint. Note that the market-clearing conditions, along with the fact that the government and individual budget constraints hold at every period, imply that the external sector condition of a balanced current account is also satisfied (Walras' law).

Calibration Methodology

The model period is one year, and the model is calibrated to each selected country depending on the reform and the country characteristics. The year of the calibration depends on the data availability. Most parameters are calibrated jointly so that the model matches moments from the

data. Income data are rarely available for low-income countries; hence, the literature typically focuses on inequality as measured by consumption inequality, for which data are available.

Preferences. As discussed in the model description, households have preferences over food, manufacturing, and services. We select the following functional form for the household utility:

$$u(c_t^{,a}, c_t^{,s}, c_t^{,m}) = \log(c_t^{,a} - \bar{a}) + \omega \log(c_t^{,s}) + \gamma \log(c_t^{,m})$$

Herrendorf, Rogerson, and Valentinyi (2013) shows that this functional form for the preferences is able to match many stylized facts about structural transformation. We calibrate the share of manufacturing consumption γ to match household expenditure on manufacturing, according to Household Consumption Expenditure Surveys. We calibrate the share of services consumption ω to match household expenditure on food. We calibrate the subsistence level of consumption $\bar{a}$ to match the share of food consumption at the bottom quintile of the income distribution. The discount factor β is set to 0.96, which is a value commonly used in economic literature for this parameter.

Agricultural Export Sector. The export sector production function is Cobb-Douglas, where land, capital, and labor are the inputs of production. We calibrate the productivity of the export sector z^* to match the share of exports of this sector in GDP.

Manufacturing Sector. We assume that the production function of the manufacturing sector is Cobb-Douglas. We normalize the price of manufacturing and the manufacturing productivity z^m to 1.

Agriculture Sector. The agriculture sector productivity z^a is calibrated to match the share of the agricultural sector in GDP. We normalize the land holdings of large farmers to 1 and calibrate the land holdings of small farmers following Teshome and others (2014). For the value of the parameter that determines the share of the land factor in agricultural income, $\alpha_1^a = \alpha_1^*$, we follow Adamopolous and Restuccia (2014).

Service Sector. The productivity of the service sector z^s is calibrated to match the share of this sector in GDP. In the versions of the model where services are produced only in the informal sector of the economy, we adjust this total productivity measure from the original country measure to reflect the fact that the sector represents the informal sector of the economy. We do this by excluding modern service sectors like banking, telecom, and tourism from the data definition of the sector.

Income Shares. Given the fact that income data are not reliable/available for most low-income countries, the calibration of income share parameters in the different sectors of the economy can only be done indirectly. As in Adamopoulos and Restuccia (2014), we set these share parameters to values from the literature (typically based on data for the United States). Such shares can then be seen as those that would prevail in an economy without distortions.

Labor Force Shares. The shares of urban households and rural households are set using household survey data and employment data.

Idiosyncratic Shocks. We choose the persistency of the idiosyncratic shocks ρ to be identical across all type of agents. We set ρ value following Peralta-Alva, Mendes Tavares, and Tam (forthcoming), which estimates the income shock process for Ghana, using a household panel survey of urban workers. The variance of the process is calibrated to match the Gini coefficient of the urban and rural sector from household survey data.

Fiscal Policy. The tax schedule is calibrated to match the revenue and expenditure estimates from each type of tax and expenditure category according to estimates from the IMF staff. It is important to notice that our tax estimates are usually below the country statutory tax rates; this difference captures inefficiency, informality, and tax evasion.

Tables A2.1 and A2.2 illustrate the calibration values for the Ethiopian case study.

Table A2.1. Fiscal Policy

Fiscal Policy	Parameters	Values
Consumption Tax on Domestically Produced Food	τ^a	0.06
Consumption Tax on Non-Food	τ^m	0.06
Import Taxes	τ^*	0.32
Corporate Taxes	τ^k	0.24
Corporate Taxes Export Sector	τ^r	0.12
Labor Income Tax	τ^w	0.06

Table A2.2. Calibration

Target	Data	Model
Share of Labor Income Tax in Government Revenue	0.16	0.13
Share of Corporate Tax in Government Revenue	0.17	0.21
Share of Value-Added Tax in Government Revenue	0.29	0.28
Share of Import Tax in Government Revenue	0.39	0.38
Share of Exports in GDP	14.0	19.0
Share of Agriculture in GDP	0.47	0.52
Share of Food Consumption in Total Consumption	0.70	0.71
Share of Food Consumption in Total Consumption Rural Households	0.74	0.75
Urban Gini	0.37	0.31
Rural Gini	0.26	0.27

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