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FISCAL POLICY AND LONG-TERM GROWTH

EXECUTIVE SUMMARY

This paper explores how fiscal policy can affect medium- to long-term growth. It identifies the main channels through which fiscal policy can influence growth and distills practical lessons for policymakers. The particular mix of policy measures, however, will depend on country-specific conditions, capacities, and preferences. The paper draws on the Fund's extensive technical assistance on fiscal reforms as well as several analytical studies, including a novel approach for country studies, a statistical analysis of growth accelerations following fiscal reforms, and simulations of an endogenous growth model.

Fiscal policy is an effective tool for supporting growth. While it is difficult to disentangle the impact of fiscal reforms from other factors and to determine causality with certainty, the analysis suggests that they could lift medium- to long-term growth by ¾ of a percentage point in advanced economies and even more in developing economies.

Fiscal policy promotes growth through macro and structural tax and expenditure policies. At the macro level, it plays an important role in ensuring macroeconomic stability, which is a prerequisite for achieving and maintaining economic growth. At the micro level, through well-designed tax and spending policies, it can boost employment, investment, and productivity. Notably:

- Lowering the tax wedge and improving the design of labor taxes and social benefits can strengthen work incentives and induce a positive labor supply response;
- Reforming capital income taxes to tax rents reduces distortions and encourages private investment; well-targeted tax incentives can stimulate private investment and enhance productivity through research and development (R&D);
- Efficient public investment, especially in infrastructure, can raise the economy's productive capacity;
- More equitable access to education and health care contributes to human capital accumulation, a key factor for growth;
- If growth-friendly reforms require fiscal space, revenue measures should focus on broadening the tax base and minimizing distortions; and expenditure measures should aim at rationalizing spending and improving efficiency.

Design and social consensus matter for the success and durability of fiscal reforms. To reap full growth benefits, fiscal reforms also need to be internally consistent and complemented by relevant structural reforms (e.g., labor or trade) and supportive macroeconomic policies. Balancing efficiency and equity objectives and fostering public support through social dialogue are critical.

Approved By
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INTRODUCTION

1. Fiscal policy can play an important role in supporting strong, lasting and equitable growth. In the aftermath of the global financial crisis, potential output in many affected countries declined sharply. Restoring robust growth is essential for addressing the fiscal challenges ahead. Fiscal policy can make an important contribution to lifting potential growth. At the macro level, fiscal policy helps ensure macroeconomic stability, an essential prerequisite for growth; at the micro level, tax and expenditure policies can boost growth by altering work and investment incentives, promoting human capital accumulation, and enhancing total factor productivity. Consistent with earlier studies, fiscal policy is defined to encompass overall budget balance, tax, and expenditure policies (Cottarelli and Keen, 2012; Tanzi and Zee, 1997).

2. Endogenous growth theory provides the analytical framework for studying the effects of fiscal policy on long-run growth. In contrast to neoclassical growth theory, in which policy can only have a transitory effect on growth since long-term growth is driven by exogenous and policy-invariant factors, endogenous growth theory provides a framework to analyze how government policy can affect long-term growth, making it the framework of choice in the public finance literature (Barro and Sala-i-Martin, 1992; Rebelo, 1991). In practice, however, it is difficult to distinguish between permanent and transitory, but persistent, effects on growth.

3. This paper draws on the Fund's expertise in providing hands-on advice on fiscal reforms, complemented by a multi-pronged analysis. The Fund has significant expertise and a unique perspective on structural fiscal reforms, including through its extensive technical assistance program.[1] The paper also draws from an extensive review of the literature on the topic and several analytical studies. First, the paper presents 9 country studies covering advanced, emerging market, and low-income countries (LICs), spanning 12 reform episodes.[2] The analysis uses a novel technique to estimate the post-reform impact on medium- to long-term growth, which is proxied by 10-year average growth rates following reforms. Second, a statistical analysis identifies the share of fiscal reform episodes that are followed by growth accelerations within the next 5 years. Finally, an endogenous growth model simulates the growth impact of several revenue and spending reforms. However, fiscal policy is only one amongst many factors that drive growth. Despite attempts at isolating the effect of fiscal policy by using three complementary analytical techniques, the results should be interpreted with care given the difficulty in disentangling the impact of fiscal reforms from other factors.

[1] The Fund fielded some 250 technical assistance missions from headquarters in revenue and expenditure areas in FY2015, in addition to supporting member countries through 9 regional technical assistance centers in Africa, Asia, Latin America, and the Middle East and through numerous short- and long-term expert assignments.

[2] See SM/15/92, Supplement 1. The country studies cover Australia, Chile, Germany, Ireland, Malaysia, the Netherlands, Poland, Tanzania, and Uganda.

4. The paper differs in important ways from other studies. First, the coverage in terms of both regions and policies is wider than in other studies where the focus is on a particular country group or region (e.g., Abdon and others, 2014; and IDB, forthcoming) or on specific issues such as the design of tax structures that support growth (OECD, 2010a), and the long-term growth effects of public spending (Barbiero and Cournède, 2013). Second, the discussion of policy measures is organized around the main growth channels rather than by policy instrument as is common in the literature. Third, the paper explicitly looks into the equity implications of fiscal policy reforms, an issue that has received less attention in the literature. Finally, all country studies use a consistent analytical framework to assess the impact of fiscal reforms on potential growth.

5. The growth dividend from fiscal reforms could be substantial. The country studies suggest that there are significant potential gains from fiscal reforms. In advanced countries, per capita growth is estimated at about ¾ percentage points higher following fiscal reforms. The growth dividend could be even higher in emerging markets and LICs. As mentioned above, these results should be interpreted with caution. Other coterminous reforms also played an important role in many cases, and the available analytical tools are limited in the degree to which they can disentangle the effects of fiscal policy from other factors. Simulations of an endogenous growth model, which does isolate the impact of fiscal reforms, show that even a budget-neutral tax reform package aimed at enhancing the efficiency of the tax system may lift long-term growth by as much as ½ percentage point. Shifting the composition of spending toward infrastructure investment could add ¼ percentage point. Finally, a statistical analysis shows that there is a relatively high likelihood that fiscal reforms are followed by growth accelerations.

6. The effectiveness of growth-friendly fiscal policy is enhanced when reforms reinforce each other and are accompanied by complementary structural reforms. Combining fiscal reforms (e.g., scaling up infrastructure investment while improving the public investment process) increases their effectiveness. Complementary reforms such as liberalizing trade, labor and product markets can magnify the impact of fiscal reforms by promoting savings, stimulating investment, and unlocking productivity gains.

7. Policy design and social consensus matter for the successful implementation of reforms. Appropriately designed fiscal reform packages can serve both growth and equity objectives. Social consensus enhances the likelihood of reforms being implemented and sustained. A number of strategies can help foster public support for reforms, including effective communication with stakeholders and the inclusion of compensatory measures for those expected to lose from reforms.

8. The paper is organized as follows. Section II draws on existing empirical evidence, country studies and statistical analysis to examine the key channels through which fiscal policy, both at the macro and micro level, influences medium- to long-term growth. Since some reforms may require fiscal space, the paper next discusses how additional resources can be generated with the least adverse impact on growth. The section ends with the implications of fiscal reforms for equity. Section III examines the design of fiscal reforms and political economy considerations. Section IV summarizes policy lessons, and Section V offers issues for discussion.

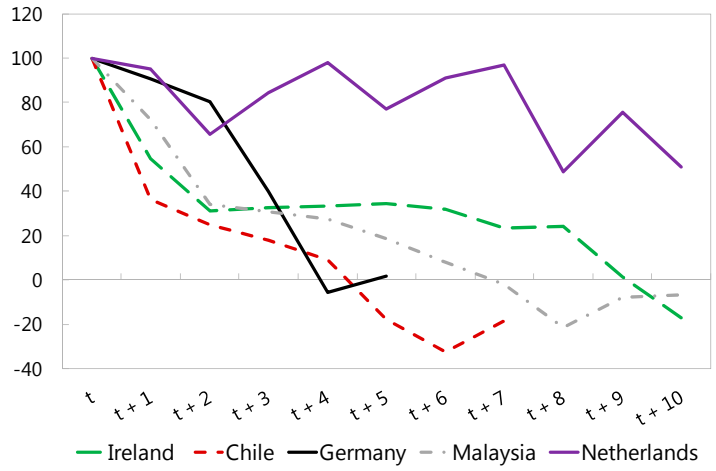
FISCAL POLICY AND LONG-TERM GROWTH: WHAT WORKS?

A. Macroeconomic Stability–A Prerequisite for Sustained Growth

Fiscal sustainability and macroeconomic stability are key for medium- to long-term growth. Policy uncertainty and high levels of public debt deter private investment and slow growth. Fiscal consolidation can help, but its impact on growth depends notably on its pace, composition and financing modalities. In many advanced and emerging economies, ensuring fiscal sustainability would require addressing age-related spending pressures without harming equity. In contrast, many LICs with low debt levels and strong growth prospects may have scope for additional productive spending.

9. Macroeconomic stability is an essential prerequisite for strong and lasting growth. Large fiscal deficits reduce aggregate savings in the economy and may lead to inflation, high interest rates, and balance of payments pressures, with negative growth consequences.[3] Indeed, policy uncertainty created by macroeconomic instability affects growth through the volatility of returns on investment and misallocation of resources as price signals become distorted (Fischer, 1993; and Fatas and Mihov, 2013). This underscores the role of automatic stabilizers in reducing macroeconomic volatility: fiscal frameworks that facilitate the symmetric functioning of automatic stabilizers eliminate an important source of public debt accumulation and foster medium-term growth (IMF, 2015a).The potential growth dividends from fiscal stabilization are especially large in advanced economies where an increase in the responsiveness of fiscal policy to output by one standard deviation could boost annual growth by about 0.3 percentage point. Dividends appear much smaller in emerging markets and LICs, where fiscal stabilization is less effective and is dominated by developmental priorities (IMF, 2015a; Aghion and others, 2014).

Figure 1. Fiscal Deficits Post-Reform 1/
(Index, reform period t = 100)



Source: IMF staff calculations; Supplement 1.
1/ Chile refers to 1975-1980; Germany to 2004-2008.

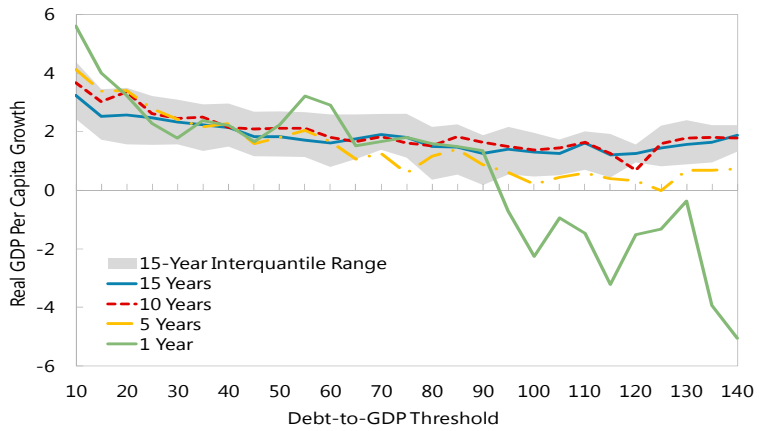
[3] The relationship between fiscal policy, macroeconomic stability, and long-run growth runs in both directions because low growth can weaken the fiscal position and may put fiscal sustainability at risk.

- Fiscal deficit reductions featured prominently in many country studies (Figure 1). In Chile, macroeconomic stability was pursued before growth took off. Notably, large cuts in spending and measures to broaden the tax base resulted in an improvement of the primary balance by about 28 percentage points of GDP over five years in the 1970s. After an initial decline, GDP growth picked up markedly and Chile's growth performance became one of the strongest in Latin America.

10. In developing economies, the relationship between fiscal deficits and growth is likely to be non-linear and dependent on financing modalities.[4] In contrast to many advanced countries, developing countries tend to have lower debt levels, strong growth prospects, high population growth, and large infrastructure gaps. Empirical evidence suggests that the relationship between fiscal adjustment and growth depends on the level of the fiscal deficit. For example, Adam and Bevan (2013) estimate that for developing economies the long-term growth dividend of cutting the deficit disappears or reverses below a threshold of around 1½ percent of GDP. In addition, the magnitude of the dividend depends on how the deficit is financed: Gupta and others (2005) find that reductions in the deficit that translate into significant cuts in domestic financing tend to be associated with higher growth rates. In Uganda public financial management reforms, including strict expenditure controls, facilitated a reduction in budget deficits and their monetization, which helped lower inflation. Greater macroeconomic stability in turn paved the way for higher growth.

11. High public debt tends to hamper growth by increasing uncertainty over future taxation, crowding out private investment, and weakening a country's resilience to shocks (Krugman, 1988). Figure 2 illustrates the link between debt and growth: at one-year horizons, high debt levels are associated with lower growth; over longer horizons, the relation is less pronounced, but a tradeoff still remains. However, it is rather difficult to ascertain the level of public debt that is prudent to sustain, or for how long it can rise without jeopardizing macroeconomic stability. Empirical evidence suggests that the level at which the debt-to-GDP ratio starts to harm long-run growth is likely to vary with the level of economic development and to depend on other factors, such as the investor base.[5]

Figure 2. Debt and Growth: Short- and Long-Term Horizons
(Percent)



Source: Pescatori, Sandri and Simon (2014).

[4] In this paper, the term "developing economies" refers to both emerging market economies and LICs.

[5] For example, for OECD countries, Cecchetti and others (2011) show that when public debt exceeds 85 percent of GDP it may become a drag on growth; in particular, a further 10 percentage point increase in the debt-to-GDP ratio

(continued)

12. The pace of fiscal consolidation is important for medium- to long-term growth. A vast literature, largely from the pre-crisis period, emphasizes the scope for expansionary fiscal adjustments—not only for advanced economies, but also for emerging market economies and low-income countries.[6] However, in a deep and lasting recession, fiscal consolidation is likely to have a negative short-term impact on growth when there are large negative output gaps and monetary policy is constrained by the zero lower bound and/or inoperative credit channels. In such an environment, consolidation policies can be harmful to longer-term growth due to possible hysteresis effects, whereby temporary layoffs become permanent (De Long and Summers, 2012). Furthermore, in a deep recession, investment is likely to remain low for a prolonged period of time, reducing further potential output. Overall, these arguments highlight the need to carefully calibrate the pace of fiscal adjustment during a deep recession. In particular, countries that are not under market pressure should proceed with gradual fiscal consolidation, anchored in a credible medium-term plan (Blanchard and Cottarelli, 2010; IMF, 2013b; Jaramillo and Cottarelli, 2013).

13. The composition of adjustment matters as well. The appropriate mix of revenue and expenditure measures depends on each country's specific conditions. Policymakers need to consider the durability of the selected measures and their impact on growth and equity. For advanced economies, expenditure-based fiscal consolidations have been shown to be more durable (Alesina and Ardagna, 2012), and have been associated with growth in private investment (Alesina and others, 2002). In contrast, for LICs Baldacci and others (2004) find that revenue-based adjustment leads to more durable consolidation episodes, with greater benefits for growth. In addition, credit-constraints matter: in the presence of high private debt and credit supply restrictions, deficit reductions achieved through tax-base broadening while protecting public investment are supportive of medium-term growth in both advanced and emerging economies (Baldacci, Gupta, and Mulas-Granados, 2015). Large expenditure-based consolidations tend to increase inequality, which can undermine long-term growth (Ball and others, 2013; Woo and others, 2013; Berg and Ostry, 2011). Some degree of pragmatism is therefore needed to strike the proper balance between revenue and spending measures.[7]

- Faced with sluggish growth and high fiscal deficits (10 percent of GDP in 1986), Malaysia cut current spending and rationalized inefficient public investment. As a result, the budget was balanced during most of the 1990s, the private investment-to-GDP ratio more than doubled, and annual growth averaged around 8 percent. Similarly, in the Netherlands, an expenditure

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can reduce annual average growth by more than 0.1 percentage point. Kumar and Woo (2010) confirm this effect on a sample of advanced and emerging economies. For developing countries, estimated thresholds are generally much lower: Pattillo and others (2011) find that the marginal effect of additional debt becomes negative when the net present value of debt reaches 20-25 percent of GDP. Clements and others (2004) obtain a similar result for low-income countries and external debt.

[6] Key papers include Alesina and Perotti (1995, 1996); McDermott and Wescott (1996); Alesina and Ardagna (1998); Bleaney, Gemmel, and Kneller (2001); Alesina, Ardagna, Perotti, and Schiantarelli (2002); Baldacci and others (2004); Gupta and others (2005).

[7] For a fuller discussion on the nexus between the composition of fiscal adjustment and growth, see IMF (2013b).

cut of 15 percent of GDP between 1982 and 2000 created room for lower taxes and helped pave the way for private investment and private sector job-creation. At the same time, both countries managed to avert adverse consequences on income inequality (as further discussed in Section D on *Growth and Equity*).

14. Ensuring fiscal sustainability in a number of countries will require putting pension and health systems on a sound financial footing. In advanced and emerging market economies, age-related spending on public pensions and health care accounts for a large share of government spending (40 percent and 30 percent, respectively; IMF, 2014f). As populations age, these spending pressures can undermine long-term fiscal sustainability—and any fiscal consolidation strategy needs to include reforms in these areas (Blanchard and Cottarelli, 2010). Several countries studied strengthened long-term fiscal sustainability by reforming their pension and health systems. For instance, Poland shifted from a financially unsustainable defined-benefit system to an actuarially solvent defined-contribution system; and Germany put its pension system on a more sound financial footing by linking pension benefits to the old-age dependency ratio, tightening access to early retirement and raising the statutory retirement age. In health care, Germany and the Netherlands introduced a combination of macro- and micro-level reforms to contain cost and enhance efficiency, including price controls on pharmaceuticals, higher co-payments and contributions, and budget caps.

15. Strong and transparent institutions support macroeconomic stability and the sustainability of fiscal policies. Because debt and deficits have an impact on longer-term growth, fiscal frameworks and institutions that help mitigate deficit and debt biases can help promote growth. Countries with stronger budget institutions tend to deliver a more growth-friendly fiscal adjustment (IMF, 2014g).[8]

B. How Can Fiscal Structural Reforms Promote Growth?

In theory, fiscal reforms can affect growth through four main transmission channels—labor supply, investment in physical and human capital, and total factor productivity. Country studies and statistical analysis find some evidence of higher growth following the implementation of growth-friendly fiscal reforms, with some variation in the relative importance of channels and fiscal policy areas across country groups.

16. There are four main channels through which tax and expenditure policy reforms can impact medium- to long-term growth:

[8] The 12 budget institutions that are included in the IMF (2014g) study are fiscal reporting; macro-fiscal forecasting; fiscal risk management; independent fiscal agency; fiscal objectives and rules; medium-term budget framework; performance orientation; intergovernmental financial arrangements; budget unity; top-down budgeting; parliamentary approval; and budget execution.

- ***Labor supply.*** The tax-benefit system (including labor income tax and social transfers) influences decisions on whether to participate in the labor market (extensive response) and how much to work (intensive response). Empirical evidence suggests that this transmission mechanism is particularly important at the lower end of the income distribution and for specific groups, such as women and older workers (IMF, 2014a; OECD, 2011). Reforms in labor taxes and/or benefits were undertaken in five of the nine country studies (Australia, Chile, Germany, Ireland, and the Netherlands). Devereux and Love (1994) and Turnovsky (2000) use endogenous growth models to show how fiscal policy through labor tax cuts can lift long-term growth by inducing a positive labor supply response.

- ***Physical capital.*** Taxation of capital income influences private savings and investment decisions. At the individual level, capital income taxes reduce the return on savings. At the corporate level, profit taxes reduce the rate of return on investment projects, while different tax treatment of financing (i.e., deductibility of interest expenses) creates a bias toward debt financing. This bias leads to inefficiently high debt-equity ratios and discriminates against innovative firms (De Mooij, 2011). On the expenditure side, efficient public investments can boost returns on private investment and thereby enhance long-run growth. All countries studied implemented investment-friendly tax reforms and/or bolstered public capital spending. The models of Rebelo (1991) and Devereux and Love (1994) illustrate how capital tax cuts encourage investment and boost long-term growth.

- ***Human capital***. Human capital is one of the main drivers of long-term growth (Lucas, 1988; Barro, 2001). In endogenous growth models, human capital contributes to growth directly as an input in production activities, and indirectly by promoting technical progress with positive externalities. Both tax and spending policies can help raise the human capital stock, given the presence of positive externalities and credit market imperfections. Investment in health and education constituted an important part of the fiscal reform packages in three country studies (Ireland, Tanzania, and Uganda). Pecorino (1993), and King and Rebelo (1990) use endogenous growth models to show how income tax reductions can encourage human capital accumulation and hence growth by increasing the returns to education.

- ***Total factor productivity***. One important channel to enhance productivity is through technological progress. There is a strong case for government intervention in the presence of positive externalities from research and development (R&D). Governments can either spend on R&D directly or (more commonly) provide tax incentives to encourage private R&D spending. If designed and implemented well, these can yield high social returns. In addition, as noted above, public infrastructure and services can have a direct effect on private sector productivity and promote technological progress; and public spending on education can help foster a better absorption of new technologies. In six country studies either tax incentives for R&D activities were provided or public R&D spending increased noticeably (Australia, Germany, Ireland, Malaysia, the Netherlands, and Poland). Public infrastructure to support private sector activity improved substantially in Chile, Malaysia, and

Poland. Baier and Glomm (2001), and de Hek (2006) present endogenous growth models where public investment increases total factor productivity and ultimately long-term growth.

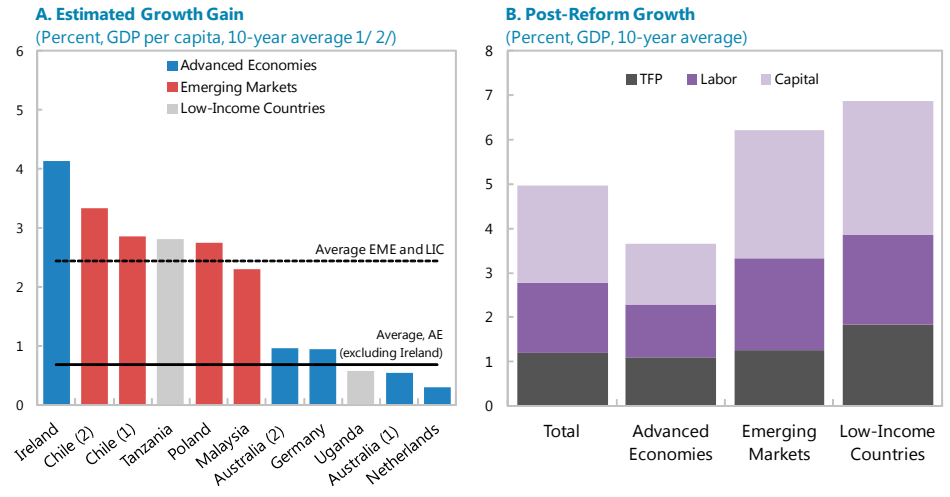
17. Country studies reflect the potential of fiscal reforms to affect growth through these channels (Figure 3; and SM/15/xx, Supplement 1). Using the Synthetic Control Method (SCM), country studies show a significant increase in average growth during the 10 years following fiscal reform episodes, compared with the counterfactual (Figure 3a). However, the limitations of the SCM suggest interpreting the results with care (Box 1). While biases may run in both directions, one should be particularly cautious in attributing the increase in growth entirely to fiscal reforms, as they were often part of broader reform packages (e.g., reforms of labor and product markets) that also played an important role. With this caveat, the country studies find that:

- In advanced countries, excluding Ireland which experienced a significantly higher growth dividend, per capita growth in the post-reform period is about ¾ percentage points higher than the counterfactual. In developing economies, the estimated divergence in growth paths reaches almost 2½ percentage points, on average.

- Relative contributions of capital, labor, and total factor productivity (TFP) to total growth showed different patterns across income groups: while advanced economies experienced relatively balanced contributions, in emerging markets and LICs capital accumulation was the dominant growth driver (Figure 3b).

- Shifts in the contribution of capital, labor, and TFP to growth at times coincided with the focus of fiscal reform efforts: for example, in cases where an overhaul of labor taxation and reductions in the tax wedge were at the core of tax changes (e.g., Ireland, the Netherlands), the contribution of labor in total output growth increased after the reform.

Figure 3. Evidence from Country Studies: Growth Post-Reform



Source: IMF staff calculations; Supplement 1.
1/ 5-year averages for Germany and Poland.
2/ Chile (1) refers to the first reform episode (1974); Chile (2) to the second reform episode (1983); Australia (1) to the first reform episode (1985); and Australia (2) to the second reform episode (1998).

18. Fiscal reforms are frequently followed by growth accelerations (Annex I; Figure 4). Analysis of 146 episodes of growth accelerations in 112 countries shows that revenue reforms are most likely to be followed by a growth acceleration (defined as a durable increase in five-year average growth of at least one percentage point) in emerging market economies, while expenditure reforms displayed the most potential in both advanced and emerging economies (Figures 4a and 4b).

- On the revenue side, 37 percent of episodes involving reductions in the share of income taxation matched by an increase in the share of indirect taxation are followed by a growth acceleration in the sample as a whole (Figure 4c). This is consistent with the findings of recent empirical studies (see for instance, Arnold and others, 2011).

- On the expenditure side, increases in health, education and infrastructure spending are followed by higher growth in 20 to 40 percent of all identified cases.

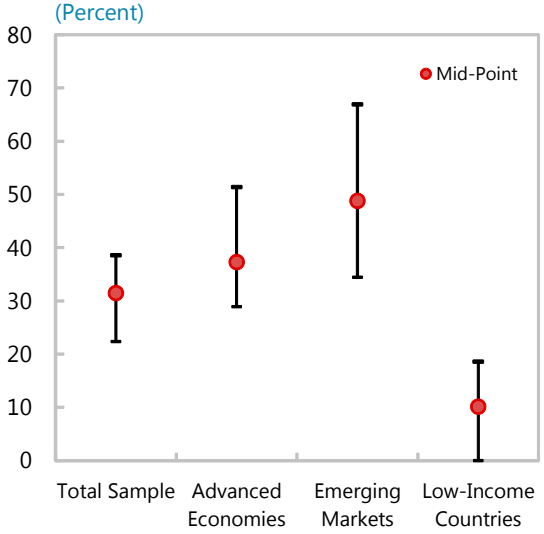
- Combined revenue and expenditure fiscal reform packages have a higher likelihood (around 60 percent of reform cases) of being followed by growth acceleration.

19. Model simulations show that even budget-neutral fiscal reforms can yield a significant growth dividend. A budget-neutral tax reform package aimed at enhancing the efficiency of the tax system may lift long-term growth by about ½ percentage point. Shifting the composition of spending toward infrastructure investment could add ¼ percentage point.

Figure 4. Growth Accelerations

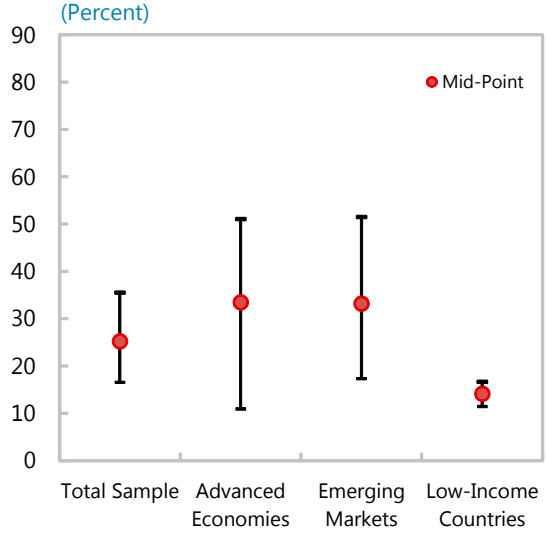
A. Revenue Reforms Followed by Growth Accelerations

(Percent)



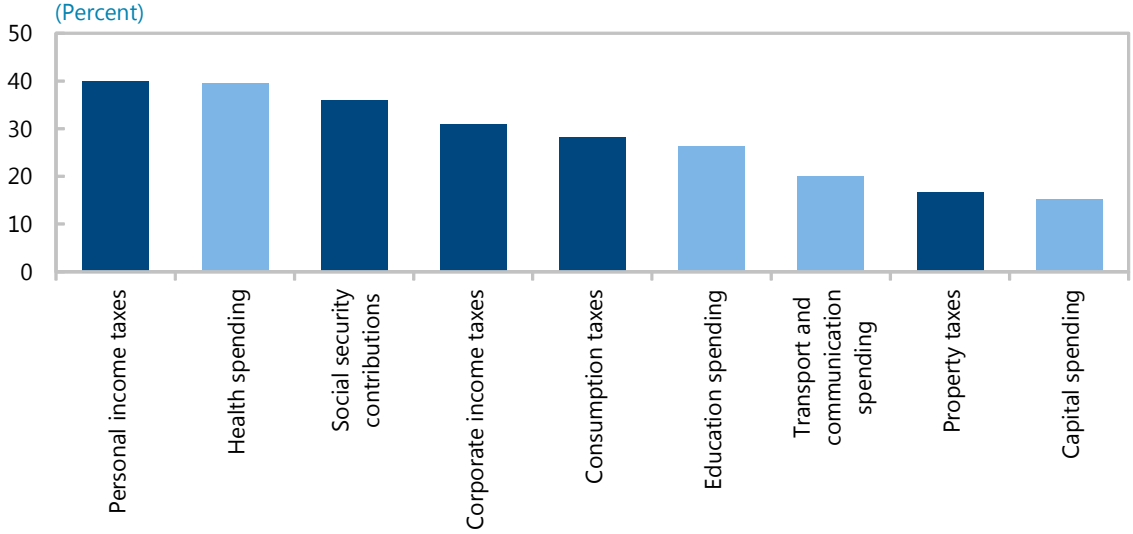
B. Expenditure Reforms Followed by Growth Accelerations

(Percent)



C. Type of Reforms and Conditional Probability of Growth Accelerations

(Percent)



Source: IMF staff calculations.

Note: Reported are the ratios of fiscal reforms followed by a growth accelerations within a 5-year period to the total number of fiscal reforms (in percent). Panels A and B show the range between 10th and 90th percentiles across different types of revenue and expenditure reforms. The red dots indicate averages.

Box 1. The Synthetic Control Method

The Synthetic Control Method (SCM) is a formal data-driven procedure to quantify the effect of an event (fiscal reform in this study) on an outcome variable of interest (i.e., medium- to long-term growth, defined as 10-year average growth rates). It is particularly well-suited for comparative case studies since it removes discretion in the selection of comparison groups. The method is based on the creation of an artificial counterfactual (i.e., growth performance in the absence of fiscal reform) using data prior to the event and then comparing the outcomes for the counterfactual and the unit being analyzed (the country that implemented fiscal reforms in this case) after the event has occurred.

The counterfactual or the synthetic unit is constructed as a weighted average of countries that have similar characteristics as the case study but are unaffected by the event. Country weights are chosen to minimize the distance between the case study country and its counterfactual in terms of the outcome variable and its predictors (Abadie and others, 2010). In general, only a few comparator countries receive positive weights.

The effect of an event is obtained as the difference between the outcome variable for the country in question and the weighted average of the outcome variable for the synthetic control group. Robustness of the results is checked using placebo tests where, for example, the time of occurrence of the event is shifted backward or forward, or countries in the synthetic group are replaced with other countries which are unaffected by the event.

The presence of two potential biases suggests interpreting the results with caution, however. First, the impact of fiscal reforms could be overstated, as it is difficult to disentangle their growth impact from that of various other factors affecting growth. Although various tests are used to check the robustness of the results, the difference between post-reform growth in the country of interest and its synthetic counterpart could be due to factors other than fiscal policy. On the other hand, results could be potentially biased downwards if the comparator groups include countries that also underwent growth-enhancing reforms.

Policies to Encourage Labor Supply

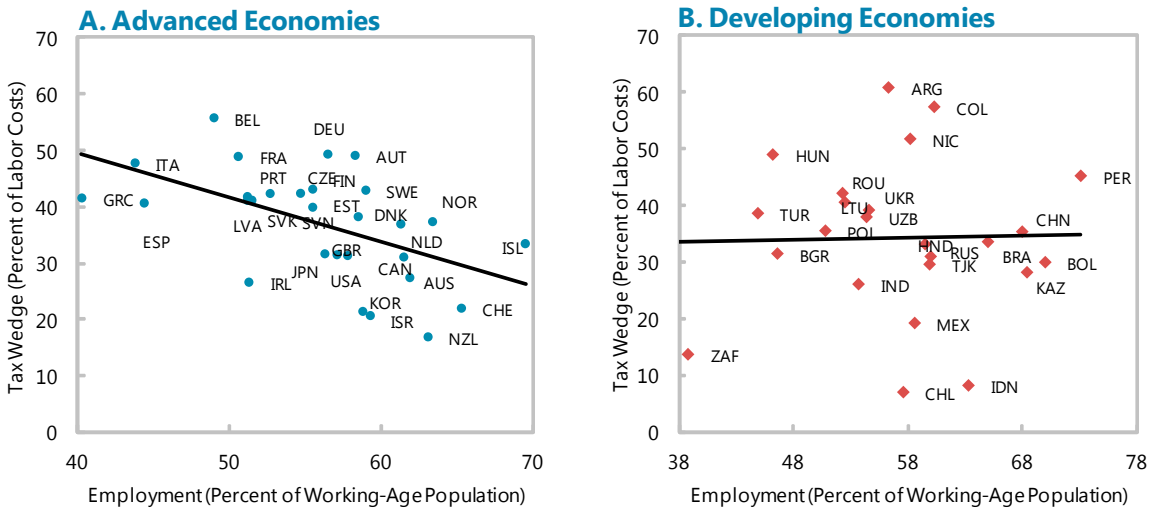
In many advanced and emerging economies, sustaining high growth will require offsetting the adverse impact of aging on labor supply and addressing low labor force participation rates, in particular of women. This can be done by cutting taxes on labor, redesigning social benefits, and strengthening active labor market programs (ALMPs). In low-income countries, the focus should be on providing equal access to education and dismantling legal obstacles to female labor force participation (FLFP).

20. Lowering overall taxes on labor income can boost labor supply. The overall labor supply response to cuts in labor tax depends on the elasticity of labor supply and on the degree of competition in the factor and product markets. Reducing the tax wedge can help address the problem with youth unemployment, which has increased sharply in Europe since the crisis (Banerji and others, 2014). Figure 5 shows that, in advanced economies, the labor tax wedge—including social security contributions—is negatively correlated with employment, while in developing economies there is no clear relationship, mainly due to smaller social safety nets and the narrower revenue base of personal income tax (IMF, 2014a).

- Revenue-neutral policy simulations using an endogenous growth model show that reducing tax on labor income by 5 percentage points leads to higher long-run economic growth of about 0.2-0.3 percentage point, as the increase in the after-tax wage induces higher labor supply.

- Country studies show that labor tax cuts were used to boost labor participation, including in Ireland and the Netherlands. For instance, in Ireland labor taxes were cut substantially in the context of a social partnership agreement. This contributed to a strong increase in labor force participation and a noticeably higher contribution of labor to total economic growth.

Figure 5. Relationship Between the Tax Wedge and Employment Rate



Source: IMF (2014a).
Note: the black lines shows an ordinary least squares (OLS) regression line.

21. Unemployment benefits can be designed to strengthen incentives to seek employment without compromising their important contribution to the social safety net. Unemployment benefits play a key role in advanced economies in protecting individuals from loss of income due to transitory or structural unemployment. However, these programs, if not well designed, can adversely affect employment incentives and outcomes (Meyer, 2002; Abbring and others, 2005; OECD, 2006). The withdrawal of benefits as individuals return to employment can operate like a tax on earned income and create work disincentives, especially for low-wage workers and families with children. Efficient benefit design can help, including through the following design features:

- ***Eligibility criteria.*** Conditioning eligibility rules (e.g., on previous contributions or participation in ALMPs) can better support and incentivize the return to employment. For instance, in the Netherlands, almost one-fifth of the working-age population received unemployment or disability benefits prior to reforms in the mid-1980s that tightened access and resulted in an increase in participation (Watson and others, 1999).

- ***Benefit duration.*** Lowering the maximum duration of benefit eligibility can expedite the return to employment. About a third of OECD countries have a maximum duration in excess of 12 months. Reducing replacement rates during the course of unemployment spells can enhance work incentives more gradually. The desired generosity of benefits can be achieved through various combinations of benefit levels and duration.

- ***Individual unemployment savings accounts (ISAs).*** Increased use of these accounts could help reduce the distortionary impact of contributions by strengthening the link with benefits received and facilitate the expansion of unemployment insurance schemes in developing economies with large informal sectors. Under this system, part of the unemployment insurance contribution could be credited to an individual account on which a person receives interest (Bovenberg and others, 2012). During unemployed periods, individuals can draw money from their account, and once the account is exhausted, they can borrow from the government at the same interest rate. Individual accounts are used in a number of emerging economies, including Brazil and Chile (Hijzen and Venn, 2011).

22. In particular, advanced economies could intensify the use of ALMPs and in-work benefits to reduce unemployment. Reforms to replace "passive" benefits which dilute incentives to return to employment with ALMPs and in-work benefits have contributed to a decline in unemployment in a number of advanced countries:

- ***Conditioning of means-tested transfers on participation in ALMPs.*** In most advanced economies, continued eligibility for benefits is conditioned on participation in ALMPs, including personal employment services, training, job placement, and public employment schemes. Tight activation measures are especially important for helping job-seekers and providing incentives to work. The intensity of activation requirements should increase with unemployment duration to allow an initial period for job search, followed by assistance with job placement and access to individually tailored training opportunities—which are especially important for youth unemployment and the long-term unemployed. Although the use of ALMPs has increased over the last decade, there is still significant room for improvement in many countries (OECD, 2012b). Germany introduced activation conditions, complemented by wide-ranging labor market reforms, including improving job search efficiency, raising work incentives, and fostering labor demand (Hüfner and Klein, 2012). As a result of these reform packages, between 2000 and 2013, labor force participation increased from 66 percent to 74 percent, and the unemployment rate fell to 5.2 percent in 2013, after reaching a peak of 11.2 percent in 2005 (OECD, 2014c).

- ***Greater use of in-work benefits.*** Many economies that target labor market participation (Germany, the Netherlands, and Sweden) have adopted a system of in-work benefits that allows for the gradual withdrawal of benefits as earnings or employment duration increase (IMF, 2012). This reduces the net tax on additional earnings; even turning it negative for low-income groups, with significant benefits for employment, equity, and poverty reduction.

23. Targeted tax and spending measures for specific groups could elicit an even greater labor supply response with a positive impact on growth.[9] In many countries, labor force participation of women and older workers is still low. For instance, the gender gap in labor force participation rates remains high in most regions, ranging from 51 percentage points in the Middle East and North Africa to 35 percentage points in South Asia and Central America and to 12 percentage points in OECD countries (Elborgh-Woytek and others, 2013; Cuberes and Teigner, 2014). Key obstacles vary across income groups: for instance, in developing economies access to education, legal obstacles and poor infrastructure are more critical for FLFP than e.g. parental leave policies (Das and others, 2015; Gonzalez and others, 2015). At the same time, most countries have witnessed declining old-age employment despite higher life expectancy. Targeted measures can help boost women, older workers' and low-skilled workers' supply response:

- ***Women***: Female labor supply is more responsive to taxes than male labor supply. Hence, tax relief for women could elicit a positive net response, even when financed by higher taxes on men. For instance, India makes a gender distinction by applying a higher tax exemption for women, and most advanced economies replaced family taxation with individual taxation to reduce the tax burden for secondary earners (often women). Special tax relief could also be targeted at single parents. On the expenditure side, interventions that could be critical in increasing FLFP include closing the gender gap in education (e.g., India, Turkey); well-designed family benefits, including paid parental leave up to about two years (e.g. the United States); more flexible work options (e.g., India and Japan); and greater availability of child-care options (e.g., Germany, Japan, and the United States).[10] Policies that have had a beneficial impact on FLFP include social benefit reforms (Germany, and the Netherlands); higher labor market flexibility (Germany, and the Netherlands); better education (Ireland); and a shift from family to individual taxation (Ireland).

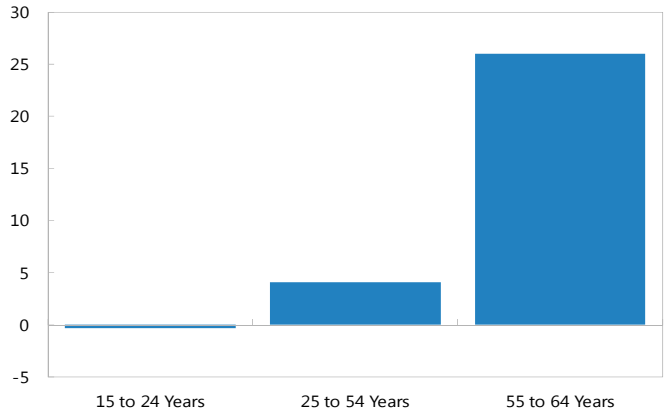
- ***Older workers****:* Older workers are more sensitive to financial incentives than younger workers (Blundell, 2014; IMF, 2014a). Lower tax rates (including implicit taxes on continuing work) can increase incentives to remain in the labor force. Australia, Denmark, the Netherlands, and Sweden, for example, have introduced specific earning tax credits for older workers, aimed at stimulating labor-market participation. On the expenditure side, pension reform could also boost the labor supply of older workers. Options include increasing the effective retirement age, and adjusting pension benefits to actuarially fair levels that do not distort participation decisions. For instance, future pension benefits could be adjusted fully for extra years of contributions, eliminating incentives to retire early. Many advanced and emerging countries enacted legislation to raise statutory retirement ages (including Australia, France, Germany, and Poland). For example, participation of older cohorts

[9] For instance, Elborgh-Woytek and others (2013) report that, in Japan, the annual potential growth rate could rise by about ¼ percentage point if the female labor participation rate were to reach the average for the G7 countries. For OECD countries, full convergence in participation rates by 2030 can increase annual per capita growth rates by 0.6 percent, on average (OECD, 2012a).

[10] Blau and Kahn (2013); Das and others (2015); Elborgh-Woytek and others (2013); OECD (2012).

increased significantly in Germany after it phased out early retirement options (Figure 6). At the same time, targeted measures should protect against old-age poverty, including the expansion of social pension for low-income workers, financed through general revenues rather than labor taxes (e.g., India, Indonesia, and Thailand; Clements, Eich, and Gupta, 2014).

Figure 6. Germany: Change in Employment Rate by Age Group, 2000-2013
(Percent)



Source: ILO.

- ***Low-skilled workers***: Empirical evidence shows that targeted tax credits result in positive net employment effects as low-skilled workers exhibit higher labor supply elasticities than high-skilled workers (OECD, 2011; IMF, 2014a). Most advanced economies have introduced such in-work tax credits. More progressive tax schedules could also be a revenue-neutral way of reducing tax wedges for low-skilled workers (OECD, 2011; Imervoll and Pearson, 2009; Chirinko and Wilson, 2009). Hiring subsidies or targeted reductions in non-wage labor costs (such as social contributions) can stimulate demand for low-skilled labor.

Policies to Enhance Investment in Physical Capital

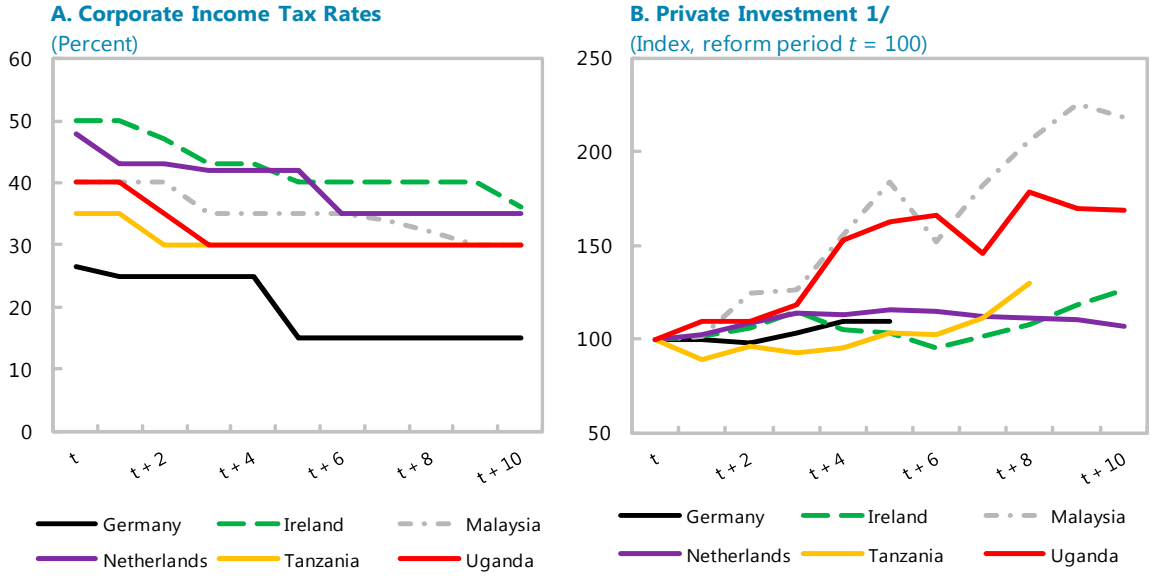
Physical investment—both public and private—is an important driver of growth in all economies and also holds the key to improvements in productivity. This section focuses on the tax policy drivers of private capital accumulation and discusses the importance of efficient public capital investment for the economy's growth potential.

24. Taxation of capital income influences private savings and investment decisions. By increasing the user cost of capital, corporate taxes can have an adverse impact on domestic investment and FDI (Abbas and Klemm, 2012; Vartia, 2008; Schwellnus and Arnold, 2008). Revenue-neutral policy simulations using the endogenous growth model indicate that reducing tax on capital income by 5 percentage points (while increasing the consumption tax to keep fiscal revenue unchanged) adds about 0.2 percentage point to long-run economic growth.[11] Malaysia streamlined and reduced corporate income tax (CIT) to a level comparable to other South-East Asian countries, which contributed to a surge in investment. Similar responses were observed in Germany, Ireland, the Netherlands, and Uganda. In these countries, tax changes were carried out following

[11] This is because the tax cut increases the after-tax rate of return on private capital which encourages investment and growth.

macroeconomic stabilizations which created the necessary supportive environment for investment (Figure 7).

Figure 7. Corporate Income Taxes and Investment Post-Reform



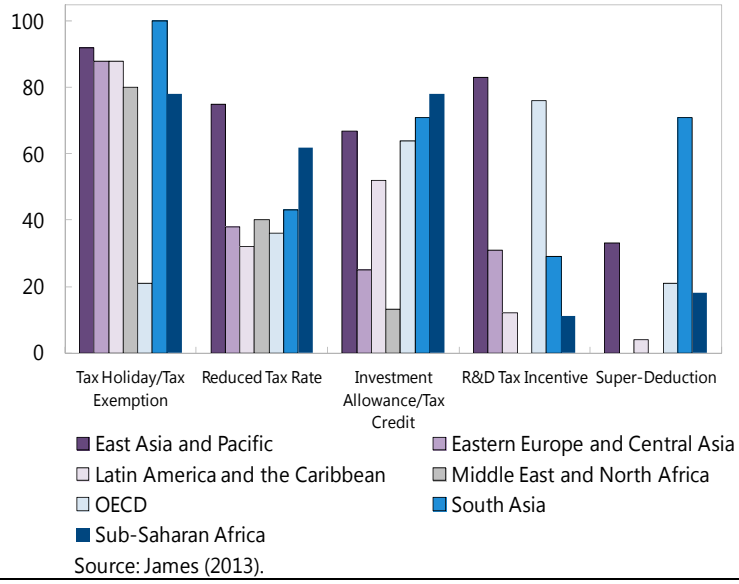
Source: Haver, IMF staff calculations, WDI, and WEO.
1/ Germany refers to 2004-2008.

25. Reforming corporate income taxes to tax "excess returns" could have a significant growth dividend. While their distortionary impact is widely acknowledged, CITs are an important source of revenue in many economies. Limiting the tax to "excess returns" or rents would reduce investment distortions, thereby promoting long-term growth while still generating revenue (Cottarelli and Keen, 2012). Under the allowance for corporate equity (ACE) scheme, investments that earn a "normal" return are exempt from taxation through a deduction of an imputed return on equity.[12] The ACE also reduces the bias toward debt-financing, created by the deductibility of interest expenses (Klemm, 2006; Mirrlees and others, 2011). Several advanced and emerging economies (including Austria, Belgium, Brazil, Croatia, and Italy), have used variants of this scheme. There is evidence that the ACE has had a positive impact on private investment in Belgium (Aus dem Moore, 2014).

[12] The normal rate of return is the risk-free rate of return (e.g., rate of return on a government bond) while excess returns are defined as anything above this rate (Mirrlees and others, 2011).

26. Tax incentives can significantly erode the revenue base without achieving offsetting benefits from increased investment, unless they are properly designed and limited. Tax incentives take several forms, such as tax holidays, preferential tax treatments in special zones or targeted allowances for certain investments (Figure 8). The choice of incentive, and the design details, matter critically for the effectiveness of tax incentives (IMF, World Bank, OECD, and UN, forthcoming). Well-targeted incentives that directly reduce the cost of capital, such as accelerated depreciation schemes, investment tax credits, and super deductions, have been used with some success in advanced countries (a discussion on incentives for R&D can be found, for example, in the section *Policies to Increase Total Factor Productivity*). In contrast, open-ended and profit-based tax holidays are less effective and can erode the tax base indefinitely. And they can be very costly: for instance, Cubeddu and others (2008) estimate the cost of CIT incentives in 15 Caribbean countries at around 5½ percent of GDP, on average; and Villela and others (2010) estimate the cost of preferential treatments under the income tax in Latin America to range between ½-6 percentage points of GDP.[13] This argues for a rigorous cost-benefit analysis of tax incentives. The investment climate more generally is an important determinant of the level of foreign investment: FDI is eight times stronger for countries with good investment climates (James, 2013). For example, an assessment of tax incentives that were introduced in Malaysia in 1986 concluded that—while they succeeded in stimulating domestic investment—foreign investors were primarily influenced by other factors (including macroeconomic stability and the quality of infrastructure, World Bank, 1991). At the same time, they came at a very high cost (2.2 percent of GDP).[14]

Figure 8. Regional Prevalence of Tax Incentives
(Percent)



Source: James (2013).

[13] For further discussion please see IMF (2011).

[14] Cost estimate for 1991. The main incentives that were introduced included (i) five-year tax holidays for priority sectors; (ii) investment tax and industrial tax allowances; and (iii) export incentives, such as tax abatements and tax allowances (World Bank, 1992).

27. Lack of international cooperation can erode tax bases and squeeze fiscal space. National tax policies can generate cross-border spillover effects: for instance, more favorable tax incentives in one country can divert FDI flows from other countries and thereby dampen their growth prospects and erode their tax base. In addition, multinational enterprises (MNEs) may shift profits from a high-tax jurisdiction to a lower-tax one by using accounting tricks, hence exacerbating the problem of base erosion. For example, in low-income countries this can limit significantly the scope for pro-growth public spending and raise difficult trade-offs between the need to raise revenue by limiting tax avoidance by MNEs and encouraging investment (IMF, 2014c). In a world of increasing tax competition, all countries may end up being worse off. To avoid such an adverse outcome, international cooperation is needed, and initiatives such as the OECD/G20 Base Erosion and Profit Shifting project—which aims at protecting tax bases and ensuring predictability—should be encouraged (OECD, 2014a). In view of the difficulty of achieving and enforcing effective cooperation, however, coordination could initially focus on smaller steps, such as promoting transparency by publishing data on tax expenditures arising from tax incentives and country-by-country reporting on transfer prices used to value intra-firm transactions.

28. Public investment, in particular in infrastructure, can raise the economy's productive capacity and growth potential. There is a positive relationship between public capital and growth, and developing economies with large infrastructure gaps stand to reap high returns from increasing public investment (Romp and de Haan, 2007; Bom and Ligthart, 2010). In the endogenous growth literature, public capital yields a direct permanent growth dividend (Futagami and others, 1993). It has indirect growth effects by increasing the longevity of private capital (Agenor, 2010). Higher infrastructure investment is estimated to raise output by as much as three percent in advanced economies—assuming, however, significant slack and accommodative monetary policies as well as fully efficient public investment (IMF, 2014b). Staff's growth acceleration exercise finds that among capital spending categories, transportation and communication spending exhibits the highest likelihood of subsequent growth acceleration (20 percent). In Poland, transport infrastructure expansion contributed to higher growth. Malaysia accelerated the provision of infrastructure between 1985 and 1995, more than doubling existing capacity in most sectors (World Bank, 2000). During the same period, annual growth surged to close to 8 percent.

29. The efficiency of public investment helps raise its productivity. Not all public investment creates economically valuable capital (Pritchett, 2000, and Dabla-Norris and others, 2012). In particular, in countries with weak public investment management processes, public investment is unlikely to translate fully into productive capital and growth (Agénor, 2010). On the flip side, potential gains are substantial: Gupta and others (2014) show that the marginal product of capital is particularly high in low-income countries. Hence, productive investment could have a high growth dividend. The average country loses about 30 percent of the value of its public investment to inefficiencies in the investment process (IMF, forthcoming). The economic dividends from closing this "efficiency gap" could be substantial—(IMF, forthcoming) estimates that the most efficient countries get twice the growth dividend from investment compared with the least efficient countries. Improving institutional arrangements for allocating public investment projects is most important for enhancing efficiency. Tanzania carried out improvements in the investment process

(medium-term planning and improved project selection and prioritization) before scaling up infrastructure spending. In Malaysia, inefficient projects by state-owned enterprises (SOEs) were dismantled and public investment re-focused on public infrastructure projects vital to private sector development.

Policies to Support Human Capital Development

Human capital accumulation is a key contributor to growth. At the same time, inequities in education and health outcomes persist in advanced and developing economies. This section focuses on public expenditure and tax policies that can improve equitable access to education and health care.

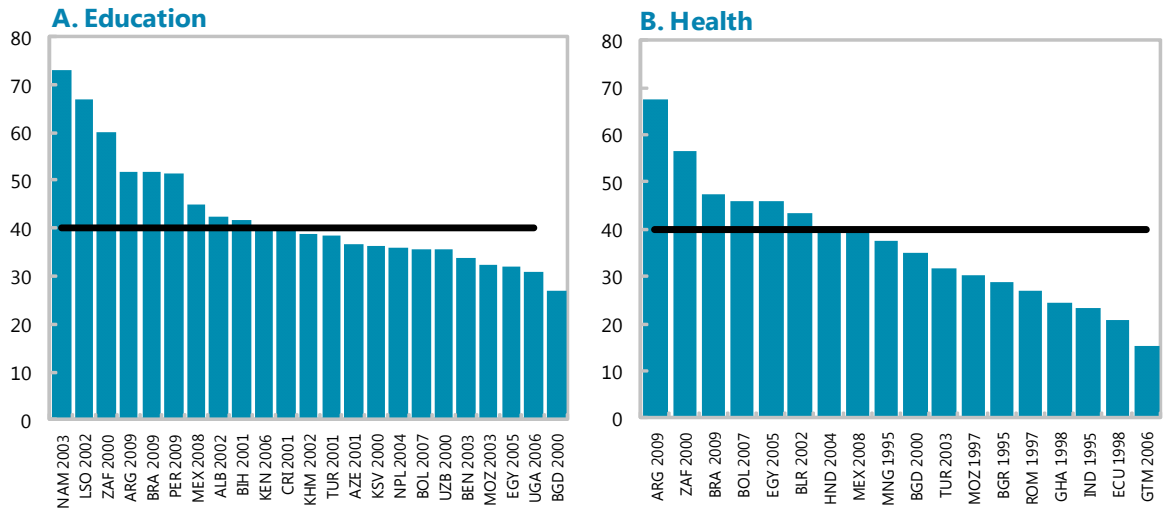
30. Fiscal policies can play an important role in promoting investment in human capital. Because of the positive externalities of education, the private sector alone cannot provide the optimal level of human capital, which supports the case for government intervention in the provision of educational services (Gerson, 1998; Fisher and Keuschnigg, 2002). Allowing for deductibility of education expenses or provision of tax credits can mitigate the adverse impact of progressive income taxation on human capital accumulation (Heckman and Klenow, 1997). Public spending on education can directly affect education outcomes and raise the stock of human capital. Specifically, Baldacci and others (2008) show that spending on education has a significant impact on output growth in developing countries, with two-thirds of the effect being realized within the first five years and the remainder over the following five-year span. Analysis of growth accelerations finds that a sustained increase in the share of education spending is followed by a growth acceleration in about a quarter of reform cases. Tanzania increased education spending significantly, provided assistance to open new schools in less developed regions, and decentralized the management of schools to enhance accountability. These reforms helped boost enrollment rates and spur sustained economic growth. Ireland's substantial investment in education from the 1960s onwards helped create a skilled workforce, a key factor for FDI inflows after the implementation of comprehensive fiscal and structural reforms in 1987-89.

31. Education reform in both advanced and developing economies should focus on improving access for disadvantaged groups.[15] In developing economies, low-income groups and girls have lower access to education (especially upper secondary and tertiary education), resulting in most of the benefits from education spending going to higher income groups. In most developing economies less than 40 percent of spending is reaching the poorest 40 percent of households (Figure 9). In advanced economies, education spending as a whole is progressive, but spending on tertiary education is regressive and significant inequities in education outcomes persist (OECD, 2014d). Inequitable access to education in both developing and advanced economies reduces opportunities and perpetuates inequality across generations, thereby further constraining the economy's long-term growth. In Ireland, Tanzania, and Uganda, a range of spending reforms focused on improving access to education helped unlock disadvantaged groups' untapped

[15] See OECD (2010); Hanushek and Woessmann (2011); and Pritchett (2013) for more detailed discussion.

productive capacity, while enhancing the distributional impact of education spending. Education reform options include:

Figure 9. Benefit Incidence of Education and Health Public Spending
(Percent of Public Spending Going to Poorest 40 Percent of Households)



Source: Davoodi, Tiongson, and Asawanuchit (2010); Lustig and others (2011); World Bank

- ***Increasing investment in lower levels of education.*** In developing economies a relatively large share of the budget is allocated to higher levels of education. Lower income groups often fail to progress to higher levels of education which are disproportionally accessed by higher income groups. This requires improving access to and progression through primary and lower-secondary education, especially for girls.[16] Increasing access to early childhood education is required in both advanced and developing economies, especially given the substantial evidence that this has a crucial impact on education performance at higher levels.

- ***Improving the efficiency of education spending.*** Increased spending on education at lower levels should be complemented by efforts to get better results from existing levels of spending. Inefficiencies in spending are substantial, including in developing economies (Gupta and others, 2007; Grigoli, 2014).

- ***Increasing cost recovery in tertiary education***. Demand for tertiary education has increased rapidly in both advanced and developing economies, and often faster than public financing capabilities. This has resulted in a decline in the quality of instruction in public

[16] Gender gaps in education are directly linked to gender disparities in wages and labor market participation, with adverse implications for long-term growth (Elborgh-Woytek and others, 2013).

institutions and a growth in private education institutions (Woodhall, 2007; OECD, 2011b). Since much of the benefit from tertiary education accrues to graduates in the form of higher earnings and other non-monetary benefits, there is a strong case for financing part of the cost from tuition fees. Income-contingent student loans (to be repaid once students start earning salaries) can relieve the financing constraint on higher education and provide insurance against the inability to repay loans due to low future income (Barr, 2012). Higher private financing allows tertiary education to expand without increasing public spending.

- ***Targeting conditional cash assistance***. Targeting cash assistance to disadvantaged groups, and conditioning this assistance on certain education outcomes, can help to reduce income barriers to education and improve overall educational attainment. Pioneered in the Mexican PROGRESA program in the late 1990s, conditional cash transfer (CCT) strategies are being increasingly used in both advanced and developing economies, including Brazil, Chile, Nicaragua, Peru, the United Kingdom, and the United States. The largest of its kind—*Bolsa Familia* in Brazil—provides assistance to about 14 million families or about 50 million people, and is credited with reducing inequality and halving extreme poverty since its introduction in 2003 (World Bank, 2013). The United Kingdom introduced means-tested education stipends conditioned on education performance; and New York City provides targeted education and health subsidies (IMF, 2014e). However, CCT programs are administratively demanding and may require complementary reforms, such as investment in quality health and education services, and targeted information campaigns to raise awareness amongst eligible populations (Grosh and others, 2008; Fiszbein and Schady, 2009).

32. Investing in health care also supports human capital accumulation. Healthier individuals are likely to invest more in their own education and health, thereby further fostering labor productivity and human capital accumulation (Aghion and others, 2010). Empirical studies confirm the potential payoffs for growth from investing in health: Jamison and others (2013) estimate that the economic value of increases in life expectancy in developing economies between 2000 and 2011 was equivalent to a 1.8 percent annual increase in GDP. Staff's growth acceleration analysis suggests that amongst all expenditure categories, health spending is most likely to be followed by growth accelerations (40 percent).

33. In advanced economies, maintaining the access of the poor to health care services during periods of expenditure constraint is a priority. Public health care spending accounted for about 17 percent of primary spending in advanced economies or 6 ½ percent of GDP in 2013, and is projected to rise on average by 3 percentage points of GDP between 2015 and 2030 (Clements, Coady, and Gupta, 2012; IMF, 2015a). Health care reforms to curb the growth of spending will be a necessary component of many countries' fiscal adjustment plans. Some of these reforms could take the form of an increase in cost-sharing with the private sector, for example through increased co-payments or a reduction in the scope of services provided by the public sector. These reforms should be designed to ensure that the poor retain access to services, for instance, by exempting them from co-payments.

34. In developing economies, a focus on universal access to a basic package of health services would yield the highest growth dividends. Fiscally sustainable progress toward universal access can be achieved through the following measures:

- ***Expanding health coverage to low-income households.*** The recent Lancet Commission report (Jamison and others, 2013) emphasizes that a fiscally sustainable, publicly financed, basic health package covering essential health care, would benefit the poor and enhance the progressivity of public health spending. In many developing economies the poor often forgo or delay necessary care at an early stage of illness when treatment is more cost effective. Many households fall into poverty because of high out-of pocket spending or catastrophic illnesses. Access to health care can provide financial protection and free up households from the need to accumulate unproductive precautionary savings.

- ***Reducing or eliminating user charges for low-income households.*** Health services outside the basic package could be financed by a mix of public and private mechanisms, including insurance contributions, fees, and copayments. However, out-of-pocket spending under the typical health insurance plan may still be too high for low-income households. To further improve the affordability of health care, it may be necessary to reduce or eliminate user charges for certain groups or services. In particular, preventive care, such as immunizations, should be offered free of charge given their large social benefits. In addition, linking utilization of preventive care to eligibility for other social benefits (such as conditional cash transfers) could help increase coverage among low-income households.

- ***Addressing supply side barriers in less developed areas.*** Since many low-income households reside in less developed areas or neighborhoods, availability of health care facilities and health care professionals—in particular those with similar quality as in more affluent areas—can be a major barrier to access. This may require public provision of health care as the last resort or additional incentives for service provision by private providers in these areas. Tanzania and Uganda managed to expand access to health care. Both countries significantly increased public spending on health and channeled resources through improved public expenditure frameworks. Tanzania increased public health spending almost threefold, from 1.3 percent of GDP in 1998, to a peak of 3.8 percent of GDP in 2006. In Uganda, the increase in public spending was also significant; from 0.1 percent of GDP in 1998 to 1.2 percent in 2003, after free primary health care was introduced.

Policies to Increase Total Factor Productivity

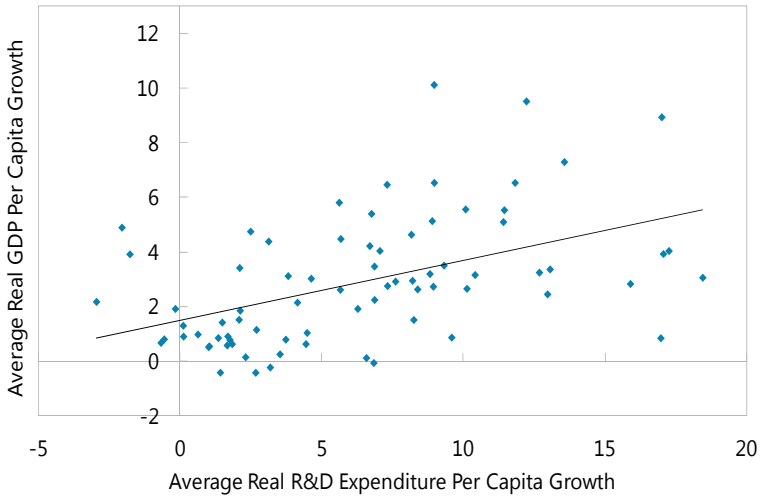
Fiscal policy can raise total factor productivity through several channels, including by stimulating R&D and providing critical infrastructure. It can also help enhance the sustainability of growth by addressing negative environmental externalities.

35. The supply of key public goods can raise total factor productivity. In addition to enhancing the economy's productive capacity as discussed earlier, public investment in physical infrastructure can improve the productivity of private capital and raise its rate of return (Munnel,

1992; Easterly and Rebelo, 1993). Similarly, public spending on education can also accelerate technology catch-up and enhance local productivity by improving the ability of the domestic labor force to absorb cutting edge technologies from the global economy (Everaert and others, 2014; Dhont and Heylen, 2009).

36. Well-targeted R&D tax incentives can support lasting growth. Figure 10 illustrates the positive relationship between spending on R&D and growth. R&D tax incentives generally take two forms: (i) tax credits that reduce the costs of R&D; and (ii) special intellectual property (IP) boxes that reduce the tax burden on profits earned from patents and trademarks. The former are truly geared toward encouraging innovation, while the latter are more likely used as a tool for tax competition. In advanced economies, R&D tax provisions are found to have a positive, albeit relatively small, impact on total factor productivity; this effect is larger for R&D intensive industries (OECD, 2010a).

Figure 10. R&D Expenditure and Growth, 2001-2012
(Percent)



Source: WDI.
Note: Excludes countries with fewer than five observations during the considered period.

- Country studies show that a few countries provided tax credits and extended deductions of R&D-related spending with some success (Ireland, Malaysia, and Poland). In Ireland, business expenditure on R&D grew by 80 percent between 2003—the year before the introduction of the tax credit regime—and 2012 (Hynes and O'Connor, 2014). In Poland, five-year growth in real R&D spending accelerated from 32 percent in the pre-reform period (1994-99) to 63 percent in the post-reform period (2005-10).

- In addition to tax measures, a number of countries increased public spending on R&D. For example, in the Netherlands, public spending on R&D increased by 8 percent during a substantial expenditure-based consolidation in the mid-1980s.

37. However, similar to tax incentives in general, R&D tax incentives can be distortive and ineffective if not designed carefully. In addition to the care that is required in designing tax incentives in general (as discussed under *Policies to Enhance Investment in Physical Capital*), the design of incentives targeted at encouraging R&D requires particular attention. Empirical evidence on positive effects of such incentives on innovation and growth remains relatively scant. This could be due to R&D spending actually translating into only modest social benefits. Importantly, in

countries where the capacity for carrying out R&D activities is limited by human capital constraints, the case for such tax incentives is less compelling, and other measures (such as incentives for technology transfers) may be better suited to boost productivity.

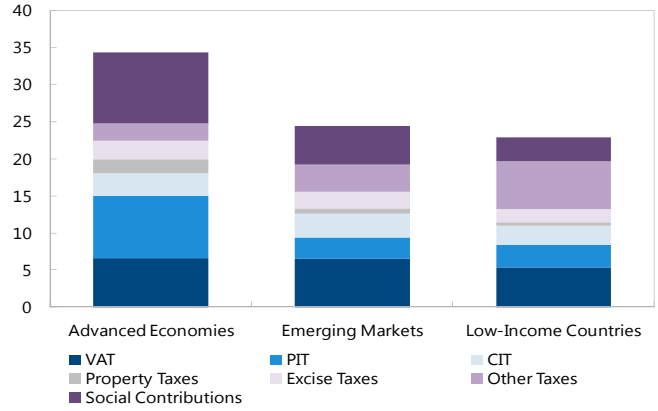
C. Fiscal Space for Pro-Growth Reforms

In some instances, the implementation of growth-friendly fiscal reforms will require fiscal space. While revenue measures should focus on minimizing distortions, expenditure reforms should primarily address inefficiencies in spending. Such policies would not only provide fiscal space but also contribute directly to medium- to long-term growth. Policies to reduce energy subsidies and introduce environmental taxation would address negative externalities, as well as generate resources for growth-enhancing interventions. For countries facing difficulties in expanding fiscal space, the focus should be on budget-neutral fiscal reforms.

38. Growth-friendly fiscal reforms may require fiscal space.[17] For example, given a tight budget constraint, revenue losses from lowering highly distortionary taxes (e.g., labor taxes) would need to be offset by other tax measures and/or spending cuts. Similarly, increased spending on public infrastructure, health, and education would need to be financed either through additional revenue or through reductions in other public spending. Additional borrowing is an option for countries where fiscal sustainability and rollover risk are not a concern.

39. Countries that opt to create fiscal space through revenue measures should focus on less distortionary taxes and base-broadening measures. Such measures could include:

Figure 11. Revenue Structure by Country Group, 2009-2013
(Percent of GDP)



Source: IMF staff calculations.

- ***A shift in the revenue composition toward more growth-friendly taxes.*** As noted above, corporate income taxes have the most negative effect on growth, followed by labor income taxes, then indirect taxes, and finally property taxes (IMF, 2013a). However, most countries rely to a great extent on direct tax revenue (Figure 11). In many countries, closing value-added tax (VAT) policy and compliance gaps would both improve revenue collection and remove

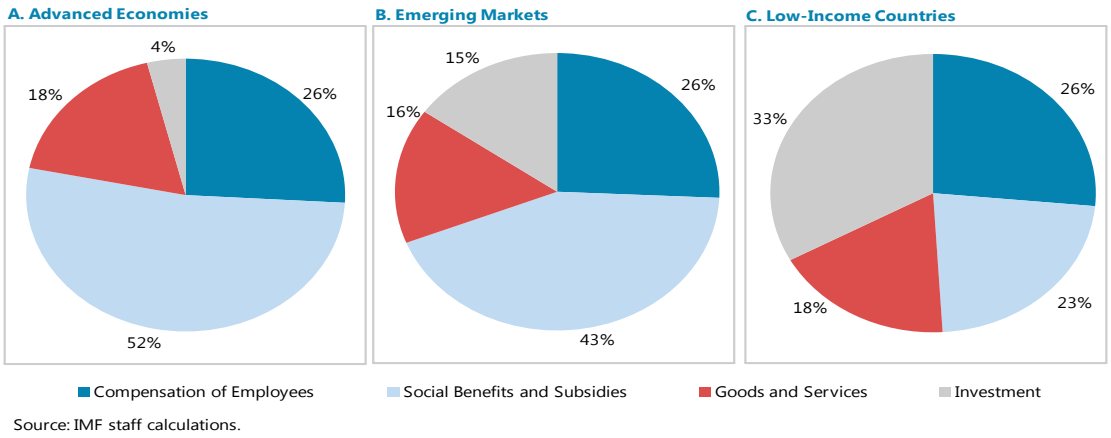
[17] Fiscal space is defined as "the availability of budgetary room that allows a government to provide resources for a desired purpose without any prejudice to the sustainability of a government's financial position" (Heller, 2005, p. 3). Ostry and others (2010) use an alternative definition: by fiscal space they mean the scope for further increases in public debt without undermining sustainability.

inefficiencies (IMF, 2013a). Increasing excise taxes on alcohol, tobacco and even sugar, can be justified on the grounds of their possible harmful health effects. The regressive impact of higher indirect taxes can be compensated by expanding spending on programs that benefit the poor relatively more. In Poland, a reduction in the share of direct taxes in overall tax revenues from 45 percent to 36 percent contributed to a significant increase in investment and employment. In Chile, an early introduction of a broad-based VAT with limited exemptions, helped to reduce distortionary effects of sales taxes and yielded substantial revenue gains. In both countries growth improved following the reforms.

- ***Base-broadening measures.*** These often include rationalizing tax exemptions and preferential regimes. Eliminating preferential treatments or improving their targeting could yield higher revenue and improve horizontal equity while enhancing growth. A number of countries combined tax rate reductions with tax base broadening. Australia in the 1980s launched a tax reform which cut tax rates and tightened tax exemptions in such areas as agriculture, forestry and film production. In Malaysia in the late 1980s, growth-friendly tax cuts (profit and trade taxes) were partially offset by broadening the sales tax base; and in Uganda, civil servants' salaries were made taxable, while tax exemptions were curtailed.

- ***Improvements in revenue administration.*** Tax compliance affects the revenue yield, efficiency and fairness of a tax system (IMF, 2015b). Effective revenue administration reforms include the introduction of risk management techniques and segmentation of taxpayers (e.g., establishment of large taxpayer units). In addition, simplification of laws and procedures can help reduce the cost of taxpayer compliance. In Chile, for instance, simplification of taxpayer forms and streamlining of filing and payment procedures contributed to improved enforcement and tax collection. Tanzania and Uganda created a unified revenue authority. Conditionality under Fund-supported programs can help: Crivelli and Gupta (2014) estimate that tax revenues increased by approximately ½ percentage point of GDP in a given year in countries where Fund-supported programs included conditionality on tax policy and administration.

Figure 12. Public Expenditure Composition, 2007-2013

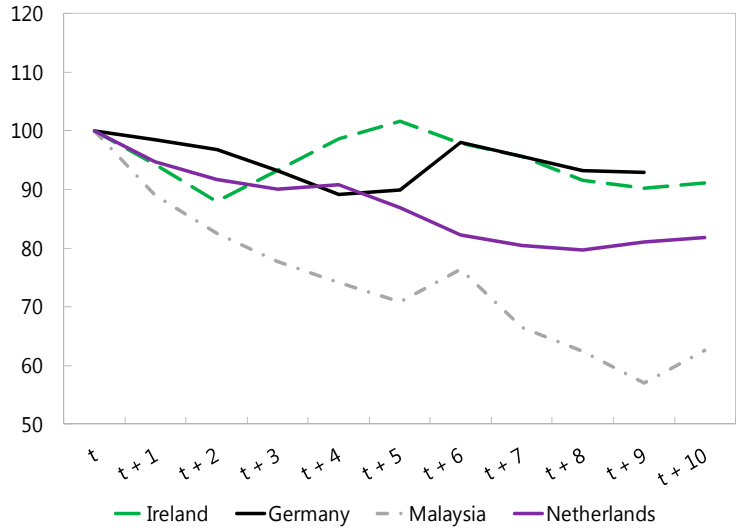


Source: IMF staff calculations.

40. Countries that opt to create fiscal space through spending measures should focus on rationalizing spending and improving efficiency. Such measures could include:

- ***Rationalizing spending.*** Spending on wages, subsidies and social benefits accounts for around three-quarters of total spending in advanced and emerging economies (Figure 12). Priority areas that could be examined for rationalization therefore include the government wage bill, especially where public sector wages and employment are high relative to the private sector; and social spending, in particular where it is poorly targeted. For example, in advanced economies, only one-fifth of total spending on family benefits was means-tested in 2011; and in low-income countries, social assistance programs are often prone to leakages and insufficient coverage of eligible populations (IMF, 2014f).

Figure 13. Public Wage Bill Post-Reform
(Index, reform period t = 100)



Source: ECB, Haver, IMF staff calculations, and WEO.

Country studies illustrate how public wage bill rationalization helped create fiscal space and contributed to wage moderation in the Netherlands, Ireland, Germany, and Malaysia (Figure 13). The redesign of social transfers formed part of broader adjustment packages in the Netherlands, Chile, Germany, and Poland.

- ***Improving efficiency.*** Many countries could enhance the delivery of essential public services while saving resources by improving the efficiency of spending. For example, at least 20-40 percent of health spending is typically wasted (World Health Organization, 2010), and, as noted earlier, there is scope for substantial gains in health indicators at current levels of spending (Grigoli and Kapsoli, 2013). With regard to education, trends in the wage bill in many advanced countries do not reflect the fact that teacher-student ratios are falling. Implementing a per-student financing formula such as in the Netherlands could ensure that wage costs remain in line with the number of students and potentially generate savings that could be used to enhance the quality of school infrastructure and teaching materials (IMF, 2014f). The potential for efficiency improvements also extends to quasi-fiscal activities. For instance, reform of inefficient SOEs and privatizations provided significant fiscal space in Chile, Tanzania, and Malaysia.

41. Policies to address negative environmental externalities can also create fiscal space. Fiscal policy has an important role to play in building greener economies and boosting environmentally sustainable growth by pricing environmental externalities and improving resource allocation. At the same time, eliminating energy subsidies and introducing environmental taxation can generate substantial fiscal resources:

- ***Generalized energy subsidies*** distort consumption and production decisions, and constitute a poor instrument for income redistribution (Arze del Granado and others, 2012). In 2015, spending on energy subsidies (on a post-tax basis) is projected to reach US$5.3 trillion (or 6½ percent of global GDP).

- ***Carbon or congestion taxes*** are aimed at reducing greenhouse gas emissions and pollution. Potential revenue gains from these environmental taxes could amount to 2.9 percent of global GDP (Gupta and Keen, forthcoming).

D. Growth and Equity

Income inequality affects growth in its own right and an overall assessment of growth-enhancing fiscal reforms needs to reflect their distributional consequences. While some growth-enhancing reforms can have a negative impact on income inequality, country studies illustrate strategies to mitigate equity-efficiency tradeoffs.

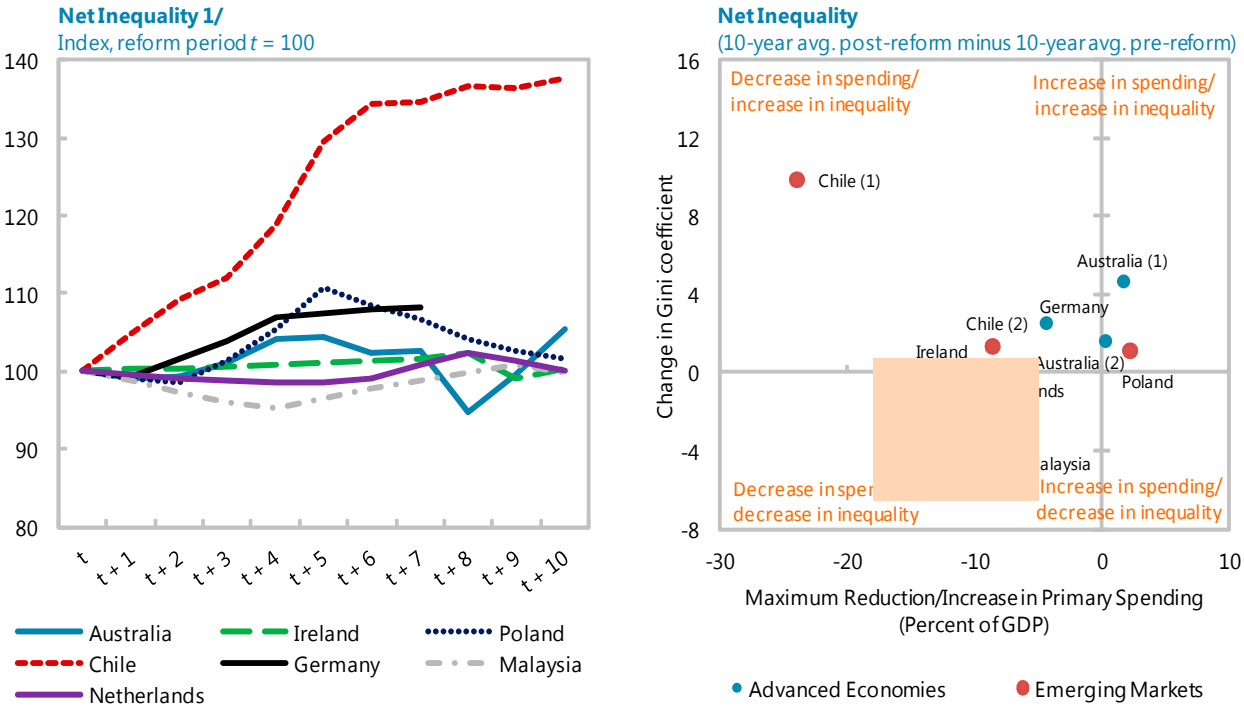
42. Income equality can lead to higher long-term growth through faster human and physical capital accumulation. At low levels of income, some degree of inequality can spur growth by raising savings and investment (Kaldor, 1957) and allowing at least a share of the population to start businesses and get a good education (Barro, 2000). However, with rising inequality the relationship may turn negative (Benhabib, 2003). Recent studies indicate that high levels of inequality are, overall, harmful for the pace and sustainability of growth (Berg, Ostry and Zettelmeyer, 2012; Ostry, Berg and Tsangarides, 2014). Education and health outcomes of the poor tend to be better in a more equal society, due to higher personal income, larger transfers from the government, and/or better public services. This can lead to a faster accumulation of human capital (Perotti, 1996; Galor and Moav, 2004; Aghion, Caroli, and Garcia-Penalosa, 1999). In addition, higher income equality can expand the size of domestic demand and support higher physical capital accumulation (Murphy, Shleifer and Vishny, 1989).[18]

43. Some reforms that increase efficiency have adverse distributional consequences. For instance, a shift from direct to indirect taxes, aimed at reducing distortions and promoting growth, can reduce the progressivity of the tax system and increase inequality. A reduction in social transfers—aimed at encouraging labor participation—might likewise have a detrimental impact on

[18] Improved equality can also create a more stable social and political environment, which can facilitate greater public acceptance of growth-enhancing reforms (Todaro, 1997; Ramey and Ramey, 1995; Hausmann and Gavin, 1996; Rodrik, 1999).

equity. In particular, measures such as public employment reductions or pension freezes can increase unemployment and reduce the purchasing power of lower income groups, with adverse consequences for the income distribution (Ball and others, 2013; Woo and others, 2013). In the country studies, inequality worsened especially where current spending cuts involved reductions in social benefits, including in Chile and Germany (Figure 14). In Australia, income inequality widened in part because the reforms in the 1980s increased wage dispersion, and the introduction of the GST in the early 2000s reduced the progressivity of the tax system (Singh and others, 1998; Greenville and others, 2013).

Figure 14. Trends in Inequality Post-Reform



Source: IMF staff calculations, SWIID 5.0.
1/ Refers to Gini coefficient after taxes and transfers.

44. Appropriately designed, fiscal reform packages can serve both growth and equity objectives.[19] Cross-country analysis finds that a reduction in inequality does not diminish the association between fiscal reforms and growth accelerations. For example, if the proceeds of a regressive, yet growth-enhancing tax reform are used to finance higher health and education spending, the overall outcome may be higher growth and lower inequality (Muñoz and Cho, 2004; IMF, 2014e). In particular, providing conditional cash transfers tied to the schooling of young

[19] Ostry, Berg and Tsangarides (2014) argue that on average fiscal redistribution has no clear direct negative consequence for growth and thus can indirectly promote sustainable growth.

children, especially girls, can reduce inequality and boost human capital. Reducing evasion and tax expenditures or loopholes that largely benefit the rich can simultaneously benefit growth and income equality (Blanchard and Cottarelli, 2010). More generally, a tax system that is perceived to be "fair" is associated with improved tax compliance (IMF, 2015c). Despite a sharp reduction in public spending, income inequality did not increase significantly after Ireland's first reform episode in the late 1980s. This reflects the composition of fiscal adjustment—specifically the fact that cuts in public sector wages and untargeted transfers turned out to be progressive—as well as the sharp increase in employment subsequent to reforms (Bastagli, Coady and Gupta, 2012; IMF 2014e). In Malaysia, spending to reduce ethnic inequality was protected when a 10 percent of GDP cut in primary spending was instituted during the second half of the 1980s. Measures that helped reduce inequality and poverty included the public provision of health and education services, in particular in rural areas; a system of targeted transfers; and education and technical training to facilitate mobility from agriculture to higher-value added activities.

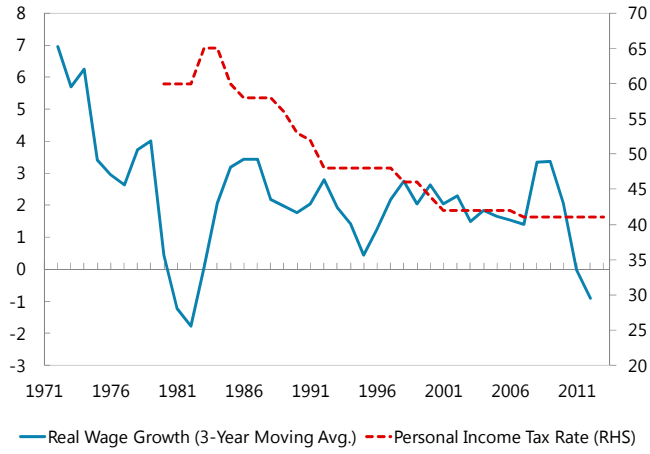
THE "HOW" MATTERS: DESIGN AND IMPLEMENTATION OF REFORMS

How fiscal reforms are designed and implemented are key determinants of their success in generating strong and sustained growth. The most critical considerations in this regard include social dialogue around key reform areas; policy complementarities; consistency with structural and macroeconomic policies; and policy credibility.

45. Social dialogue enhances the likelihood of reforms being implemented and sustained. In advanced economies public sector employment reforms that involved social dialogue resulted in much deeper and more sustained reductions in the wage bill (IMF, 2014f). Examples of such reform episodes include the Netherlands and Ireland. The Netherlands' *Wassenaar* agreement (1982) and Ireland's tripartite agreement (1987) facilitated the implementation of politically difficult measures such as cuts in benefits and wage moderation.

46. A number of strategies can help foster public support for reforms. Effective communication with stakeholders that emphasizes the intended benefits of reforms—or the cost of maintaining the status quo—can help mitigate resistance to reforms (as arguably occurred in Germany in 2003). Also, inclusion of compensatory measures for those expected to lose from reforms has been found to be effective in gaining public support for reform packages. In Ireland and the Netherlands, real wage growth reductions were compensated with tax cuts to mitigate the impact on disposable income (Figure 15); and cuts in social benefits were made more palatable by the promise of job-creation in the private sector. Common policy anchors can help forge consensus. In Poland, for instance, the prospect of EU-accession was critical in overcoming resistance to pension reform and reductions in social benefits. In most cases, countries apply a combination of strategies (Clements and others, 2013).

Figure 15. Ireland: Tax Cuts and Wage Moderation
(Percent)



Source: IMF staff calculations.

47. Successful fiscal reforms exploit policy complementarities to maximize their impact on growth, and are generally accompanied by supportive structural reforms and macroeconomic policies:

- ***Fiscal policy complementarities.*** In all countries studied, policy design helped fiscal measures reinforce each other. For example, in the Netherlands, Ireland and Germany, work incentives were enhanced by reducing benefits and income taxes. Countries simultaneously reduced corporate/personal income taxes and current spending, in order to stimulate private investment and employment while improving public finances (Poland, Australia, Ireland, Netherlands, Chile, and Malaysia). Complementary steps are often necessary to reap positive outcomes: for example, in a country with weak governance, scaling up public investment would need to be preceded by improvements in public financial management—which Tanzania strived to do. Staff's analysis of growth acceleration episodes points to the potential benefits of policy complementarities: the likelihood of growth acceleration is higher when expenditure and revenue reforms are combined.

- ***Supportive structural reforms in other areas.*** Broader structural reforms can help to boost medium-to long-term growth and magnify the impact of fiscal reforms. In the majority of the country studies, fiscal reforms were implemented together with other structural reforms. To boost employment, countries combined strengthened work incentives with labor market reforms aimed at facilitating job creation, such as streamlined hiring/firing procedures, changes in wage bargaining, and minimum wage cuts (Netherlands, Ireland, and Germany). In other cases, fiscal consolidation to create room for corporate tax reductions was pursued simultaneously with economic deregulation and privatizations (Netherlands, Malaysia, and Chile). In Tanzania, opening up the economy, including through trade liberalization, helped enhance the effectiveness of fiscal reforms and create a favorable environment for private-sector development.

- ***Consistent macroeconomic policies.*** Reform packages also require a "two-handed approach" (Blanchard and others, 1985) where macroeconomic policies support structural reforms. For example, a transitory loosening of the fiscal stance can buy valuable time to implement labor market reforms. In this regard, a slower pace of consolidation may be required to absorb the potential costs of structural reforms (IMF, 2014a).

48. The credibility of reforms can boost their effectiveness and impact on medium- to long-term growth. Recent evidence for advanced economies confirms that the establishment of a credible medium-term adjustment path matters more for instilling market confidence than the initial fiscal adjustment effort (Harris and others, 2013). Policy credibility can thus allow for an even distribution of adjustment effort over time—or even back-loading—and hence minimize the potential negative impact on longer-term growth from hysteresis effects (IMF, 2013b).

Table 1. Menu of Options: Fiscal Policies for Medium- to Long-Term Growth

	Advanced Economies	Emerging Economies	Low-Income Countries	Examples from Country Studies
Macroeconomic Stability (Section II.A)				
Reduce large fiscal deficits	xxx	xxx	xxx	Chile, Ireland, Malaysia, Netherlands
Adjust pace and composition of fiscal consolidation to protect growth	xxx	xxx	xxx	Ireland, Netherlands
Contain increase in age-related expenditure	xxx	xx	x	Germany, Poland, Australia
Structural Fiscal Policies (Section II.B)				
Policies to encourage labor supply				
Reduce labor taxes, especially at low income levels	xxx	xx	x	Ireland, Netherlands
Redesign unemployment benefits, including by tightening eligibility and shortening duration	xxx	xx	x	Netherlands, Germany
Provide in-work benefits and tax credits	xxx	xx	x	Germany, Netherlands
Increase use of active labor market programs (ALMPs)	xxx	xx	x	Germany
Stimulate labor force participation of:				
-women, including through individual taxation	xxx	xx	x	Ireland
-older workers, by restricting early retirement and providing tax incentives	xxx	xx	x	Australia, Germany, Netherlands
-low-skilled workers, through targeted ALMPs and use of in-work benefits	xxx	xx	x	Germany,Netherlands
Policies to enhance investment in physical capital				
Design a system that taxes excess returns on capital	xxx	xx	x	
Provide well-designed tax incentives that reduce the cost of capital	xxx	xx	xx	
Protect or increase the public capital stock	xxx	xxx	xxx	Poland, Tanzania, Malaysia
Enhance the productivity of public investment by strengthening the investment process	xx	xx	xxx	Tanzania
Policies to support human capital development				
Provide access to education for disadvantaged groups by:				
-spending more at lower levels	xxx	xxx	xxx	Ireland, Tanzania, Uganda
-increasing cost-recovery for tertiary education	xxx	xx	xxx	
-conditioning cash transfers on school enrollment	xx	xxx	xxx	
Expand access to basic healthcare by:				
-reducing user charges for low-income households	xxx	xxx	xxx	Tanzania, Uganda, Chile
-addressing supply-side barriers in less developed areas	x	xxx	xxx	Tanzania, Uganda
-conditioning cash transfers on preventive health visits	x	xxx	xxx	
Policies to increase total factor productivity and promote technological progress				
Grant tax credits or deductions for R&D	xxx	xx	x	Ireland, Poland, Malaysia
Increase public R&D spending	xxx	xx	x	Netherlands
Provide more efficient public infrastructure	xxx	xxx	xxx	Poland, Tanzania, Malaysia
Fiscal Space (Section II.C)				
Revenue measures				
Use indirect, property/wealth and environmental taxes to raise revenue	xxx	xxx	xxx	Chile, Poland
Broaden tax base, including by reducing exemptions and preferential regimes	xxx	xxx	xxx	Australia, Malaysia, Uganda
Improve revenue administration and simplify forms and procedures	x	xx	xxx	Chile, Malaysia, Tanzania, Uganda
Expenditure measures				
Rationalize the public wage bill	xxx	xxx	xxx	Chile, Germany, Ireland, Netherlands, Malaysia
Improve the design of social spending programs by better targeting	xx	xxx	xxx	Chile, Germany, Ireland, Netherlands, Poland
Improve the efficiency of spending through targeted sectoral reforms, e.g. in health or education	xxx	xxx	xxx	Netherlands
Eliminate generalized subsidies, especially for energy products	x	xxx	xxx	
Reform inefficient SOEs	x	xxx	xxx	Chile, Malaysia, Tanzania
Equity and Growth (Section II.D)				
Include mitigating measures when implementing potentially regressive reforms (e.g. increasing indirect taxes)	xxx	xxx	xxx	Ireland, Malaysia
Growth-enhancing reforms that also help equity include closing tax loopholes used by the wealthy and targeted CCTs	xxx	xxx	xxx	
Policy Design and Complementarity (Section III)				
Build social consensus through effective communication and/or compensating losers	xxx	xxx	xxx	Ireland, Netherlands
Complement fiscal reforms with other structural reforms and consistent macroeconomic policies	xxx	xxx	xxx	Chile, Germany, Ireland, Malaysia, Netherlands

Note: 'xxx' denotes highly relevant policy, 'xx' denotes moderately relevant policy and 'x' denotes less relevant policy.

LESSONS FOR POLICYMAKERS: AN AGENDA FOR REFORM

49. There are many ways in which fiscal policy can support medium- to long-term growth (Table 1). In designing growth-friendly fiscal policies, consideration should be given to country-specific needs, circumstances, and administrative capacities.

✓ **Macroeconomic stability is an essential prerequisite for strong and sustained growth.**

- Large fiscal deficits reduce aggregate savings in the economy and may lead to inflation, high interest rates, and balance of payments pressures. Policy uncertainty, high levels of public debt, and high inflation, can deter private investment.
- Fiscal frameworks that facilitate the symmetric functioning of automatic stabilizers can reduce macroeconomic volatility and uncertainty and foster medium-term growth.
- Careful consideration needs to be given to the pace of fiscal consolidation. Countries that are not under market pressure should proceed with gradual fiscal consolidation, anchored in a credible medium-term plan.
- The composition of adjustment matters for growth. Expenditure-based consolidations are typically more durable and supportive of longer-term growth; however, in some cases revenue-based consolidations may be more appropriate and equity-friendly.
- Not all countries need to adjust, however: many low-income countries may have fiscal space for productive spending on infrastructure and critical social services.

✓ **Policy design and social consensus matter for the successful implementation of reforms.**

- Structural reforms can promote savings, stimulate investment, and unlock productivity gains. To be successful, fiscal measures should be mutually reinforcing and may need to be accompanied by supportive structural reforms and macroeconomic policies.
- Appropriately designed fiscal reform packages can serve both growth and equity objectives: for example, if revenue from relatively regressive tax reforms is used to finance higher health and education spending, the overall result can be higher growth and lower inequality.
- Social consensus increases the likelihood of reforms being implemented and sustained. A number of strategies can help foster public support for reforms, including effective communication with stakeholders, and compensatory measures for those expected to lose from reforms.

✓ **Specific tax and expenditure policies can help growth.**

Policies to increase the labor supply

In many advanced economies, significant distortions arise from the tax-benefit system:

- Lowering the labor tax wedge increases after-tax earnings and the supply of labor, particularly for younger workers, women and the low-skilled;
- Redesigning unemployment benefits by conditioning eligibility on participation in ALMPs and increasing the use of in-work benefits can better support job-seekers—especially unemployed youth— and strengthen work incentives;
- Introducing targeted measures can encourage the labor force participation (LFP) of particular groups:
  - → *Women*: improving the design of family benefits, including paid parental leave; providing more flexible work options; and ensuring the availability of affordable child care;
  - → *Older workers:* lowering implicit taxes on continuing work, increasing the effective retirement age, and adjusting pension benefits to actuarially fair levels that do not distort participation decisions, while ensuring effective protection against old-age poverty; and
  - → *Low- skilled workers*: providing in-work tax credits, hiring subsidies, and tailored support through ALMPs.
- Promoting equitable access to education, and dismantling legal obstacles to work for women could increase LFP in developing economies.

Policies to enhance investment in physical capital

- In advanced economies, reforming the corporate income tax to tax "excess returns" or rents, e.g., through an allowance for corporate equity (ACE), can reduce distortions and stimulate private investment;
- In developing economies, avoiding open-ended tax holidays that erode the tax base indefinitely and providing instead targeted and transparent incentives that reduce the cost of capital, such as accelerated depreciation schemes, investment tax credits, and super deductions, can promote investment; and
- Putting in place efficient public investment processes and prioritizing infrastructure can help reverse the decline in public capital stocks in advanced economies and help close

infrastructure gaps in developing economies. This can boost growth directly and indirectly by raising the productivity of private capital.

Policies to support human capital development

- Human capital accumulation can be supported by improving access to education for disadvantaged groups and increasing investment in lower levels of education; as well as ensuring universal access to a basic package of health services by reducing or waiving user charges for poor households.
- In developing economies, addressing supply-side barriers in remote areas and conditioning cash transfers on school attendance and preventive health visits can further promote access to health and education services; and
- In advanced economies, allowing for deductibility of education expenses or providing tax credits can encourage private investment in education.

Policies to increase total factor productivity

- In line with administrative capacities, countries can pursue improvements in productivity through targeted and transparent tax incentives such as tax credits that reduce the cost of R&D and encourage investment in new technologies.
- In most developing and many advanced economies, better public infrastructure can lift growth through both the investment channel and through total factor productivity.

✓ **If growth-friendly reforms require fiscal space, resources should be made available in the least harmful way for growth and equity.**

- Broadening the tax base by rationalizing tax exemptions and preferential regimes raises revenue and boosts horizontal equity.
- Shifting the tax composition to the least distortionary taxes such as taxes on consumption, increases efficiency. Taxes on property or wealth can also increase the progressivity of the tax system.
- Improvements in revenue administration including through introducing risk management techniques, segmenting taxpayers, and simplifying laws and procedures, can strengthen taxpayer compliance and enhance revenue collection as well as equity.
- Rationalizing the government wage bill where public sector wages and employment are high relative to the private sector; and improving the targeting of social spending can increase expenditure efficiency.

- Addressing environmental externalities by phasing out energy subsidies and introducing environmental taxation can create fiscal space while facilitating implementation of growth-enhancing measures, such as lower wage taxation.

- For countries facing difficulties in expanding fiscal space, the focus should be on budget-neutral fiscal reforms.

ISSUES FOR DISCUSSION

50. This paper finds that fiscal policy can play an important role in strengthening sustained and inclusive growth. Directors' views and guidance on the analysis and recommendations contained therein would be welcome. Specifically:

- Do Directors agree that fiscal policy can be an effective tool for supporting medium- to long-run growth?

- Do Directors agree that the mix of fiscal policy options should be tailored to country-specific conditions, administrative capacities and preferences?

- Do Directors agree that the growth dividends of fiscal reforms depend to a large degree on complementary structural reforms and supportive macroeconomic policies?

- Do Directors agree that strategies such as effective communication with stakeholders, and compensatory measures for those made worse off can help foster public support for fiscal reforms?

- Do Directors agree that both growth and equity objectives can be achieved when fiscal reform packages are appropriately designed?

- In cases where countries need to mobilize resources to create space for growth-friendly policies, do Directors agree that the tax and spending policies identified in the paper are the least harmful for growth?

References

Abadie, A., A. Diamond and J. Hainmueller, 2010, "Synthetic Control Methods for Comparative Case Studies: Estimating the Effect of California's Tobacco Control Program," *JASA*, Vol. 105, No. 490, pp. 493-505.

Abbas, A. and A. Klemm, with S. Bedi and J. Park, 2012, "A Partial Race to the Bottom: Corporate Tax Developments in Emerging and Developing Economies," IMF Working Paper No. 12/28 (Washington: International Monetary Fund).

Abbring, J., G. Berg and J. Ours, 2005, "The Effect of Unemployment Insurance Sanctions on the Transition Rate from Unemployment to Employment," *Economic Journal*, Vol. 115(505), pp 602-630.

Abdon, A., Estrada, G.B., Lee, M. and D. Park, 2014, "Fiscal Policy and Growth in Developing Asia", ADB Economics Working Paper No. 412 (Asian Development Bank).

Acosta-Ormaechea, S., and J. Yoo, 2012, "Tax Composition and Growth: A Broad Cross-Country Perspective," IMF Working Paper No. 12/257 (Washington: International Monetary Fund).

Acosta-Ormaechea, S. and Morozumi, A., 2013, "Can a Government Enhance Long-Run Growth by Changing the Composition of Public Expenditure?" IMF Working Paper 13/162 (Washington: International Monetary Fund).

Adam, C. and D. Bevan, 2013, "Fiscal deficits and growth in developing countries," *Journal of Public Economics*, Vol. 89(4), pp. 571-597.

Agénor, P-R., 2010, "A Theory of Infrastructure-led Development," *Journal of Economic Dynamics and Control*, Elsevier, vol. 34(5), pp. 932-950.

Aghion, P., E. Caroli, and C. Garcia-Peñalosa, 1999, "Inequality and Economic Growth: The Perspective of the New Growth Theories," *Journal of Economic Literature*, Vol. 37(4), pp. 1615–1660.

Aghion, P., P. Howitt, and F. Murtin, 2010, "The Relationship between Health and Growth: when Lucas Meets Nelson-Phelps," NBER Working Paper No. 15813 (Cambridge, Massachusetts: National Bureau of Economic Research).

Aghion, P., D. Hémous and E. Kharroubi, 2014, "Cyclical Fiscal Policy, Credit Constraints, and Industry Growth," *Journal of Monetary Economics*, Vol. 62, pp. 41-58.

Alesina, A. and S. Ardagna, 1998. "Tales of Fiscal Adjustment", Economic Policy, Vol. 13(27), pp. 487-545.

———, 2012, "The Design of Fiscal Adjustments", NBER Working Paper Series, No. 18423 (Cambridge, Massachusetts: National Bureau of Economic Research).

Alesina, A., Ardagna, S., Perotti, R. and F. Schiantarelli, 2002. "Fiscal Policy, Profits, and Investment", *American Economic Review*, 92(3), pp. 571-589.

Alesina, A., S., Perotti, 1995, "Fiscal Expansions and Fiscal Adjustments in OECD Countries," NBER Working Paper No. 5214.

———, 1996, "Fiscal Adjustments in OECD Countries: Composition and Macroeconomic Effects," NBER Working Paper No. 5730.

Arnold, J., B. Brys, Ch. Heady, Å. Johansson, C. Schwellnus and L. Vartia, 2011, "Tax Policy For Economic Recovery and Growth," *The Economic Journal*, Vol. 121, pp. F59-F80.

Arze del Granado, F. J., D. Coady, and R. Gillingham, 2012, "The Unequal Benefits of Fuel Subsidies: A Review of Evidence for Developing Countries," *World Development*, Vol. 40, Issue 11, pp. 2234-2248.

Aus dem Moore, N., 2014. "Corporate Taxation and Investment: Evidence from the Belgian ACE Reform," Ruhr Economic Papers 0534, Rheinisch-Westfälisches Institut für Wirtschaftsforschung, Ruhr-Universität Bochum, Universität Dortmund, Universität Duisburg-Essen.

Baier, Scott L. & Glomm, Gerhard, 2001. "Long-run growth and welfare effects of public policies with distortionary taxation," Journal of Economic Dynamics and Control, Elsevier, vol. 25(12), pages 2007-2042, December.

Baldacci, E., B. Clements, S. Gupta, and C. Mulas-Granados, 2004, "Persistence of Fiscal Adjustments and Expenditure Composition in Low-Income Countries," in *Helping Countries Develop, The Role of Fiscal Policy*, Editors. S. Gupta, B. Clements and G. Inchauste, (Washington: International Monetary Fund).

Baldacci, E., B. Clements, S. Gupta, and Q. Cui, 2008, "Social Spending, Human Capital, and Growth in Developing Countries," *World Development*, Vol. 36(8), pp. 1317-1341.

Baldacci, E., Gupta, S. and C. Mulas-Granados Debt, forthcoming, "Debt Reduction, Fiscal Adjustment, and Growth in Credit-Constrained Economies", *Journal of Applied Economics*.

Ball, L., Furceri, D., Leigh, D. and P. Loungani, 2013, "The Distributional Effects of Fiscal Austerity," IMF Working Paper No. 13/151 (Washington: International Monetary Fund).

Banerji, A., S. Saksonovs, L. Huidan, and R. Blavy, 2014, "Youth Unemployment in Advanced Economies in Europe: Searching for Solutions," IMF Staff Discussion Note SDN/14/11 (Washington: International Monetary Fund).

Barbiero, O. and B. Cournède (2013), "New Econometric Estimates of Long-term Growth Effects of Different Areas of Public Spending", *OECD Economics Department Working Papers*, No. 1100 (Paris: Organisation for Economic Co-operation and Development).

Barr, N., 2012, *Economics of the Welfare State* (Oxford: Oxford University Press).

Barro, R., and Xavier Sala-i-Martin, 1992, "Public Finance in Models of Economic Growth," The Review of Economic Studies, Vol. 59, Issue 4 (October), pp. 645-661.

Barro, R. J., 2000, "Inequality and Growth in a Panel of Countries," *Journal of Economic Growth*, Vol. 5(1), pp. 5–32.

_____, 2001, "Human Capital and Growth", *American Economic Review*, 91(2), pp. 12-17.

Bastagli, F., D. Coady and S. Gupta, 2012, "Income Inequality and Fiscal Policy," IMF Staff Discussion Note SDN/12/08 (Washington: International Monetary Fund).

Benhabib, J. 2003, "The Tradeoff Between Inequality and Growth," *Annals of Economics and Finance, Society for AEF*, vol. 4(2), pp. 491-507.

Berg, A., Borensztein, E., and C. Pattillo, 2005, "Assessing Early Warning Systems: How Have They Worked in Practice?" *IMF Staff Papers*, Vol. 52(3), pp. 462–502.

Berg, A., J. D. Ostry, and J. Zettelmeyer, 2012, "What Makes Growth Sustained?" *Journal of Development Economics*, Vol. 98(2), pp. 149–66.

Berg, A., and C. Pattillo, 1999, "Predicting Currency Crises: The Indicators Approach and An Alternative" *Journal of International Money and Finance*, Vol. 18, pp. 561–586.

Blanchard, O., Dornbusch, R., Dreze, J., Giersch, H., Layard, R., M. Monti, 1985, "Employment and Growth: A Two-handed Approach," *Center for European Policy Studies*, Economic Papers No. 36, June 1985. II/344/85-EN.

Blanchard, O. and Cottarelli, C., 2010, "Ten Commandments for Fiscal Adjustment in Advanced Economies," IMFdirect, Global Economy Forum.

Blau, F. and L. M. Kahn, 2013, "Female Labor Supply: Why is the United States Falling Behind," *American Economic Review*, 103(3): pp. 251-56.

Bleaney, M., N. Gemmell and R. Kneller, 2001, "Testing the Endogenous Growth Model: Public Expenditure, Taxation, and Growth over the Long Run," Canadian Journal of Economics, Vol. 34(1).

Blundell, R., 2014, "How Responsive is the Labor Market to Tax Policy?" *IZA World of Labor*, Institute for the Study of Labor (May), pp. 1-10.

Bom, P.R.D., J. E. Ligthart, 2009. "How Productive is Public Capital? A Meta-Regression Analysis," Working Paper No. 0912, International Center for Public Policy, Andrew Young School of Policy Studies, Georgia State University.

Bovenberg, A.L., Hansen, M. I. and P.B. Sorenson, 2012, "Efficient Redistribution of Lifetime Income Through Welfare Accounts," *Fiscal Studies*, Vol. 33, No. 1, pp.1–37.

Cecchetti, S. G., Mohanty, M. S. and F. Zampolli, 2011, "The Real Effects of Debt," BIS Working Paper No. 352. (Basel: Bank for International Settlements).

Chen, B. and C. Lu, 2013, "Optimal Factor Tax Incidence in Two-Sector Human Capital-Based Models," *Journal of Public Economics,* Vol. 97, pp. 75-94.

Cheng, K., Rehman,D. Seneviratne, and S. Zhang, forthcoming, "Global Value Chains and Economic Complexity: Will it Help Asia?" Working Paper (forthcoming), (Washington: International Monetary Fund).

Chirinko, R. and D. J. Wilson, 2010, "Job Creation Tax Credits and Job Growth: Whether, When, and Where?" Federal Reserve Bank of San Francisco Working Paper 2010–25.

Clements, B., R. Bhattacharya, and T. Q. Nguyen, 2004, External Debt, Public Investment, and Growth in Low Income Countries," in *Helping Countries Develop, The Role of Fiscal Policy*, eds. S. Gupta, B. Clements and G. Inchauste, (Washington: International Monetary Fund).

Clements, B., Coady, D., Fabrizio, S., Gupta, S., Serge, T., Alleyne, C., and C. A. Sdralevich, 2013, *Energy Subsidy Reforms: Lessons and Implications* (Washington: International Monetary Fund).

Clements, B., D. Coady, and S. Gupta, eds., 2012, *The Economics of Public Health Care Reform in Advanced and Emerging Economies* (Washington: International Monetary Fund).

Clements, B., Eich, F. and S. Gupta, 2014, *Equitable and Sustainable Pensions: Challenges and Experience* (Washington: International Monetary Fund).

Cottarelli, C. and M. Keen, 2012, "Fiscal Policy and Growth: Overcoming the Constraints," in *Ascent after Decline, Regrowing Global Economies after the Great Recession*, eds. O. Canuto and D.M. Leipziger.

Crivelli, E. and S. Gupta, 2014, "Does Conditionality in IMF-Supported Programs Promote Revenue Reform?" IMF Working Paper No. 14/206 (Washington: International Monetary Fund).

Cubeddu, L, Bauer,A. Berkman, P., Kandil, M. Nassar, K. and P. Mullins, 2008, "Tax Incentives and Foreign Direct Investment: Policy Implications for the Caribbean," in *The Caribbean: Enlarging Economic Integration*, ed. by Andreas Bauer, Paul Lashin, and Sanjaya Panth, pp. 44–84 (Washington: International Monetary Fund).

Cuberes, D., and M. Teignier, 2014, "Aggregate Costs of Gender Gaps in the Labor Market: A Quantitative Estimate." UB Economics Working Paper 2014/308.

Dabla-Norris, E., J. Brumby, A. Kyobe, Z. Mills, and C. Papageorgiou, 2012, "Investing in public investment: an index of public investment efficiency," *Journal of Economic Growth*, 17(3), pp. 235-266.

Das, S., Jain-Chandra, S., Kochhar, K. and N. Kumar, 2015, "Women Workers in India: Why So Few Among So Many? IMF Working Paper No. 15/55 (Washington: International Monetary Fund).

Davoodi HR, Tiongson ER, Asawanuchit SS. 2010. Benefit incidence of public education and health spending worldwide: evidence from a new data base. Poverty & Public Policy

De Long, J.B., and L. Summers, 2012, "Fiscal Policy in a Depressed Economy" *Brookings Papers on Economic Activity*, Economic Studies Program, The Brookings Institution, Vol. 44(1), pp. 233-297.

De Mooij, R. A., 2011, "Tax Biases to Debt Finance: Assessing the Problem, Finding Solutions", IMF Staff Discussion Note SDN/11/11 (Washington: International Monetary Fund)

_____, 2008, "Reinventing the Dutch Tax-Benefit System: Exploring the Frontier of the Equity-Efficiency Trade-off," *International Tax and Public Finance*, Vol. 15, No. 1, pp. 87–103.

Devereux, M. and D. Love, 1994, "The Effects of Factor Taxation in a Two-Sector Model of Endogenous Growth" *The Canadian Journal of Economics,* Vol. 27(3), pages 509-536.

Dhont, T. and F. Heylen, 2009, "Employment and growth in Europe and the US: the role of fiscal policy composition," *Oxford Economic Papers,* 61, pp. 538-565.

Easterly, W., and S. Rebelo, 1993, "Fiscal Policy and Economic Growth: An Empirical Investigation," *Journal of Monetary Economics*, Vol. 32 (December), pp. 417-58.

Elborgh-Woytek, K., Newiak, M. Kochhar, K., Fabrizio, S., Kpodar, K., Wingender, P., Clements, B. and G. Schwartz, 2013, "Women, Work, and the Economy: Macroeconomic Gains from Gender Equity," Staff Discussion Note SDN/13/10 11 (Washington: International Monetary Fund).

Everaert, G., Heylen, F. and R. Schoonackers, 2014, "Fiscal policy and TFP in the OECD: Measuring Direct and Indirect Effects", Working Paper Research 274 (National Bank of Belgium).

Fatás, A., and I. Mihov, 2013, "Policy Volatility, Institutions and Economic Growth," *The Review of Economics and Statistics*, Vol. 95, No. 2, pp. 362–76.

Feldstein, 2014, "Raising Revenue by Limiting Tax Expenditures" NBER Working Paper No. 20672 (Cambridge, Massachusetts: National Bureau of Economic Research).

Fischer, S., 1993, "The Role of Macroeconomic Factors in Growth," *Journal of Monetary Economics*, 32, pp. 485-512.

Fisher, W. H., and C. Keuschnigg, 2002, "Public Policy for Efficient Education," *Metroeconomica*, Vol. 53, Issue 4, pp. 361-390.

Fiszbein, A., and N. Shady, 2009, Conditional Cash Transfers: Reducing Present and Future Poverty (Washington: World Bank).

Futagami, K., Y. Morita and A. Shibata, 1993, "Dynamic Analysis of an Endogenous Growth Model with Public Capital," *Scandinavian Journal of Economics*, Vol. 95, pp. 607-25.

Galor, O., and O. Moav, 2004, "From Physical to Human Capital Accumulation: Inequality and the Process of Development," *Review of Economic Studies,* Oxford University, Vol. 71 (4), pp. 1001-1026.

Gemmell, N., F. Misch, B. Moreno-Dodson, 2012. "Public Spending for Long-Run Growth: A Practitioners' View," World Bank - Economic Premise, Issue 99, pp 1-4 (Washington: World Bank).

Gerson, P., 1998, "The Impact of Fiscal Policy Variables on Output Growth," IMF Working Paper WP/98/1 (Washington: International Monetary Fund).

Ghosh, S. and A. Gregoriou, 2008, "The Composition of Government Spending and Growth: Is Current or Capital Spending Better?" *Oxford Economic Papers*, 60 (3), pp. 484-516.

Gonzalez, C., S. Jain-Chandra, K.Kochhar and M. Newiak, 2015, "Fair Play: More Equal Laws Boost Female Labor Force Participation," Staff Discussion Note, SDN/15/02, (Washington: International Monetary Fund).

Grosh, M., del Ninno, C., Tesliuc, E. and A. Ouerghi, 2008, *From Protection to Promotion: The Design and Implementation of Effective Safety Nets* (Washington: World Bank).

Greenville, J., Pobke, C., and N. Rogers, 2013, "Trends in the Distribution of Income in Australia," Productivity Commission Staff Working Paper (Canberra).

Grigoli, F., 2014, "A Hybrid Approach to Estimating the Efficiency of Public Spending on Education in Emerging and Developing Economies," Working Paper 14/19 (Washington: International Monetary Fund).

_____, and J. Kapsoli, 2013, "Waste Not, Want Not: The Efficiency of Health Expenditure in Emerging and Developing Countries," IMF Working Paper 13/87 (Washington: International Monetary Fund).

Gupta, S., B. Clements, E. Baldacci and C. Mulas-Granados, 2005, "Fiscal policy, expenditure composition, and growth in low-income countries," *Journal of International Money and Finance, Elsevier,* vol. 24(3), pages 441-463.

Gupta, S., Kangur, A., Papageorgiou, C. and A. Wane, 2014, "Efficiency-Adjusted Public Capital and Growth," *World Development* Vol. 57, pp. 164–178.

Gupta, S., and M. Keen, forthcoming, "Global Energy Subsidies: An Update" Blog, (Washington: International Monetary Fund).

Gupta, S., G. Schwartz, S. Tareq, R. Allen, I. Adenauer, K. Fletcher, and D. Last, 2007, "Fiscal Management of Scale-Up Aid," IMF Working Paper No. 07/222 (Washington: International Monetary Fund).

Hanushek, E., and L. Woessmann, 2011, "The Economics of International Differences in Educational Achievement," in *Handbook of the Economics of Education*, Vol. 3, ed. by E. Hanushek, S. Machin, and L. Woessmann, (Amsterdam: North Holland).

Harris, J., R. Hughes, G. Ljungman, and C. Sateriale, 2013, "*Medium-Term Budget Frameworks in Advanced Economies: Objectives, Design, and Performance"* in "Public Financial Management and its Emerging Architecture" editors, M. Cangiano, T. Curristine, and M. Lazare (Washington, D.C. : International Monetary Fund)

Hausmann, R. and M. Gavin, 1996, "Securing Stability and Growth in a Shock-Prone Region: The Policy Changes for Latin America," in *Securing Stability and Growth in Latin America*, R. Hausmann and H. Reisen, eds. (Paris: Organization for Economic Co-operation and Development), pp. 23-64.

Hausmann, R., Pritchett, L., and Rodrik, D., 2005, "Growth Accelerations," *Journal of Economic Growth,* 10: pp. 303–29.

Heckman, J. and P. Klenow, 1997, "Human Capital Policy", Mimeo, University of Chicago, (December).

Heller, P, 2005, "Understanding Fiscal Space," IMF Policy Discussion Paper No. PDP/05/4 (Washington: International Monetary Fund).

Hijzen, A., and D. Venn, 2011, "The Role of Short-Time Work Schemes During the 2008–09 Recession," OECD Social, Employment and Migration Working Papers No. 115 (Paris: Organisation for Economic Co-operation and Development).

Hüfner, F. and C.Klein, 2012, "The German Labour Market: Preparing for the Future", OECD Economics Department Working Papers, No. 983, OECD Publishing (Paris: Organization for Economic Co-operation and Development).

Hynes, T. and B. O'Connor, 2014, "An Economic Approach to Evaluate the R&D Tax Credit in Ireland," Working Paper, An Roinn Airgeadais Department of Finance.

IDB, (forthcoming), "Fiscal Policy for Sustainable and More Equitable Growth in Latin America and the Caribbean.

Immervoll, H., and M. Pearson, 2009, "A Good Time for Making Work Pay? Taking Stock of In-Work Benefits and Related Measures across the OECD," IZA Policy Paper No. 3 (Bonn: Institute for the Study of Labor).

International Monetary Fund, (IMF), 2010, "From Stimulus to Consolidation: Revenue and Expenditure Policies in Advanced and Emerging Economies" (Washington: International Monetary Fund).

_____, 2011, "Revenue Mobilization in Developing Countries" (Washington: International Monetary Fund).

_____, 2012, "Fiscal Policy and Employment in Advanced and Emerging Economies" (Washington: International Monetary Fund).

_____, 2013a (October), *Fiscal Monitor: Taxing Times*, (Washington: International Monetary Fund).

_____, 2013b, "Reassessing the Role and Modalities of Fiscal Policy in Advanced Economies" (Washington: International Monetary Fund).

_____, 2014a, (October), *Fiscal Monitor: Back to Work, How Fiscal Policy Can Help* (Washington: International Monetary Fund).

_____, 2014b, World Economic Outlook, October 2014 (Washington: International Monetary Fund).

_____, 2014c, "Spillovers in International Corporate Taxation" (Washington: International Monetary Fund).

_____, 2014d, *Getting Energy Prices Right; From Principle to Practice* (Washington: International Monetary Fund).

_____, 2014e, "Fiscal Policy and Income Inequality", Policy Paper, (Washington: International Monetary Fund).

_____, 2014f, (April) *Fiscal Monitor: Public Expenditure Reform, Making Difficult Choices* (Washington: International Monetary Fund).

_____, 2014g, "Budget Institutions in G-20 Countries: An Update" (Washington: International Monetary Fund).

_____, 2015a, *Fiscal Monitor: Now Is the Time: Fiscal Policies for Sustainable Growth*, (Washington: International Monetary Fund).

_____, 2015b," Current Challenges in Revenue Mobilization: Improving Tax Compliance" (Washington: International Monetary Fund).

_____, 2015c, "Fair Taxation," Presented at the Meeting of Arab Ministers of Finance and Central Bank Governors, April 7, Kuwait City, Kuwait.

_____, forthcoming (April 2015*)*, "Capturing a Bigger Slice of the Pie in Global Value Chains*," Asia and Pacific Regional Economic Outlook* (Washington: International Monetary Fund).

_____, forthcoming, "Making Public Investment More Efficient" (Washington: International Monetary Fund).

_____, World Bank, OECD, UN, (forthcoming), "Options for Low-Income Countries' Effective and Efficient Use of Tax Incentives for Investment".

James, S., 2013, "Tax and Non-Tax Incentives and Investments: Evidence and Policy Implications," FIAS, World Bank Group, Washington, DC.

Jamison, D., L. H. Summers, G. Alleyne, K. J. Arrow, S. Berkley, A Binagwaho, F. Bustreo, and others, 2013, "Global Health 2035: A World Converging within a Generation," *Lancet,* Vol. 382, pp. 1898–1955.

Jaramillo, L. and C. Cottarelli, 2013, "Walking Hand in Hand: Fiscal Policy and Growth in Advanced Economies," *Review of Economics and Institutions*, Vol. 4(2), pp.1-25.

Jones, L., R. Manuelli and P. Rossi, 1993, "Optimal Taxation in Models of Endogenous Growth," *Journal of Political Economy,* Vol. 101(3), pages 485-517.

Kaldor, N., 1957, "A model of economic growth," *The Economic Journal*, Vol. 67, No. 268, pp. 591-624.

Kaminsky, G., Lizondo, S., and C. Reinhart, 1998, "Leading Indicators of Currency Crises," IMF Staff Papers, Vol. 45, pp. 1–48.

Kaminsky, G., and C. Reinhart, 1999, "The Twin Crises: The Causes of Banking and Balance-of-Payments Problems," *American Economic Review*, Vol. 89, pp. 473–500.

King, R. and S. Rebelo, 1990, "Public Policy and Economic Growth: Developing Neoclassical Implications," *Journal of Political Economy,* Vol. 98(5).

Klemm, A. 2006, "Allowances for Corporate Equity in Practice," IMF Working Paper No. 06/259 (Washington: International Monetary Fund).

Kim, S., 1998, "Growth Effect of Taxes in an Endogenous Growth Model: To what Extent do Taxes Affect," Economic Growth?" *Journal of Economic Dynamics and Control,* Vol. 23, pages 125-158.

Krugman, P., 1988, "Financing vs. Forgiving a Debt Overhang", NBER Working Paper No.2486, (Cambridge Massachusetts: National Bureau of Economic Research).

Kumar, M. and J. Woo, 2010, "Public Debt and Growth," IMF Working Paper No. 10/174 (Washington: International Monetary Fund).

Lucas R., 1988, "On the Mechanics of Economic Development," *Journal of Monetary Economics*, Vol. 22, pp. 3-42.

_____, 1990, "Supply-Side Economics: An Analytical Review," *Oxford Economic Papers,* Vol. 42(2), pp. 293-316.

Lustig, N., S. Higgins, M. Jaramillo, W. Jimenez, G. Molina, V. Paz Arauco, C. Pereira, C. Pessino, J. Scott, and E. Yañez, 2011, "Fiscal Policy and Income Distribution in Latin America: Challenging the Conventional Wisdom," Tulane Economics Working Paper 1124 (New Orleans: Tulane University).

Mankiw, G., Romer, D. and D. Weil, 1992, "A Contribution to the Empirics of Economic Growth," *The Quarterly Journal of Economics*, pp. 407-437.

McDermott, C. and R. Wescott, 1996, "An Empirical Analysis of Fiscal Adjustments," IMF Working Paper No. 96/59, (Washington: International Monetary Fund).

Meyer, B. D., 2002, "Labor supply at the extensive and intensive margins: The EITC, Welfare, and Hours Worked", *American Economic Review*, 92(2), pp. 373-379.

Milesi-Ferretti, Gian Maria and Nouriel Roubini, 1998, 'Growth Effects of Income and Consumption Taxes' (1998) 30(4) *Journal of Money, Credit and Banking* 721-744.

Mirrlees, J., Adam, S., Besley, T., Blundell, R., Bond, S., Chote, R., Gammie, M., Johnson, P., Myles, G. and J. Poterba, 2011, *Tax by Design* (Oxford: Oxford University Press)

Munnell, Alicia H., 1992. "Policy Watch: Infrastructure Investment and Economic Growth." Journal of Economic Perspectives, 6(4): pp. 189-198.

Muñoz, S. and S.S. Cho, 2004, "Social Impact of a Tax Reform: The Case of Ethiopia," in *Helping Countries Develop, The Role of Fiscal Policy*, Editors. S. Gupta, B. Clements and G. Inchauste, (Washington: International Monetary Fund).

Murphy, K., A. Shleifer and R. Vishny, 1989, "Industrialization and big push," *Journal of Political Economy*, Vol 87, pp. 1003-25.

Organization for Economic Co-operation and Development (OECD), 2006, *Employment Outlook*, (Paris: Organization for Economic Co-operation and Development)

———, 2010a, "Tax Policy Reform and Economic Growth" (Paris: Organization for Economic Co-operation and Development)

———, 2010b, "Income Distribution and Growth: Outline and Literature Review, Working Party No. 1 on Macroeconomic and Structural Policy Analysis," Economics Department Working Paper ECO/CPE/WP1 (2010) 16 (Paris: Organization for Economic Co-operation and Development).

———, 2011a, "Taxation and Employment", OECD Tax Policy Studies No 21 (Paris: Organization for Economic Co-operation and Development).

———, 2011b, "Education at a Glance 2011", OECD indicators, OECD Publishing (Paris: Organization for Economic Co-operation and Development).

———, 2012a, "Closing the Gender Gap: Act Now" (Paris: Organization for Economic Co-operation and Development).

———, 2012b, "Income Inequality and Growth: The Role of Taxes and Transfers," OECD Economics Department Policy Notes, No. 9 (Paris: Organization for Economic Co-operation and Development).

———, 2013, "Choosing fiscal consolidation instruments compatible with growth and equity", OECD Economic Policy Papers, No. 7 (Paris: Organization for Economic Co-operation and Development).

———, 2014a, "OECD/G20 Base Erosion and Profit Shifting Project: Explanatory Statement" (Paris: Organization for Economic Co-operation and Development)

———, 2014b, "Part 1 of a Report to G20 Development Working Group on the Impact of BEPS in Low Income Countries" (Paris: Organization for Economic Co-operation and Development) <http://www.oecd.org/ctp/beps-reports.htm>

———, 2014c, "OECD Economic Surveys: Germany" (Paris: Organization for Economic Co-operation and Development).

———, 2014d, "Education at a Glance" (Paris: Organization for Economic Co-operation and Development) <http://www.oecd.org/education/eag.htm>

Ostry, J.D., Ghosh, A.R., Kim, J.I. and M.S. Qureshi, 2010, "Fiscal Space," Staff Position Note No. SPN/10/11 (Washington: International Monetary Fund).

Ostry, J.D., Berg, A. and C.G. Tsangarides, 2014, "Redistribution, Inequality and Growth," IMF Staff Discussion Note SDN/14/02 (Washington: International Monetary Fund).

Papi, L., Presbitero, A., and Zazzaro, A., 2015, "IMF Lending and Banking Crises," IMF Working Paper 15/19 (Washington: International Monetary Fund).

Pattillo, C., Gupta, S., and Carey, K., 2005, "Sustaining Growth Accelerations in Pro-Poor Growth Africa," IMF Working Paper 05/195 (Washington: International Monetary Fund).

Pattillo, C., Poirson, H., and L.A. Ricci, 2011, "External Debt and Growth," *Review of Economics and Institutions*, Vol 2(3).

Pecorino, P., 1993, "Tax Structure and Growth in a Model with Human Capital" *Journal of Public Economics,* Vol. 52, pages 251-271.

Perotti, R., 1996, "Growth, Income Distribution, and Democracy: What the Data Say," *Journal of Economic Growth*, Vol. 1(2), pp. 149–87.

Pescatori, A., Sandri, D., and J. Simon, 2014, "Debt and growth: is there a magic threshold?" IMF Working Paper No. 14/34 (Washington: International Monetary Fund).

Pritchett, L., 2000, "The Tyranny of Concepts: CUDIE (Cumulated, Depreciated, Investment Effort) Is Not Capital," *Journal of Economic Growth*, Springer, vol. 5(4), pp. 361-84.

———, 2013, *The Rebirth of Education: Schooling Ain't Learning* (Baltimore: Brookings Institution Press).

Ramey G. and V. Ramey, 1995, "Cross-Country Evidence on the Link between Volatility and Growth," *American Economic Review*, Vol. 85 (5), pp. 1138-1151.

Rebelo, Sergio 1991, "Long-Run Policy Analysis and Long-Run Growth", *Journal of Political Economy*, Vol. 99, No. 3 (Jun., 1991), pp. 500-521.

Rodrik, D., 1999, "Where did all the growth go? External shocks, social conflict, and growth *collapses*," *Journal of Economic Growth*, 4(4), pp. 385-412.

Romer, P. M., 1986, "Increasing Returns and Long-Run Growth," *Journal of Political Economy,* Vol. 94:5, pp. 1002-37.

Romp, W., and J. De Haan, 2007, "Public capital and economic growth: A critical survey," *Perspektiven der Wirtschaftspolitik*, 8(S1), 6-52.

Schwellnus, C. and J. Arnold, J., 2008, "Do Corporate Taxes Reduce Productivity and Investment at the Firm Level?" Economics Department Working Papers No. 641 (Paris: Organization for Economic Co-operation and Development).

Singh, A., Felman, J., Brooks, R., and T. Callen, 1998, *Australia: Benefiting from Economic Reforms* (Washington: International Monetary Fund).

Tanzi, V., and H. Zee, 1997, "Fiscal Policy and Long-Run Growth," IMF Staff Papers, Vol. 44(2), pp. 179–209.

Todaro, M., 1997, *Economic Development*, (Addison Wesley) pp. 165-166.

Turnovsky, S., 2000, "Fiscal Policy, Elastic Labour supply and Endogenous Growth," *Journal of Monetary Economics,* Vol. 45, pages 185-210.

———, 2004, "The Transitional Dynamics of Fiscal Policy: Long-Run Capital Accumulation and Growth," *Journal of Money, Credit and Banking,* Vol. 36(5), pages 883-910.

Vartia, L., 2008, "How do taxes affect investment and productivity?" OECD Economics Department Working Papers No. 656 (Paris: Organization for Economic Co-operation and Development).

Villela, L., Lemgruber, A, and Jorratt, M., 2010, "Tax Expenditure Budgets: Concepts and Challenges for Implementation," Inter-American Development Bank Working Paper No. IDB-WP-179.

Watson, C. M., Bakker, B.B., Martijn, J.K. and I. Halikias. 1999. "The Netherlands: Transforming a Market Economy", IMF Occasional Paper No. 181 (Washington: International Monetary Fund).

Woo, J., Bova, E. Kinda, T. and S. Zhang, 2013, "Distributional Consequences of Fiscal Consolidation and the Role of Fiscal Policy: What Do the Data Say?" IMF Working Paper No. 13/195 (Washington: International Monetary Fund)

Woodhall, M., 2007, "Funding Higher Education: the Contribution of Economic Thinking to Debate and Policy Development," Education Working Paper Series, No. 8 (Washington: World Bank).

World Bank, 1991, Comparative Assessment of Malaysia's Incentive System, Foreign Investment Advisory Services, (Washington, World Bank).

———, 1992, "Malaysia: Fiscal Reform for Stable Growth," World Bank Report No. 10120-MA (Washington: World Bank).

———, 2000, Malaysia Public Expenditures: Managing the Crisis; Challenging the Future, Report No. 20371-MA (Washington: World Bank).

———, 2013, "Bolsa Família: Brazil's Quiet Revolution," Opinion by Wetzel, D, (Washington: World Bank), http://www.worldbank.org/en/news/opinion/2013/11/04/bolsa-familia-Brazil-quiet-revolution.

World Health Organization (WHO), 2010, *The World Health Report 2010—Health Systems: Improving Performance* (Geneva: World Health Organization).

Technical Annex I. Fiscal Reforms and Growth Accelerations: A Cross-Country Statistical Analysis

This annex analyses the empirical relationship between fiscal reforms and subsequent growth accelerations in a set of 112 economies over 1975-2013. Revenue and expenditure reforms are followed by growth acceleration in 26 and 21 percent of reform cases, respectively. A combined package of both revenue and expenditure reforms has a stronger likelihood of being followed by acceleration (60 percent). For these comprehensive reform packages, the association is strongest in advanced countries (80 percent), followed by emerging (67 percent) and low-income (38 percent) countries. Reforms aimed at reducing the share of income taxation and increasing the share of health and education spending are most likely to be followed by growth acceleration. The conditional likelihood of growth acceleration is not significantly altered by the presence of high initial debt, subsequent fiscal expansion and reduction in income inequality.

A. Background

1. **The fiscal response to a rapid slowdown in economic growth has dominated the policy agenda following the global crisis**. The global crisis left a lasting legacy of slow growth in most advanced and many emerging economies. The slowdown in growth poses serious risks to fiscal sustainability and further compounds challenges associated with projected demographic and environmental trends. In response, policymakers are becoming increasingly focused on measures to strengthen growth. With monetary policy options limited due to the zero-lower bound, and fiscal expansion complicated amid rapid build-up of debt, attention has shifted to deficit-neutral fiscal reforms aiming at more growth-friendly composition of government revenue and expenditure.

2. **This note analyzes the empirical relationship between fiscal reforms and long-run growth.** The analysis is performed using the event study methodology on a sample of 112 countries over the period 1975-2013. Periods of protracted growth accelerations are identified and related to incidences of entrenched improvements in revenue and expenditure composition. The outcomes of the indicators approach suggest that: (i) fiscal reforms have a high probability of being followed by a growth acceleration but the exact likelihood varies across country groups (advanced, emerging, and low-income countries) and reform types (subcategories of revenue and expenditure reforms), (ii) the conditional likelihood is robust to high initial debt, as well as subsequent fiscal expansion and reduction in income inequality.

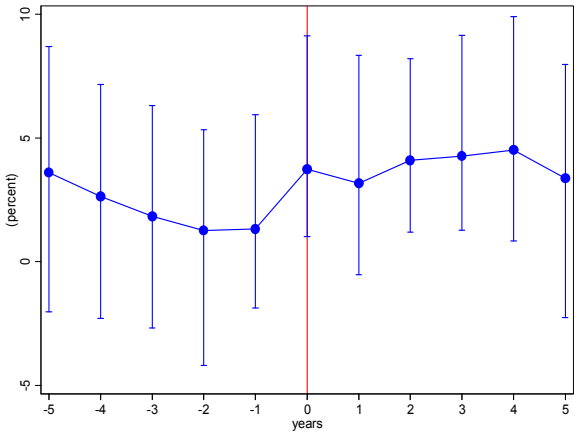
B. Empirical Methodology

3. **Growth accelerations**. Growth profiles of advanced, emerging, and low-income countries used in the analysis vary widely, making it difficult to use standard time series techniques to measure long-run growth. Therefore, the analysis follows an event study approach (Hausmann and others, 2005) to identify country-specific instances of sustained high growth (Box 1). Using a slightly

less restrictive parameterization compared to the original Hausmann and others (2005) study, the methodology identifies 146 growth acceleration episodes in 112 countries over the period 1975-2013. The largest number of growth accelerations was registered in advanced economies (62 episodes), followed by emerging and low-income countries (42 episodes each). The median growth rate decelerated from 4 percent, five years before acceleration, to close to 1 percent, one year before acceleration (Figure 1A). The median growth rate jumped to 4 percent on the first year of acceleration and peaked at 5 percent on the fifth year, with all countries in the 10^{th}/90^{th} percentile range recording positive growth rates during the acceleration. The persistent increase in the median growth rate following the acceleration suggests that the 5-year window used in the analysis is sufficiently long to smooth cyclical fluctuations and detect changes in potential growth.[1] The distribution of growth rates shifted markedly subsequent to acceleration, with average growth increasing from 1.8 percent before acceleration to 4.5 percent during acceleration (Figure 2B).

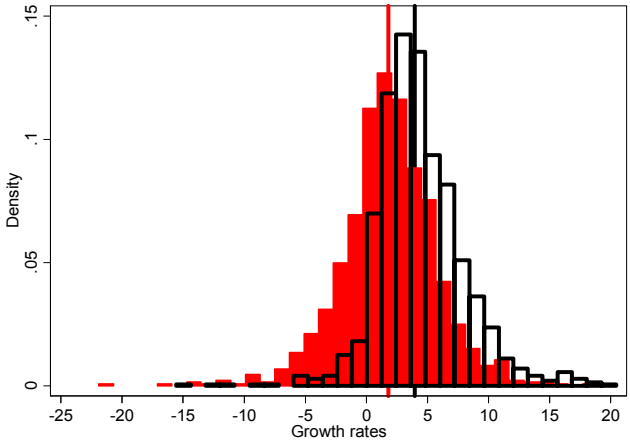
Figure 1. Real GDP Per Capita Growth Rates
(Total Sample: Advanced, Emerging, and Low-Income Countries)

A. Around Acceleration Episodes



Note: Reported are medians and 10th/90th percentiles. t=0 is the first year of growth acceleration.

B. During and Before Acceleration Episodes



Note: Black bars stand for the 5 year period during growth acceleration, red bars stand for the 5 year period before growth acceleration. Vertical lines represent respective medians: 1.8% before acceleration, 3.9% during acceleration.

4. **Fiscal reforms**. In the absence of a cross-country dataset of *de-jure* fiscal reforms, the analysis relies on a *de-facto* approach to identify fiscal reform episodes (Box 2). Protracted growth-friendly improvements in government revenue and expenditure composition are used to identify fiscal reforms. The "growth-friendliness" of government revenue and expenditure composition follows theoretical rationale and previous empirical studies (Acosta-Ormaechea and Yoo, 2012; Acosta-Ormaechea and Morozumi, 2013). On the revenue side, growth-friendly composition implies higher share of indirect taxes in total revenue. On the expenditure side, growth-friendly composition

[1] The main results of the analysis are robust to using an 8-year window to identify growth accelerations.

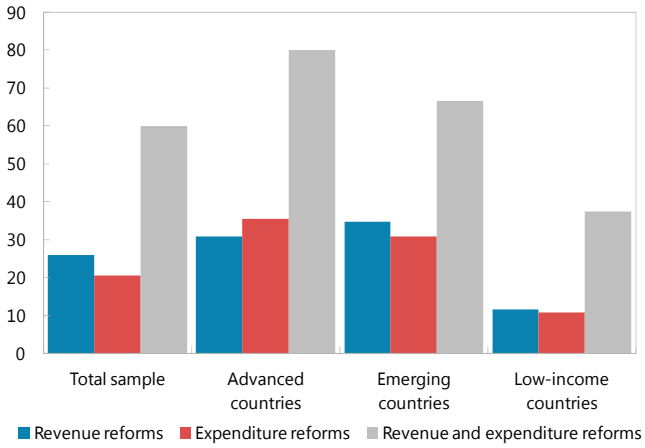
implies higher share of capital, health, and education spending in total expenditure. Using the parameterization described in Box 2, the methodology identifies 168 revenue reforms and 220 expenditure reforms in 112 countries over the period 1975-2013. After fiscal reforms, improved revenue and expenditure composition persists through the fifth year into the reform. The lasting impact of reforms on revenue and expenditure composition is consistent with persistent impact of legal amendments underpinning the reforms.

5. **Empirical model.** An indicators approach is used to analyze the relationship between fiscal reforms and subsequent growth accelerations (Box 3).[2] This non-parametric method was developed by Kaminsky and others (1998) and has been widely applied in previous studies on determinants of crises (see, e.g., Kaminsky and Reinhart, 1999; Berg and Patillo, 1999; Berg and others, 2005). However, previous studies did not analyze the association between fiscal reforms and growth accelerations.

C. Estimation Results

6. **Fiscal reforms and growth accelerations**. Estimation results suggest a relatively high conditional probability of fiscal reforms being followed by growth accelerations (Table 1, Figure 2). The total sample includes 3419 observations for which entries for both growth accelerations and fiscal reforms are available, 143 growth accelerations, 131 revenue reforms and 185 expenditure reforms. For the total sample, revenue reforms and expenditure reforms are followed by growth accelerations in 26 and 21 percent of reform cases, respectively. In contrast, 60 percent of reform packages that implement revenue and expenditure reforms jointly are followed by growth accelerations. The analysis was also done for subsamples of country groups. The share of combined revenue and expenditure reforms that are followed by growth accelerations is highest in advanced countries (80 percent), followed by emerging (67 percent) and low-income (38 percent) countries. A larger share of expenditure reforms are followed by growth accelerations in advanced economies given the importance of age-related costs for fiscal accounts

Figure 2. Fiscal Reforms and Conditional Probability of Growth Accelerations
(112 countries, 1975-2013)



Source: IMF staff calculations.

[2] A parametric logistic model was also used to assess the relationship between fiscal reforms and growth accelerations. The results are broadly similar to the non-parametric approach, but definition of the explanatory fiscal reform binary variable in the regression setting is complicated due to the fact that growth accelerations cannot happen more than once over a 5-year time period.

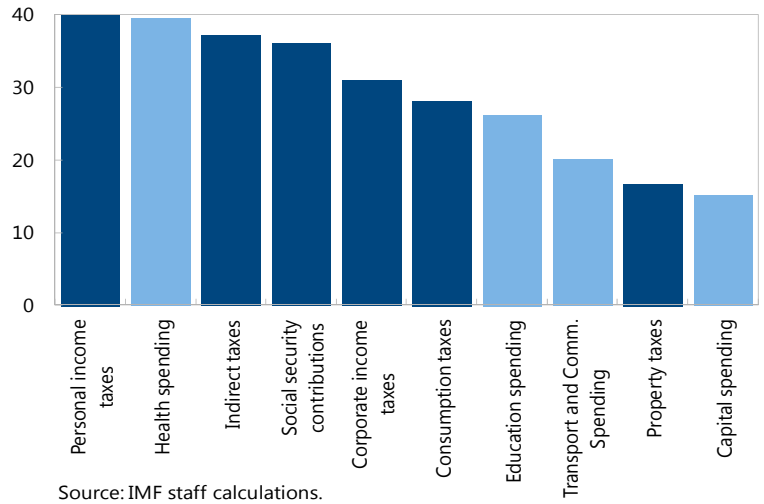
in advanced economies. By contrast, in emerging and low-income countries the share of revenue reforms that are followed by growth accelerations is highest amid the prominence of revenue collection issues in these countries.

7. **Types of reforms**. To identify the relationship between individual revenue and expenditure reforms and growth accelerations, separate analysis was done for each type of reforms (Table 1, Figure 3).

- ***Revenue reforms***. Measures aimed at reducing the share of income taxation (corporate, personal, and social security contributions) are most likely to be followed by growth acceleration (conditional probabilities range between 31-40 percent). This is consistent with the theoretical prediction of the distortionary impact of income taxation on labor and capital inputs. The conditional probabilities of growth acceleration for reforms in areas of consumption and property taxation are 28 and 17 percent, respectively.

- ***Expenditure reforms***. The highest conditional probability of growth accelerations is estimated for health (40 percent) and education (26 percent) spending reforms, which improve the contribution of human capital to the production process. The probability of capital expenditure reforms and targeted reforms of transportation and communication being followed by growth acceleration is relatively lower (15 and 20 percent, respectively).

Figure 3. Types of Reforms and Conditional Probability of Growth Accelerations
(112 countries, 1975-2013)



Source: IMF staff calculations.

8. **Other conditional factors**. The importance of other conditional factors on the relationship between fiscal reforms and growth accelerations is also assessed (Table 1, Figure 4):

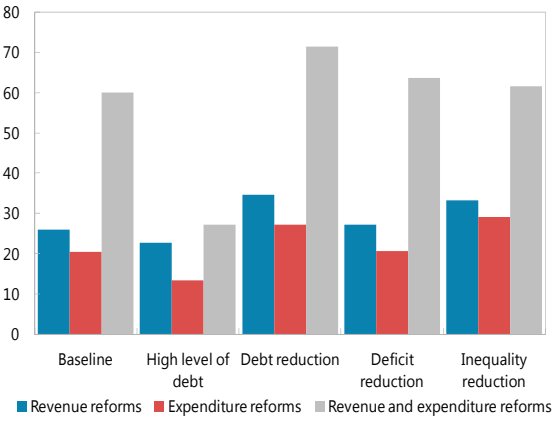
- ***High level of debt***. One of the concerns policymakers are facing in exploring fiscal options to jumpstart growth is the high initial level of debt experienced by many advanced and emerging economies in the aftermath of the global crisis. To analyze the relationship between fiscal reforms and growth accelerations in periods of limited room for further debt expansion, the

sample is restricted to periods when public debt exceeded 40 percent in low-income countries, 60 percent in emerging countries, and 90 percent in advanced countries. This reduces the total number of observations to 1774. There have been 55 growth accelerations, 44 revenue reforms and 90 expenditure reforms in periods of high level of debt. Despite the reduction in the number of reforms and accelerations, the conditional likelihood remains relatively high (23 and 13 percent for revenue and expenditure reforms, respectively).

- ***Fiscal expansion***. Fiscal reforms, such as reduction of the share of direct taxes or increase in the share of productive spending, are often followed by a fiscal expansion and an increase in the fiscal deficit and public debt. Given that fiscal expansion by itself can stimulate growth independent from fiscal reforms, the exercise checks whether the association between fiscal reforms and growth accelerations holds in periods when fiscal reforms were not followed by rising fiscal deficits and debt. Restricting the sample to non-expansionary fiscal reform episodes reduces the total number of observations to 934 (no debt expansion) and 3024 (no deficit expansion): it includes 61 (121) growth accelerations, 52 (114) revenue reforms and 88 (150) expenditure reforms in periods of non-expansionary debt (deficit) reforms. The conditional probability of growth acceleration for combined revenue and expenditure reforms remains high (71 and 64 percent, respectively), suggesting that fiscal expansion does not alter significantly the relationship between fiscal reforms and growth acceleration.

- ***Income inequality***. One of the factors contributing to the success of fiscal reforms is their inclusiveness and consensus-based implementation. To assess the importance of income inequality, the model is estimated for a subsample of periods when fiscal reforms were followed by a reduction in income inequality as measured by the GINI coefficient. The number of total observations declines to 1068, including 67 growth accelerations, 57 revenue and 72 expenditure reforms in periods of reforms leading to improved inequality. The conditional likelihood of growth acceleration remains high (62 percent) in this restricted sample as well, suggesting that inclusiveness of reforms does not undermine their success in terms of growth outcomes.

Figure 4. The Impact of Other Conditional Factors
(112 countries, 1975-2013)



Source: IMF staff calculations.

Box 1. Growth Accelerations

The approach of Hausmann and others (2005) is employed to identify growth accelerations. Average growth in real GDP per capita at time *t* over horizon *n* is estimated from the following regression:

$y_t = \alpha + g_{t,t+n-1}\, trend + \varepsilon_t$ (1)

where:

y is the log of real GDP per capita;

trend is the time trend;

ε is the residual;

$g_{t,t+n-1}$ is the average annual growth rate over horizon *n* (between periods *t* and *t+n-1*);

t=[i,…i+n-1] is the regression sample period, where *i = 1, 2, … T-n+1* is the starting time period for the regression and *T* is the total sample size.

In regressions, 5 year period (n=5) is used when calculating average growth rates. The results of regression (1) are then used to estimate changes in 5-year average growth rates:

$\Delta g_{t,5} = \hat{g}_{t,t+4} - \hat{g}_{t-1,t-5}$ (2)

Growth acceleration in period *t* is identified when the following three conditions are met:

$\hat{g}_{t,t+4} > 2\ percent$ (growth is rapid);

$\Delta g_{t,5} > 1\ percent$ (growth accelerates); (3)

$y_{t+4} > \max\{y_i\}$, $i<t$ (post-acceleration output exceeds the pre-episode peak).

This parameterization is less restrictive than that used by Hausmann and others (2005), in which rapid growth threshold is 3.5 percent and growth acceleration threshold is 2 percent.

Box 2. Fiscal Reforms

In the absence of a cross-country dataset on *de-jure* fiscal reforms, information on government fiscal indicators is used to identify *de-facto* fiscal reforms. Fiscal reforms are defined as protracted growth-friendly improvements by at least 2 percentage points over at least 3 consecutive years in the following fiscal indicators:

- *Revenue indicators*: indirect taxes (share in total government revenue), consumption taxes (share in total government revenue), property taxes (share in total government revenue), corporate income taxes (share in total government revenue, inverse), personal income taxes (share in total government revenue, inverse), social security contributions (share in total government revenue, inverse);
- *Expenditure indicators*: capital spending (share in total government spending), education spending (share in total government spending), health spending (share in total government spending), and transport and communication spending (share in total government spending).

Box 3. Empirical Methodology: The Indicators Approach

An indicators approach is a non-parametric method developed by Kaminsky and others (1998) and applied to study determinants of crises by other authors (e.g., Kaminsky and Reinhart, 1999; Berg and Patillo, 1999; Berg and others, 2005) is used to assess the probability of growth accelerations conditional on fiscal reforms. The methodology identifies the conditional relationship without implying any causality. The following classification table is used:

	Growth acceleration does not start between [t+1, t+5]	Growth acceleration starts between [t+1, t+5]
Fiscal reform does not start at t	A	B
Fiscal reform starts at t	C	D

where:

A is the number of country-year observations with no fiscal reforms and no growth acceleration in the subsequent 5-year period;
B is the number of country-year observations with no fiscal reforms and growth acceleration in the subsequent 5-year period;
C is the number of country-year observations with fiscal reforms and no growth acceleration in the subsequent 5-year period;
D is the number of country-year observations with fiscal reforms and a growth acceleration in the subsequent 5-year period.

The probability of growth acceleration starting conditional on a fiscal reform happening in the previous 5-year period is estimated as: P(acceleration|reform) = D/(D+C). Intuitively, this indicator measures the number of good signals as a share of all signals.

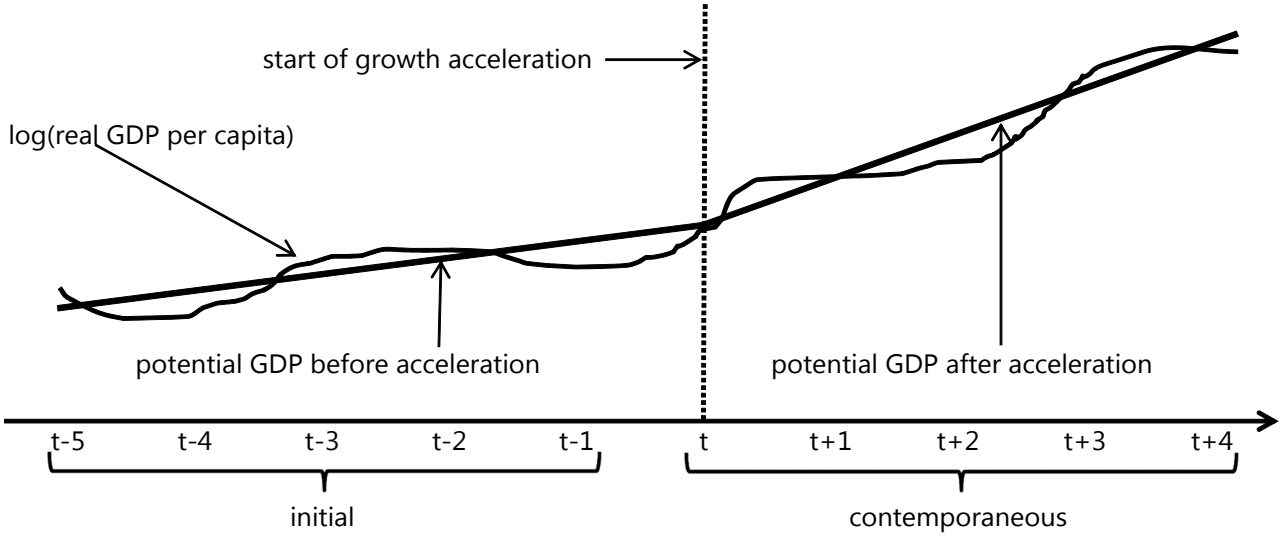


Table 1. Relationship Between Fiscal Reforms and Growth Accelerations: The Indicators Approach

Fiscal Reforms	Sample	Total obs.	# of growth accelerations	# of fiscal reforms	P(accel|reform)
	Figure 2				
Revenue measures	Total sample	3,419	143	131	26.0
Expenditure measures	Total sample	3,419	143	185	20.5
Revenue and expenditure measures	Total sample	3,419	143	25	60.0
Revenue measures	Advanced economies	894	62	39	30.8
Expenditure measures	Advanced economies	894	62	31	35.5
Revenue and expenditure measures	Advanced economies	894	62	5	80.0
Revenue measures	Emerging economies	922	42	49	34.7
Expenditure measures	Emerging economies	922	42	52	30.8
Revenue and expenditure measures	Emerging economies	922	42	12	66.7
Revenue measures	Low-income countries	1,603	39	43	11.6
Expenditure measures	Low-income countries	1,603	39	102	10.8
Revenue and expenditure measures	Low-income countries	1,603	39	8	37.5
	Figure 3				
Indirect taxes	Total sample	3,419	143	35	37.1
Consumption taxes	Total sample	3,419	143	57	28.1
Property taxes	Total sample	3,419	143	6	16.7
Corporate income taxes	Total sample	3,419	143	42	31.0
Personal income taxes	Total sample	3,419	143	35	40.0
Social security contributions	Total sample	3,419	143	25	36.0
Capital spending	Total sample	3,419	143	73	15.1
Education spending	Total sample	3,419	143	61	26.2
Health spending	Total sample	3,419	143	38	39.5
Transport and communication spending	Total sample	3,419	143	40	20.0
	Figure 4				
Revenue measures	High level of debt	1,774	55	44	22.7
Expenditure measures	High level of debt	1,774	55	90	13.3
Revenue and expenditure measures	High level of debt	1,774	55	11	27.3
Revenue measures	Debt reduction	934	61	52	34.6
Expenditure measures	Debt reduction	934	61	88	27.3
Revenue and expenditure measures	Debt reduction	934	61	14	71.4
Revenue measures	Deficit reduction	3,024	121	114	27.2
Expenditure measures	Deficit reduction	3,024	121	150	20.7
Revenue and expenditure measures	Deficit reduction	3,024	121	22	63.6
Revenue measures	Inequality reduction	1,068	67	57	33.3
Expenditure measures	Inequality reduction	1,068	67	72	29.2
Revenue and expenditure measures	Inequality reduction	1,068	67	13	61.5

Note: the table summarizes main indicators from the classification tables. The sample includes only the first year of growth acceleration spells. P(accel|reform) is the ratio of fiscal reforms that were followed by a growth acceleration within a 5-year period to the total number of fiscal reforms (in percent).

Technical Annex II. Fiscal Policy in an Endogenous Growth Model

This annex describes the theoretical model of endogenous growth. The objective of developing this model based on micro foundations is to study the effects of fiscal policy changes on long-run growth and government debt dynamics. Model simulations suggest that fiscal reforms aimed at reducing the rates of distortionary taxes on capital and labor income lead to significant increases in the long-run growth rate. This remains the case even if the government seeks to offset the associated loss in revenue by raising the rate of less distortionary consumption taxation. On the expenditure side, deficit-neutral reform aimed at increasing productive public investment offset by a reduction in unproductive government expenditure also raises the long-run growth rate.

A. The Formulation of the Endogenous Growth Model

1. **The model is in the endogenous growth theory tradition**. It is similar to models presented by King and Rebelo (1990), Rebelo (1991), and Devereux and Love (1994), in which tax reforms can affect long-run growth. The model presented in this Annex also allows for productive public capital and government borrowing.

2. **Endogenous growth models exhibit long run growth in output per worker and the growth rate is endogenously determined.** Long-run growth occurs because of non-decreasing returns to scale to reproducible factors of production (e.g. physical capital, human capital and public capital). In the models presented by King and Rebelo (1990), Rebelo (1991), and Devereux and Love (1994), this is achieved through human capital accumulation, which offsets the otherwise decreasing returns to physical capital accumulation. The long-run growth rate is endogenous in these models and can be influenced by fiscal policy. Tax policy changes can affect post-tax rates of return on physical and human capital investment, and hence saving and investment decisions and ultimately the growth rate.

3. **The model presented in this Annex contains two sectors of production in a closed economy: a final output good sector and a human capital sector.** Each sector has a different production technology. The required inputs for production in both sectors are the stocks of public capital, private capital, and human-capital-adjusted (or skilled) labor supply. The two sector formulation allows the relative importance of production factors to differ across sectors, creating the potential for interesting dynamics. The model is formulated in discrete time.

4. **There are four agents in the model (Box 1):**

- ***Representative consumer*.** The consumer chooses to consume c_t or save in up to three assets: (i) private capital[1] K_t, (ii) human capital H_t, and (iii) government bonds B_t. The

[1] The total private capital stock K_t comprises capital used by firms $K_t^1$and for human capital production K_t^2, so that $K_t = (K_t^1 + K_t^2)$.

representative consumer supplies labor[2] (n_t, m_t) and capital K_t for the production of both final output and human capital. The representative consumer makes these choices to maximize the discounted present value of utility over an infinite horizon, subject to satisfying its long-run budget constraint. The representative consumer earns income from labor supply, from return on assets, and from government transfers.[3]

- ***Representative firm.*** The representative firm produces final output Y_t^F and acquires production inputs by renting private capital K_t^1 and skilled labor[4] $n_t H_t$ from consumers each time period to maximize profit. The firm also benefits from access to the stock of public capital G_t or infrastructure, which the firm takes as given each period. In this setup, firms do not make forward looking investment decisions. This is only done by the representative consumer. This assumption is mathematically convenient and should not affect the path of variables, such as final output, since the representative consumer is the owner of the firm and behaves rationally.

- ***Human capital.*** Private capital K_t^2 and skilled labor $m_t H_t$ are needed to produce human capital Y_t^H. Public capital is also an input, so that the government has an indirect role in financing human capital by providing access to the public capital stock G_t, which could include educational facilities and transport. Consumers purchase human capital.

- ***Government.*** The government engages in various types of spending, raises revenue and borrows by selling bonds to consumers. The government spends in the following forms: (i) investment in public capital stock G_t, (ii) transfers to consumers T_t, and (iii) unproductive spending g_t. In the long run, it is assumed that the government sets spending by following a rules-based approach. A fixed share of revenue every period is spent on each item, with shares differing across spending items. Revenue is raised by levying distortionary taxes $(\tau_t^K, \tau_t^L, \tau_t^c)$ on the representative consumer's (i) private capital income $r_t K_t$, , (ii) labor income $w_t(n_t + m_t)H_t$, and (iii) consumption c_t. The government borrows by issuing bonds B_t to the representative consumer.

5. **Long-run economic growth is possible in the model.** This is because decreasing returns to physical capital accumulation can be offset by the accumulation of human capital and productive public capital.

[2] It is assumed that the representative consumer has an endowment of time equal to one. The model abstracts from population growth.

[3] It is assumed that there are no nominal rigidities in price and wage setting and also no financial intermediation frictions. Given these assumptions, the model excludes money and a system of financial intermediation of saving into investment, since these features would have only minor real effects.

[4] Human capital acquired by the representative consumer is embodied in the consumer's labor supply, becoming skilled labor supply $(n_t H_t)$. Human capital is only productive if it is attached to an individual's labour supply in this way.

6. **Fiscal policy can affect long-run growth through a number of channels**. First, changes in the capital income tax rate τ_t^K affect the post-tax rate of return on private capital $(1-\tau_t^K)r_tK_t$ and influence the incentives to invest. Second, changes to the post-tax wage also change the return to skilled labor and influence the decisions of consumers to acquire human capital. Analysis in Rebelo (1991) and Devereux and Love (1994) implies that changes to the post-tax rates of return on investment in physical and human capital impact the growth rate by affecting the decision of consumers to save and invest. Changes in the tax rates on labor income τ_t^L and consumption τ_t^c also affect labor supply to firms and for the production of human capital. Higher labor supply can boost growth by raising the marginal productivity of physical and human capital. Finally, changes in the share of revenue devoted to public investment affect the level of public capital or infrastructure G_t available to firms and for human capital production. This can also affect total factor productivity and ultimately the growth rate.

B. The Solution

7. **The model admits a long-run steady state (or balanced growth path (BGP)) for particular combinations of tax rates and rules for government spending.** On a BGP, non-stationary endogenous variables (e.g. consumption c_t, final output Y_t^F, and the stocks of physical capital $K_t=(K_t^1+K_t^2)$, human capital H_t and public capital G_t) all grow at a constant rate. This constant rate equals the overall growth rate of the economy. A constant rate of growth is possible because the production function for final output $A[\psi G_t/K_t]^\gamma(K_t^1)^\alpha(n_tH_t)^{1-\alpha}$ exhibits constant returns to scale to re-producible factors on a BGP[5]. At the firm level, the ratio of total public to private capital in the economy G_t/K_t is taken as given, so firms face constant returns to scale in private capital input K_t^1 and skilled labor input n_tH_t. This ratio is kept constant on a BGP, since public investment is set to be proportional to revenue, which should grow in proportion to output and the private capital stock. At the social level, there are constant returns to scale to public capital (G_t), the total private capital (K_t) stock and skilled labor (n_tH_t). This can be seen by noting that private capital input into final output production (K_t^1) will be a constant fraction of the total capital stock (K_t) on a BGP, so that the production function at the social level can be re-written as $AG_t^\gamma(K_t)^{\alpha-\gamma}(n_tH_t)^{1-\alpha}$ where A is a constant. The exponents sum to one, implying constant returns to scale.

8. **The BGP growth rate is identified by finding an approximate solution to the simultaneous system of nonlinear equations that characterizes the BGP.** The BGP growth rate can differ for different sets of tax rates and rules for government spending. The nonlinear equations characterizing the BGP include the first order conditions of the consumer's and firm's optimization problems, as well as budget constraints of all agents.

9. **A benchmark BGP is solved for using tax rates, government spending rules, and other key parameters that approximately characterize fiscal policy in an advanced economy**. The

[5] This is also true of the production function for human capital.

distortionary tax rates on private capital income τ_t^K and labor income τ_t^L are both set to 25 per cent. The rate of consumption taxation τ_t^c is set to 7 per cent. This is closer to some rates of sales tax in the United States, although below rates of value added tax in certain European economies. Public investment is set so that it is approximately 4 per cent of final output on the benchmark BGP, similar to its level in the United States. The complete calibration of fiscal policy settings and parameters is presented in Table 1.

10. **On any BGP, the government's long-run budget constraint must be satisfied. Government borrowing must grow at a slower rate than the real rate of interest on government bonds.** This requires the government to run a primary surplus on any BGP. Given the endogenous interest rate on government bonds and the primary surplus (as a ratio of final output), the government's budget constraint then reveals the maximum level of government debt (as a ratio of final output) that is sustainable in the long-run on a BGP.

C. Long-Run Growth Effects of Fiscal Policy Reforms

11. **Reductions in distortionary capital and labor income tax rates raise the long-run growth rate (Table 2)**:

- ***Capital income tax rate.*** A reduction in the capital income tax rate τ_t^K results in a higher post-tax rate of return on private capital $(1-\tau_t^K)r_t$ compared with the benchmark BGP, encouraging a faster pace of private capital investment. This boosts output, which ultimately allows for faster accumulation of other factors and faster long-run growth.

- ***Labor income tax rate.*** Reduction in the labor income tax rate τ_t^L leads to a higher post-tax wage rate $(1-\tau_t^L)w_t$ compared with the benchmark BGP, inducing higher skilled labor supply. There are greater returns to acquiring human capital and skills, so that there is also faster human capital accumulation. Ultimately, this boosts output and the accumulation of other factors, so that long run growth is faster.

12. **Lower capital and labor tax rates still imply faster long-run growth, even if the consumption tax rate is increased so that the primary fiscal balance (as a share of final output) is unchanged relative to the benchmark BGP.** Overall, these deficit-neutral reforms still raise the long-run growth rate because consumption taxation is less distortionary than capital or labor income taxation in this model. Specifically, consumption taxation does not distort intertemporal savings decisions. As a result, changes in consumption taxes have a smaller growth effect in the model than changes in other taxes.[6]

[6] Milesi-Ferretti and Roubini (1998) discuss model specifications under which consumption tax changes can have larger effects on growth. For example, if revenue from a consumption tax rise is rebated to consumers in the form of higher lump-sum transfers, then this can mute the income effect of the tax change, leaving only the substitution effect on the labor supply / leisure choice. The result can be a larger effect on labor supply and growth. Abstracting from this issue, Table 2 presents the growth effects of tax reform packages (changing more than one tax rate) that

(continued)

13. **Changing the composition of public spending in favor of higher public investment leads to higher long-run growth.** The increase in public capital spending is offset by cutting unproductive government spending g_t , so that the primary balance (as a share of final output) is unchanged compared with the benchmark BGP. Higher public investment raises the ratio of the public to private capital stocks G_t/K_t. This raises the productivity of inputs used in production of final output and human capital, allowing for faster long-run growth.

14. **Implementing capital and labor income tax cuts or public investment increases without compensating measures has similar long-run growth effects.** This is because the consumption tax τ_t^c (previously increased to offset the revenue loss from other tax cuts) has a relatively small distortionary effect in this model.[7] Changing the rate of consumption taxation will have "level effects" (e.g. on the level of consumption as a share of long-run final output), but should leave the economy's long-run growth rate relatively unchanged. Changes to unproductive spending g_t (used to offset higher public investment) appear to have relatively small growth effects, so the impact on the growth rate of higher public investment is similar (although not identical), whether offset by lower unproductive spending or not.

15. **Fiscal reforms that produce a lower long-run primary balance (relative to the benchmark BGP) imply that only a lower long-run level of government debt is sustainable.** The government must engineer a reduction in the level of debt (as a ratio of final output) as the economy transitions from the benchmark BGP to the post reform BGP.

leave government revenue and all types of government expenditure unchanged (as shares of final output) compared with the benchmark BGP.

[7] The assumption of constant expenditures as a share of revenue on a BGP implies that in the absence of compensating measures to accompany a tax cut, there will be lower total government spending (as a share of final output) because revenue is lower.

Box 1. Mathematical Description of the Model

Representative Consumer. The representative consumer chooses consumption c_t, labor supply (n_t+m_t) and saving (in private capital $K_t = (K_t^1 + K_t^2)$, human capital H_t and government bonds B_t) to maximize the discounted present value of utility over an infinite horizon:

$$\max_{\{c_t,n_t,m_t,K_{t+1},H_{t+1},B_{t+1}\}_{t=0}^{\infty}} \sum_{t=0}^{\infty} \frac{\beta^t\left(c_t^{\theta}(1-n_t-m_t)^{\eta}\right)^{1-\sigma}-1}{(1-\sigma)}$$

subject each period to the budget constraint:

$$(1+\tau_t^c)c_t + q_t\left[\underbrace{H_{t+1}-(1-\delta_H)H_t}_{\text{human capital inv.}}\right] + \left[\underbrace{K_{t+1}-(1-\delta_K)K_t}_{\text{physical capital inv.}}\right] + \left[\underbrace{B_{t+1}}_{\text{govt. bond purch.}}\right]$$

$$\leq (1-\tau_t^L)w_t(n_t+m_t)H_t + (1-\tau_t^K)r_tK_t + T_t + (1+r_t^b)B_t$$

with initial conditions H_0, K_0, B_0 and taking fiscal policy, the interest rate on government bonds r_t^b, wages w_t and the rental rate of return r_t on private capital as given. The price of human capital is q_t, also taken as given by consumers.

Representative Firm. The representative firm chooses a production level Y_t^F and rents from consumers inputs of skilled labor n_tH_t and private capital K_t^1 each period, to maximize profit:

$$\max_{\{n_tH_t,K_t^1\}}\{Y_t^F - w_tn_tH_t - r_tK_t^1\}$$

where final output is given by technology $Y_t^F \leq A\left[\frac{G_t}{K_t}\psi\right]^{\gamma}(K_t^1)^{\alpha}(n_tH_t)^{1-\alpha}$,taking wages w_t, the rental rate r_t on private capital and the ratio of the total public to private capital stocks G_t/K_t as given.

Human Capital. Skilled labor m_tH_t and private capital K_t^2 are rented each period to produce human capital Y_t^H,in a profit maximizing way:

$$\max_{\{m_tH_t,K_t^2\}}\{q_tY_t^H - w_tm_tH_t - r_tK_t^2\}$$

subject to the production technology: $Y_t^H \leq C\left[\frac{G_t}{K_t}(1-\psi)\right]^{\epsilon}(K_t^2)^{\phi}(m_tH_t)^{1-\phi}$ taking wages w_t, the rental rate r_t on private capital and the ratio of the total public to private capital stocks G_t/K_t as given.

Government. The budget constraint of the government that must be satisfied each period is:

$$\underbrace{G_{t+1}-(1-\delta_G)G_t}_{\text{public investment}} + g_t + T_t + (1+r_t^b)B_t = \begin{Bmatrix}\tau_t^cc_t + \tau_t^Lw_t(n_t+m_t)H_t \\ +\tau_t^Kr_t(K_t^1+K_t^2) + B_{t+1}\end{Bmatrix}$$

Fraction v of revenue is spent on public investment each period:

$$\underbrace{G_{t+1}-(1-\delta_G)G_t}_{\text{public investment}} = v\{\tau_t^cc_t + \tau_t^Lw_t(n_t+m_t)H_t + \tau_t^Kr_t(K_t^1+K_t^2)\}$$

There are similar rules for unproductive spending g_t and transfers T_t.

Table 1. Calibration of Model Parameters

Parameter	Value	Description	Parameter	Value	Description
β	0.98	Discount factor	δ_H	0.04	Depreciation rate: human capital
η	0.65	Labor supply parameter	δ_K	0.04	Depreciation rate: private physical capital
θ	0.35	Utility function parameter	δ_G	0.04	Depreciation rate: public capital
σ	2	Parameter related to the elasticity of intertemporal substitution	ϵ	0.09	Elasticity of human capital production to public capital
γ	0.09	Elasticity of final output to public capital	s	0.30	Share of revenue spent on transfers
α	0.36	Capital share in final output	v	0.11	Public investment share of revenue
ϕ	0.85	Capital share in human capital production	z	0.51	Unproductive government spending share of revenue
ψ	0.5	Share of public capital in final output	τ_L	0.25	Labor income tax rate
A	0.43	Scale factor	τ_k	0.25	Capital tax rate
C	0.43	Scale factor	τ_c	0.07	Consumption tax rate

Table 2. Impact of Revenue-Neutral Fiscal Reforms 1/

Fiscal reform /2	Increases in long-run growth relative to the benchmark /3	Change in long-run level of sustainable government debt /4
Δ capital tax -5%	0.2 percentage points	≈ 0
Δ labor tax -5%	0.2-0.3 percentage points	≈ 0
Δ capital tax -5%, Δ labor tax -5%	0.4-0.5 percentage points	≈ 0
Δ public investment +1% of GDP, Δ unproductive spending -1% of GDP	0.15-0.2 percentage points	≈ 0

1/ Consumption tax rate is raised permanently to ensure that the primary balance and the government debt levels (as a share of final output) are approximately unchanged on the new BGP following a taxation reform, compared with the benchmark.
2/ Change in fiscal policy settings compared with the benchmark BGP.
3/ The balanced growth paths achieved following all reforms imply higher consumer welfare than the benchmark balanced growth path.
4/ Following these fiscal reforms, there can be small reductions in the level of government debt sustainable on the new BGP, because the interest rate – growth differential may be higher than on the benchmark BGP.

Table 3. Fiscal Policy Experiments in the Endogenous Growth Literature 1/

Author	Type of Model	Policy Experiments: Effect on Long-Run Growth
Lucas (1990)	Two-sector endogenous growth model, where only human capital and time are used in the production of new human capital. Results are computed both under exogenous and fixed labor supply, as well as elastic labor supply.	Growth rate is invariant to changes in capital tax rates when labor supply is fixed. Small growth effects are found under elastic labor supply. Eliminating a 36 percent capital tax (while raising labor tax by 6 percentage points) raises growth by 0.03 percentage points.
Chen and Lu (2013)	Two sector endogenous growth model, where only human capital embodied in labor supply is used in the production of new human capital. Labor supply is endogenous.	1 percentage point increase in the capital income tax rate lowers growth by 0.02 percentage points. 1 percentage point increase in the labor income tax rate lowers growth by 0.22 percentage points.
King and Rebelo (1990)	Two sector endogenous growth model, where both physical capital and human capital are used in the production of new human capital, as well as in final output. Labor supply is exogenous.	10 percentage point increase in the tax rates of both labor and capital income (derived from final output) reduces the growth rate by 0.5 percentage points. A similar increase in tax rates applied to income from both final output and human capital sectors reduces the growth rate by 1.5 percentage points.
Jones Manuelli and Rossi (1993)	Two-sector endogenous growth model where the production of new human capital requires both physical capital and skilled labor supply. The model is calibrated to have a capital tax rate of 21 percent and a labor tax rate of 37 percent.	The elimination of all tax rates can raise growth by up to 8 percentage points, depending on the assumed elasticity of labor supply.
Turnovsky (2000)	An AK model with productive government expenditure and elastic labor supply. The model is calibrated to the US economy.	An increase in capital income tax rate of 12 percentage points reduces growth by around 0.5 percentage points. A reduction of capital and labor tax rates each by 8 percentage

Table 3. Fiscal Policy Experiments in the Endogenous Growth Literature 1/

Author	Type of Model	Policy Experiments: Effect on Long-Run Growth
		points raises long run growth by 0.4 percentage points. A reduction in the capital and labor income tax rates of 8 percentage points and an increase in the consumption tax rate of 13 percentage points raises long run growth by 0.36 percentage points. A 50 percent cut in productive government expenditure (as a percentage of national production) lowers growth by 0.2 percentage points.
Pecorino (1993)	A three-sector endogenous growth model. Physical and human capital are inputs into the production of new human capital. Labor supply is endogenous. The model is calibrated so that the tax rates on capital and labor income are 42 percent and 20 percent respectively.	Capital and labor income taxes replaced with a consumption tax (presumably sufficient to leave revenue unchanged). This raises the growth rate by 1.23 percentage points when labor supply is endogenous (or around 1 percentage point when labor supply is exogenous).
Kim (1998)	A one-sector endogenous growth model, with human capital in the production function. Labor supply is exogenous. The model has a rich financial and fiscal sector. There are taxes imposed on labor income, interest income, dividend income and capital gains. There is also a corporate income tax rate, a value-added tax rate as well as certain other taxes on firms. The model is calibrated to the US economy.	The elimination of all taxation raises the growth rate by 0.85 of a percentage point.
Devereux and Love (1994)	A two-sector endogenous growth model similar to that of King and Rebelo (1990), but allowing for endogenous labor supply. The benchmark calibration involves 20 percent tax rates on capital and labor income, but zero consumption tax.	Eliminating all taxation raises growth by around 1 percentage point. Eliminating only capital taxation

Table 3. Fiscal Policy Experiments in the Endogenous Growth Literature 1/ (concluded)

Author	Type of Model	Policy Experiments: Effect on Long-Run Growth
		raises growth by around 0.3 percentage points. Eliminating only wage taxation raises growth by around 0.7 percentage points.
Turnovsky (2004)	A one-sector model with growing population but constant growth rate (i.e. without scale effects). Public capital is productive and labor supply endogenous. There is no human capital.	The long-run growth rate is invariant to tax rates.
Baier and Glomm (2001)	A one-sector model with productive public capital, private capital and human capital in production. Government spending can take the form of investment in public capital, spending on useful goods (that enhance utility) and transfers to consumers.	For given tax rates on company profits and consumer labor income, increases in the share of government spending directed to public investment raise the long run growth rate. The increase in public investment is financed by reducing lump sum transfers to consumers.

1/ This table contains a summary of papers that describe fiscal policy experiments in endogenous growth models. The list of papers included is not exhaustive.