

**IMF Working Paper**

© 1996 International Monetary Fund

This is a *Working Paper* and the author(s) would welcome any comments on the present text. Citations should refer to a *Working Paper of the International Monetary Fund*. The views expressed are those of the author(s) and do not necessarily represent those of the Fund.

WP/96/119

INTERNATIONAL MONETARY FUND

Fiscal Affairs Department

**Fiscal Policy and Long-Run Growth**

*Prepared by Vito Tanzi and Howell H. Zee*

October 1996

**Abstract**

This paper discusses in a systematic and comprehensive way the existing literature on the relationship between the growth of countries' economies and various public finance instruments, such as tax policy, expenditure policy, and overall budgetary policy, from the perspectives of allocative efficiency, macroeconomic stability, and income distribution. It reviews both the conceptual linkages between each of the instruments and growth and the empirical evidence on such relationships. It broadly concludes that fiscal policy could play a fundamental role in affecting the long-run growth performance of countries.

**JEL Classification Numbers:**

H00; O00; E60

**CONTENTS**

	<b>Page</b>
Summary .....	iii
I. Introduction .....	1
II. Allocative Efficiency and Growth .....	3
A. Tax Policy .....	3
B. Public Expenditure Policy .....	8
C. Budget Policy .....	12
III. Stability and Growth .....	13
A. Tax and Expenditure Policies .....	13
B. Budget Policy .....	16
IV. Income Distribution and Growth .....	18
V. Concluding Remarks .....	21
References .....	23

Summary

This paper discusses in a systematic and comprehensive way the existing literature on the impact on long-run growth of different instruments of fiscal policy. These instruments fall broadly under the three conventional classifications of taxation, public expenditure, and aggregate budgetary balance. Each is analyzed from the perspectives of allocative efficiency, macroeconomic stability, and income distribution. While many factors, some noneconomic, could plausibly affect the performance of an economy from period to period, a country's growth over a reasonably long period of time is ultimately determined by three factors: (1) given the state of technical know-how in that country, the efficiency with which any existing stock of resources is utilized (which would depend, inter alia, on cultural, institutional, and political, as well as economic, parameters); (2) the accumulation over time of productive resources (which would include, inter alia, human and other forms of intangible capital); and (3) technological progress (which for most countries would depend, inter alia, on their ability to absorb new technology from abroad). This paper traces out various channels through which tax policy, expenditure policy, and overall budgetary policy could affect growth through their impact on the above three factors.

While noting the lack of robust results in the empirical literature on the growth effects of fiscal variables, this paper concludes that, when interpreted from the perspective of the new endogenous growth theory, fiscal policy could play a fundamental role in affecting the long-run growth performance of countries. Thus, economists should not hesitate to recommend changes in the instruments of public finance in the direction in which theory has deemed it important for enhancing growth, such as policies to improve the neutrality of taxation, promote human capital accumulation, and lessen income inequality.



## I. INTRODUCTION

Fiscal policy has occupied center stage in recent policy deliberations in many developed, developing, and transition economies alike,<sup>1</sup> as concerns with fiscal dimensions, such as high unemployment, inadequate national savings, excessive budget deficits and public debt burdens, and looming crises in the financing of pension and health care systems, have intensified. Timely policy responses to these concerns have taken on a sense of urgency. Under these circumstances, issues relating to the appropriate scope, nature, and conduct of fiscal policy, in the context of both mitigating macroeconomic instability in the short run and fostering growth in the long run, have naturally come to the fore in policy debates.

The division of fiscal policymaking into three hypothetical but interdependent branches—allocation, distribution, and stabilization—as first formalized by Musgrave (1959) almost 40 years ago, remains to this day a useful conceptual framework with which to discuss, analyze, and evaluate alternative fiscal policy measures, even though the world today is much more complex than the one that existed at the time when Musgrave wrote on the subject. Musgrave's framework has endured largely because it helps organize one's thoughts, in an elegant way, on the fundamental issues of interest to policymakers—efficiency in resource utilization, equity in income distribution, and cyclical fluctuations.

This paper considers the positive and normative aspects of the impact on growth of different instruments of fiscal policy. These instruments fall broadly under the three conventional classifications of taxation, public expenditure, and aggregate budgetary balance. Each is analyzed from the perspective of Musgrave's three economic branches. While a multiplicity of factors, some of which are of a noneconomic nature, could plausibly affect the performance of an economy from period to period, a country's growth over a reasonably long period of time is ultimately determined by three factors: (1) given the state of technical know-how in that country, the efficiency with which any existing stock of resources is utilized (which would depend, *inter alia*, on cultural, institutional, political, as well as economic, parameters); (2) the accumulation over time of productive resources (which would include, *inter alia*, human and other forms of intangible capital); and (3) technological progress (which for most countries would depend, *inter alia*, on their ability to absorb new technology from abroad).<sup>2</sup> This paper traces out various channels through which tax policy, expenditure policy, and overall budgetary policy could affect growth through their impact on the above three factors.

---

<sup>1</sup>See, for example, IMF (1996).

<sup>2</sup>While the second factor—resource accumulation—has traditionally been the focal point of growth economics, Schumpeter (1934) made the case for the first and third factors, which together imply productivity improvement, as the main ingredients for growth. Tanzi (1995) expanded on the Schumpeterian theme and emphasized the importance of a country's social absorptive capacity (with respect to technology) in determining its development. The resource-accumulation versus productivity-improvement debate has raged in recent years as researchers have tried to understand the factors which have contributed to the impressive growth of a small number of East Asian economies. For an argument supporting the resource-accumulation thesis in this context, see Young (1995).

While for ease of exposition the growth effects of different fiscal policy instruments are discussed separately below, it does not imply that they are independent of each other: the impact on growth of taxes would depend, for example, in addition to their level and structure, on how the tax revenue is spent (the composition of public expenditure), as well as on how they affect the overall budgetary balance (for any given total level of public expenditure). This interdependence underscores the danger in policy deliberations of focusing too narrowly on the value of one variable (e.g., the budgetary balance) to the neglect of its underlying components—a conceptual equivalent to not properly controlling for relevant variables in empirical estimations. In general, the empirical growth literature has shown that estimation results could be materially affected by the presence or absence of controlled variables.

The relevance of considering the growth effects of fiscal policy must be predicated, of course, on the basic proposition that policy matters for long-run growth. Although this may seem intuitively obvious, it is in fact a relatively new idea; it became established in mainstream economic thinking only with the recent advent of the endogenous growth literature.<sup>3</sup> As an alternative paradigm to the neoclassical growth theory of Solow (1956) and Swan (1956),<sup>4</sup> in which long-run growth is completely determined by factors exogenous to the theory itself (and, therefore, is invariant to policy),<sup>5</sup> the endogenous growth literature has been largely motivated as an attempt to overcome the former's failure in reconciling theory with some of Kaldor's (1961) six celebrated, stylized facts of growth, most notably the seeming absence in the data of any discernible sign of growth convergence along income levels across countries—a fundamental implication of the neoclassical paradigm.<sup>6</sup> While this paper is not a survey per se of the variety of models, results, and policy implications of the voluminous

---

<sup>3</sup>While the early roots of this literature go some ways back to Arrow (1962) and Uzawa (1965), its present analytics owe much to Romer (1986) and Lucas (1988).

<sup>4</sup>The intertemporal utility maximization-based neoclassical growth models that have become familiar today are actually due to Cass (1965) and Koopmans (1965).

<sup>5</sup>The policy invariance implication of the neoclassical growth theory applies only to the steady state, the attainment of which may take a period longer than most would regard as the long run. This point should be borne in mind when future references to the above implication are made in the rest of the paper.

<sup>6</sup>For an illuminating discussion, see Romer (1989). There is, however, no consensus among researchers on the question of convergence. Studies by Baumol (1986), Barro and Sala-i-Martin (1995), Mankiw et al. (1992), and Sala-i-Martin (1996a, 1996b) tended to confirm the existence of convergence, provided that variables other than income (such as human capital) are properly controlled. For a dissenting view, see Quah (1996a, 1996b).

endogenous growth literature,<sup>7</sup> it takes as given the basic premise of this literature that a country's growth performance in the long run is endogenously determined by a set of variables which are responsive to (and affected by) policy, in this particular case fiscal policy.

A legitimate question that could be raised is the appropriateness of adopting national output, rather than welfare, as the yardstick for evaluating policy, since it is presumably the latter that is the ultimate concern of policymakers. The problem of the gap, and in more extreme circumstances that of changes in opposite directions, between output and welfare is well known: it follows from the fact that national income accounts omit imputed values for household production, leisure, and environmental externalities, among others.<sup>8</sup> Hence, it is theoretically possible for some policy measures to stimulate output and yet reduce welfare (e.g., excessive tax incentives provided to certain industries without properly taking into account the possible pollution costs associated with their activities). While this problem is conceptually important (and hence worth noting explicitly), its resolution in practice would present formidable measurement problems, because the more encompassing welfare effects of policy are not directly and objectively observable. Moreover, in discussing issues of long-run growth, the bias in evaluating policy on the basis of output effects is somewhat lessened, as any persistent difference between changes in output and those in welfare is unlikely to be sustainable in the long run.<sup>9</sup> Accordingly, this paper will adopt the conventional approach in assuming that output growth is positively correlated with welfare improvement.

In what follows, the impact of fiscal policy on growth will be taken up first from the point of view of allocative efficiency, then from that of stability. The relatively new literature on the growth effects of fiscal policy from an income distribution perspective will be considered last.

## II. ALLOCATIVE EFFICIENCY AND GROWTH

### A. Tax Policy

Some of the clearest and most direct conceptual links between fiscal policy and growth have traditionally been associated with tax policy. This reflects, of course, the fact that the allocative impacts of taxation (e.g., on labor-leisure choice, on consumption-saving behavior, and on the relative profitabilities of different industries, among others) are easily appreciated

---

<sup>7</sup>For a textbook treatment of the literature, see Barro and Sala-i-Martin (1995).

<sup>8</sup>An early influential investigation into this problem was provided by Nordhaus and Tobin (1973). A different aspect of the problem commonly found in most centrally planned economies is that of the suboptimal mix of outputs—often heavily biased toward the production of capital goods.

<sup>9</sup>The use of output as a reference point in policy evaluation is defended by Aiyagari (1990).

by theorists and policymakers alike, and, consequently, have long been one of the best researched areas in economics. The various links between taxation and growth have, however, different conceptual underpinnings, so it will be useful to consider them separately.

One link is built on the idea that all taxes are nonneutral, with the singular exception of lump-sum levies (which are largely irrelevant as a practical instrument, and may even be nonneutral in an intertemporal context if planning horizons are finite or in open economies). With nonneutral taxes, private economic agents' allocative decisions will be different from those that would be made in the absence of such taxes. This tax-induced distortion in economic behavior results in a net efficiency loss to the whole economy, commonly referred to as the excess burden of taxation, even if the government engages in exactly the same activities—and with the same degree of efficiency—as the private sector with the tax revenue so raised.<sup>10</sup> It then follows that the higher the *level of taxation*, the larger would be this efficiency loss. Moreover, the loss typically grows disproportionately with increases in the tax level when there are other existing tax distortions in the economy. This result would go through even if the taxes are optimally structured, in the sense that the excess burden of each tax is equalized (proportionally) across all taxes.<sup>11</sup> It must be pointed out that while it is straightforward to conceptualize a negative relationship between the level of taxation and the level of output, it is not clear why the former would adversely affect the long-run growth of output.<sup>12</sup> To obtain a growth effect, the appropriate variable to consider should instead be the *rate of change* in the level of taxation.<sup>13</sup>

The above link between taxation and growth is established on the basis of the former's excess burden in a static context. A second and more conspicuous link has to do with the impact of taxation on factor accumulation, particularly capital; it relates, therefore, to the excess burden of taxation in a dynamic sense. Because in the neoclassical growth paradigm long-run growth is invariant to policy,<sup>14</sup> as noted earlier, the focus of the traditional analyses of capital income

---

<sup>10</sup>The concept and measurement of excess burden has a long and controversial history in economics, dating in its modern formulation at least as far back as the work of Dupuit more than a century ago. For a recent comprehensive survey of this literature, see Auerbach (1985).

<sup>11</sup>This is (heuristically) the celebrated Ramsey (1927) rule of optimal taxation, a modern reformulation and generalization of which can be found in Diamond and Mirrlees (1971).

<sup>12</sup>If the period for output to adjust to any given change in the level of taxation is lengthy, the latter would have, of course, an impact on the *measured* growth over the period.

<sup>13</sup>This is a central result of Engen and Skinner (1992).

<sup>14</sup>Policy can, however, have a transitory impact.

taxation employing such a paradigm is on the long-run tax impact on the level rather than the growth of output.<sup>15</sup>

Policy implications are entirely different, however, when growth is responsive to policy, as in the case of the endogenous growth theory. Here, all other things equal, a tax on income from (physical) capital would lower the after-tax return to savings, and is, therefore, a disincentive to accumulate (physical) capital. But the ultimate impact of this on growth turns out to be a priori ambiguous; it is dependent on how the other factors, such as human capital, which cooperate with physical capital in the production process, are affected by the tax (assuming these other factors are not taxed).<sup>16</sup> A comparison between two simple cases, both with human capital as the only other factor of production, will illustrate the difference in outcomes in a particularly transparent manner.

In one case, assume that the production of human capital requires only human capital (Lucas, 1988). Then the growth-depressing effect of the tax on physical capital will be entirely offset by an increase in human capital accumulation. Hence, the net impact on growth is zero. Alternatively, suppose the production of human capital requires both human and physical capital. In this case, the offset will only be partial, and the net impact on growth is negative (Rebelo, 1991). This simple comparison underscores the important point that the growth effects of (physical) capital income taxation are sensitive to the specification of production technology.<sup>17</sup> In general, however, it can be reasoned that the lighter the tax burden on the

---

<sup>15</sup>The voluminous literature on this subject is succinctly surveyed in Sandmo (1985). Two well-known results from this literature are worth noting. Atkinson and Sandmo (1980) showed that, in a two-period, life cycle, overlapping-generations model, the optimal capital income tax rate in the long run is not necessarily zero, but instead would generally depend on the relative tax elasticities of labor supply and savings, as well as on their cross elasticities. The nature of this outcome is characteristic of the optimal taxation literature. In contrast, Chamley (1986), using an infinite-horizon model, demonstrated that the long-run optimal capital income tax rate is in fact zero. The two results differ because the intergenerational inefficiency resulting from taxing capital income is not fully capturable in a life cycle framework.

<sup>16</sup>If all factors, including human capital, are taxed at the same rate, then long-run factor proportions are unchanged by the tax, in which case long-run growth would be unambiguously lowered as a result. See Rebelo (1991).

<sup>17</sup>Many of these issues are surveyed in Xu (1994). Zee (1996b) shows that, in addition to the technology of production, the growth effects of income taxation will also depend on the specification of time preference. If time preference is endogenous, i.e., if one's valuation of current relative to future consumption is responsive to the current levels of income and consumption, then an income tax would also affect savings through this time

(continued...)

production of human capital relative to that on other sectors that are human capital intensive, the smaller will be the adverse impact on growth of taxing physical capital.<sup>18</sup>

The above discussion suggests that the *structure of taxation* could have important implications for growth. This consideration actually is not limited to simply the area of capital income taxation, or even to income taxation in general; it has in fact broad significance for the overall design of the structure of the entire tax system. For a given total tax level, a relative shift from income to consumption taxation would, for example, reduce the disincentive to save, and, consequently, provide a boost to capital accumulation.<sup>19</sup> While a tax on consumption distorts labor-leisure choice, it is neutral with respect to the relative price between consumption today and tomorrow, and, thus, can only produce a level (rather than growth) effect.<sup>20</sup> In addition to its impact on resource accumulation, the structure of a tax system may have other growth consequences. A heavy reliance on trade taxes could, for example, impede an economy's capacity to absorb or develop new technologies—thus harming its growth prospects—by reducing the exposure of domestic industries to international markets and competition, although tax administration constraints may pose difficulties for their elimination.<sup>21</sup>

Another channel through which tax policy could have a significant impact on both resource accumulation and technological progress is the provision of *tax incentives* (also known

---

<sup>17</sup>(...continued)  
preference channel.

<sup>18</sup>On this point, see Lucas (1990). A quantitative assessment of the growth effects of taxing both physical and human capital in a nonuniform manner under different technological specifications is provided by Stokey and Rebelo (1995).

<sup>19</sup>It is common to note that, in the absence of a labor-leisure choice, the intertemporal budget constraint of an economic agent implies that taxing wage income (and inherited wealth) only (leaving interest income untaxed) is equivalent to taxing consumption (and bequests), with national savings unaffected by the choice between these two taxes (unless there are other distortions). Tanzi and Zee (1993) showed, however, that if consumption requires time, a wage tax would discourage savings in a manner similar to that of a tax on interest income.

<sup>20</sup>For an extended discussion on the growth effects (or the lack thereof) of taxing consumption, see Stokey and Rebelo (1995).

<sup>21</sup>Trade taxes are frequently the most administratively reliable tax handles, and consequently heavily relied upon to produce revenue, in many developing countries. On average, trade taxes (especially import duties) amount to about a quarter of total tax revenue in a broad group of non-OECD countries, compared to about 2 percent in OECD countries. See Zee (1996a).

otherwise as a form of tax expenditure), which in one form or another exist in almost all (developing and developed) countries, for promoting investment and research and development (R&D)-type activities. While there is broad consensus among economists that *general*, i.e., nontargeted, incentives are of questionable value—relative to other factors such as the stability, simplicity, and neutrality of a tax system with internationally comparable tax rates—in achieving their stated objectives, there is much less agreement on *targeted* incentives.<sup>22</sup> By their very nature, all tax incentives create distortions, but if targeted incentives are designed to mitigate certain market failures, then the distortions they cause may well be outweighed by the benefits that can be reaped from their use. For example, the social benefits from enhanced growth produced by many investments and R&D-type activities could exceed their private returns. Without corrective public measures, such activities would be below their optimal levels.<sup>23</sup> Such arguments usually neglect, however, political-economy costs of providing tax incentives, as they tend to encourage rent-seeking behavior, corruption, and the development of special interest groups.<sup>24</sup> While these costs are not easy to measure, their adverse impact on growth may be significant.<sup>25</sup>

The *empirical evidence* of the impact of various aspects of tax policy on growth has so far been mixed.<sup>26</sup> While there is some general indication that the relationship between either the total or income tax level and growth is negative, this relationship is not robust and is sensitive

---

<sup>22</sup>Many conceptual and analytical aspects of tax incentives, as well as country practices, are covered in OECD (1994) and Shah (1995).

<sup>23</sup>Delong and Summers (1991) argued on just this basis for providing tax incentives to equipment investment, which they find to have strong growth effects. Murphy et al. (1989) showed that intersectoral spillover effects of industrialization would call for the implementation of investment promotion policies in a coordinated manner.

<sup>24</sup>The growth-lowering effects of rent-seeking activities have been examined in Baumol (1990) and Murphy et al. (1991) in the context of how entrepreneurship and talent are allocated among alternative activities. Mauro (1995) found cross-country evidence that corruption retards growth.

<sup>25</sup>It is common for advocates of tax incentives to point to the extensive use of such incentives in some high-growth Asian economies as evidence of their effectiveness. Tanzi and Shome (1992) speculated, however, that this positive association probably has less to do with the nature of the incentives themselves than with the characteristics of the countries where they are used, such as the quality of the civil servants and the efficiency of the public bureaucracy—characteristics that tend to minimize the political-economy costs of providing the incentives.

<sup>26</sup>For surveys of this literature, see Levine and Renelt (1991), Easterly and Rebelo (1993), and Xu (1994).

to model specification, particularly with respect to the list of nontax variables that are controlled. Easterly and Rebelo (1993) experimented with 13 different tax measures and found only one—a marginal income tax rate computed by a time series regression of income tax revenue on GDP—to be statistically significant in explaining growth variations among their sample countries. By including the initial real GDP per capita as a variable in the regressions, these authors found that the strikingly negative correlation between the ratio of income tax revenue to GDP and growth shown in Plosser (1992)—and subsequently much cited by others—to be statistically insignificant. As noted earlier, Engen and Skinner (1992) found statistically significant relationships between growth and the rate of change in tax levels.

The most severe difficulty in isolating the impact of taxation on growth clearly lies in the fact that key nontax fiscal variables, such as public expenditure and budget policies, that are often not independent of tax policy can also affect growth (see below), let alone the complex interactions among the fiscal and other macroeconomic variables.<sup>27</sup> For example, there is also some evidence suggesting that the growth effects of fiscal policy variables are dependent on income levels, and the negative relationship between tax levels and growth rates is the strongest among the least developed countries.<sup>28</sup> Overall, the general conclusion that can be drawn is that the empirical evidence on the relationship between taxation and growth is much weaker than what the theory would have led one to expect.

### B. Public Expenditure Policy

The financing of any *level of public expenditure*,<sup>29</sup> whether through taxation or borrowing, involves the absorption of real resources by the public sector that otherwise would be available to the private sector.<sup>30</sup> From a purely static, allocative point of view, this absorption would improve overall efficiency if the social return (benefit) from public expenditure exceeds its private opportunity cost. While public expenditure may displace private sector output (the crowding-out effect), it may also improve private sector productivity (the externality or public good effect). Its total social return must, therefore, be interpreted as the sum of both of these

---

<sup>27</sup>In their sensitivity analysis of cross-country growth regressions, Levine and Renelt (1992) found that the investment share in GDP is the only robust variable in explaining growth.

<sup>28</sup>See Martin and Fardmanesh (1990).

<sup>29</sup>Public expenditure here refers to the exhaustive type, i.e., expenditures of a purely transfer nature (subsidies, welfare payments, etc.) are excluded. This is also consistent with national income accounts data on such expenditure on which most empirical studies are based. Transfers have, however, distributional implications, which are discussed in Section IV.

<sup>30</sup>The absorption of domestic resources will be delayed, of course, if foreign borrowings or unemployed resources are available.

effects.<sup>31</sup> The net impact on aggregate output of the crowding-out effect of public expenditure is clearly dependent on the relative marginal productivities between the public and private sectors. There is a widespread belief that, absent externalities, public production tends to be less efficient than private production.<sup>32</sup> Hence, on account of this effect alone, the higher the level of public expenditure, the greater the inefficiency and the lower the level of output. To relate public expenditure to long-run output growth, however, it should be the *rate of change* in the level of public expenditure that matters,<sup>33</sup> a point that is analogous to the case noted earlier involving the level of taxation.

The externality effect of public expenditure, in contrast, enhances growth by raising private sector productivity. Here, a high growth rate could be achieved by a higher level of such expenditure. In the recent endogenous growth literature, the focus has been on the stock of public infrastructure (or the level of services that flows from it) as a productive input,<sup>34</sup> although conceptually there is no reason why this effect should be limited to infrastructure spending only; there is a range of public expenditures, such as those on elementary education and vocational training that enhance human capital (a key variable in endogenous growth), which potentially could have a similar impact.

The opposing nature of the crowding out and externality effects implies that the *structure of public expenditure*, rather than merely its level, would be of considerable importance. In analyzing the composition of public expenditure, the traditional approach has been to divide it broadly into the categories of public consumption and public investment, with the idea that the former tends to retard, and the latter to promote, growth. While intuitively appealing, this classification can quickly become problematic. Many public investment projects could be wasteful, for example, in the sense that their marginal net present values could be negative for the society as a whole; at the same time, many public consumption expenditures, such as certain kinds of educational training, operations and maintenance spending on existing infrastructure, and even targeted funding for R&D-type activities, could be enormously beneficial for long-run growth. Hence, a more useful classification—one that is gaining currency recently—would divide public expenditure into productive (i.e., growth-inducing) and unproductive (i.e., growth-retarding) categories, taking into consideration the levels and

---

<sup>31</sup>For a clear separation of these two effects, see Ram (1986).

<sup>32</sup>This is often the rationale for advocating privatization of public enterprises. See World Bank (1995).

<sup>33</sup>Ram (1986) made this point explicit in his model.

<sup>34</sup>See, in particular, Aschauer (1989) and Barro (1990). The analytics of endogenous growth models incorporating public expenditure as a productive input are surveyed in Barro and Sala-i-Martin (1992).

mixes of *both* the resources absorbed, and outputs produced, by different expenditure programs.<sup>35</sup>

The usefulness of the productive-unproductive classification for growth analyses is particularly apparent in a dynamic context, because it focuses one's attention on the impact of public expenditure on private savings and investment, and hence capital accumulation. There are three dimensions to this impact. First, public expenditure needs to be financed, and this reduces resources for private savings.<sup>36</sup> Second, to the extent that it improves private productivity, it stimulates private savings. Finally, the degree of complementarity/substitutability between it and private expenditure is important. The lower (higher) the complementarity (substitutability), the smaller its impact on private savings.<sup>37</sup> The combined impact of these effects on private savings would suggest that the relationship between the level of public expenditure and growth is typically not monotonic. For a given degree of complementarity/substitutability, growth may first be enhanced by public expenditure up to a point, after which the relationship between the two turns negative.<sup>38</sup> This has provided a basis for determining the growth-maximizing level of public expenditure, as well as for government intervention in a decentralized economy.<sup>39</sup>

As with the case of taxation, the *empirical evidence* of the growth effects of public expenditure (as a share of GDP) is inconclusive. Based on cross-country regressions, Ram (1986) found that growth in general is positively correlated with the rate of change in total public expenditure, but is negatively correlated with the level of such expenditure; this latter result was also obtained by Levine and Renelt (1992). When public expenditure is broadly disaggregated, there is a stronger indication that growth is negatively correlated with public consumption *net of defense and education spending* (Barro and Sala-i-Martin, 1995); Easterly

---

<sup>35</sup>For a recent development of this argument, see Devarajan et al. (1996). See also IMF (1995) for a discussion of the various aspects of the productive-unproductive classification of public expenditure. One type of unproductive public expenditure that has received much attention recently is military spending. See, for example, Knight et al. (1996). It should, however, be noted that not all public expenditure programs are designed to promote growth. Hence, some public expenditures could be unproductive in the growth sense, and yet simultaneously effective in the sense of achieving their objectives.

<sup>36</sup>See, however, the discussion below on budget policy.

<sup>37</sup>There is a voluminous literature on this last aspect of public expenditure, stimulated by the classic analysis of Bailey (1971). For a recent treatment and review, see Karras (1994).

<sup>38</sup>Public expenditure may also become increasingly wasteful after a certain point, as argued by Tanzi and Schuknecht (1995).

<sup>39</sup>See, in particular, Barro (1990) and Jones et al. (1993).

and Rebelo (1993); and to a certain extent Levine and Renelt (1992)). One possible explanation for this negative relationship is that, in the aggregate, such public consumption is viewed by economic agents as a less-than-perfect substitute (or possibly even a complement) for private consumption, so private savings decline as a result. Karras (1994) found evidence of complementarity between public and private consumption.

As regards more specific categories of public consumption, Knight et al. (1996) found a significant adverse impact of military spending on growth, while Aschauer (1989) found that the impact of such spending on private sector productivity in the United States, though negative, is insignificant.<sup>40</sup> A significantly positive impact on growth of public spending on education was found by Barro and Sala-i-Martin (1995), who interpreted the result to represent the growth effect of improved quality in human capital, although it is also consistent with the Tanzi (1995) argument that such spending increases a country's ability to absorb technology from abroad and invent new technologies. Levine and Renelt (1992) found neither military nor public education expenditures as having a robust correlation with growth.

The finding by Aschauer (1989) of a strong and positive correlation between nonmilitary public capital stock and private sector productivity in the United States has been widely cited as evidence of the importance of public investment in promoting growth. Of particular interest here is the identification of a subset of core infrastructure (utilities and transportation facilities) as having the greatest impact. In a cross-country setting, Easterly and Rebelo (1993) also obtained strong support for a positive correlation between growth and public investment, especially that in transportation and communication, but Levine and Renelt (1992) found that the growth effects of public investment are not robust.

The difficulties noted earlier in properly estimating the growth effects of taxation clearly apply to public expenditure as well. Even if the correlation between growth and public expenditure (or a subset thereof) is found to be robust (in the sense that other relevant variables have been adequately controlled), it would still be unclear as to the direction of causation underlying the correlation. Higher income growth may well generate higher demands for some or all types of public expenditure, which in turn may necessitate higher levels of taxation.<sup>41</sup> Hence, it is at least plausible that the direction of causation could run from growth to public expenditure and taxation. To be sure, most researchers are aware of this problem of reverse causation, but the empirical growth literature has so far not dealt with it in a satisfactory manner.

---

<sup>40</sup>In the United States, military spending has often produced technologies potentially beneficial to the whole economy. This is less likely to happen in other, and particularly in developing, countries.

<sup>41</sup>For example, higher growth may generate a higher demand for cars, which in turn may generate a higher demand for roads.

A further problem that has not been addressed in this literature is that the relationship between growth and fiscal variables may not be monotonic, either over the levels of the fiscal variables themselves or over income levels, or both. As noted earlier, it is analytically plausible to argue that increasing levels of public expenditure would first raise and then reduce growth. If countries pursue approximately growth-maximizing public expenditure policies, then one would expect little correlation between growth and the level of public expenditure in a cross-country regression. Similarly, a case could be made that the growth effects of fiscal variables, if any, may well change direction as income rises.<sup>42</sup> These and other problems suggest that there is much scope for further empirical research in disentangling the complex interactions among different fiscal variables.

### C. Budget Policy

Another broad fiscal variable that could have implications for growth is budget policy, in the sense that the level of public revenue *relative* to that of public expenditure, i.e., the budget balance, may have growth effects that are separate from those related to the *absolute* level of either taxation or public expenditure discussed earlier. One type of effect stems from the stability implications of budget imbalances; this is considered in Section III below. Another type is related to a possible behavioral response from the private sector triggered by such imbalances. If the private sector regards budget deficits (even if financed by debt) simply as taxes delayed, for example, then it may choose to increase its own savings to neutralize the public dissavings, thus leading to an unchanged level of national savings. Alternatively, budget deficits might not induce a response in private sector savings, in which case national savings would be reduced and growth hampered.<sup>43</sup>

The question of whether there is *neutrality between debt and tax financing* has been the focus of much recent research.<sup>44</sup> A crucial condition for the neutrality to hold is that, when the planning horizons of economic agents are finite (as would be the case under the intuitively appealing notion of life-cycle savings), there are operative private transfers (gifts and bequests) between generations, so that the implied tax burden of public dissavings on future generations is not ignored by the current generation. It is now widely recognized that strict

---

<sup>42</sup>In an investigation of Wagner's law, Tanzi and Zee (1995) found the correlation between the levels of public wage expenditure and income to be positive for middle-low income countries and negative for high income countries.

<sup>43</sup>For the present discussion, assume that the public expenditure giving rise to the budget deficits does not entirely consist of public investment.

<sup>44</sup>This neutrality is commonly referred to as the Ricardian equivalence, since the idea can be traced back to the writings of Ricardo, as well as to some early Italian public finance literature (see Buchanan (1958) for an account). Its modern revival is usually credited to Barro (1974). Bailey (1971) contained a clear discussion of its implications.

neutrality would also depend on the absence of a host of other factors, such as tax distortions, income uncertainties, and imperfect credit markets.<sup>45</sup>

While conceptually intriguing, the importance of the above neutrality result clearly lies in the *empirical evidence*. Unfortunately, similar to the case of the growth effects of taxation and public expenditure, the empirical support for debt neutrality is mixed.<sup>46</sup> On the whole, the evidence, particularly from cross-country data, seems to suggest that the response from private sector savings to public sector dissavings does not completely neutralize the latter. Direct tests of the impact of budget deficits on growth based on cross-country data have also been recently performed by a number of studies: Easterly and Rebelo (1993) found the correlation between the two significant and negative; Martin and Fardmanesh (1990) found the correlation significant and negative only for middle-income countries; and Levine and Renelt (1992) found the correlation fragile.

### III. STABILITY AND GROWTH

#### A. Tax and Expenditure Policies<sup>47</sup>

From the point of view of stability, the most direct link between tax policy and growth has to do with the fact that, when the tax regime is uncertain, it injects volatility to the returns to an investment project. In the recent literature on investment under uncertainty, it has been established that, since most projects are to some extent irreversible, increased uncertainty to

---

<sup>45</sup>The literature on the Ricardian equivalence is too voluminous to even attempt a partial survey here. Recent assessments of relevant issues have been provided by Leiderman and Blejer (1988), as well as by two of the central debaters, Barro (1989) (proponent) and Bernheim (1989) (critic). In a recent analysis, Bailey (1993) derived the important result that if taxes are capitalized into property values, and properties are part of the bequest from one generation to another, then (approximate) Ricardian equivalence would hold even if generations are not linked by transfers over an infinite horizon.

<sup>46</sup>In testing Ricardian equivalence, empirical works have largely focused on the impact of budget deficits on one or more of the following three variables: private consumption-savings; intergenerational transfers; and interest rates. For reviews of empirical evidence, see Bernheim (1987) and the associated comments of discussants; Leiderman and Blejer (1988); and Barro (1989).

<sup>47</sup>The growth implications of tax and public expenditure policies are similar in the stability context, and, therefore, are discussed jointly.

their returns would generally lead to a reduction (postponement) in investment.<sup>48</sup> Hence, uncertainty about the tax regime, which in turn leads to uncertain after-tax returns, is likely to discourage investment and hamper growth.<sup>49</sup>

*Tax regime uncertainty* could be attributable to a number of factors. The difficulty in forecasting the direction of prospective tax reforms under political debate is one obvious example. Another example would be the possible changes to the tax regime necessitated by unexpected shocks to income and/or interest rates, or by unforeseen public expenditure needs. A tax system that is not indexed and/or has significant collection lags would also give rise to uncertain real effective tax rates in an unstable inflationary environment.<sup>50</sup> There is, however, one type of uncertainty that is unrelated to such unanticipated factors, but that nevertheless could arise even in a framework of an optimizing government whose objective coincides with that of the representative economic agent: if the optimal tax regime changes from one period to the next, there would be uncertainty as to whether the government would maintain the same regime over time.

The above problem, which is generally known as the *time-inconsistency of optimal policy*,<sup>51</sup> can best be understood intuitively by considering a simple two-period model with endogenous savings and labor supply. The government in period 1 optimizes and determines the optimal tax rates on labor and capital for period 2. When period 2 comes around, savings undertaken in period 1 have become fixed capital (sunk cost) and, if taxed, would not give rise to any excess burden. Hence, it would be optimal for the government in period 2 to tax only capital,

---

<sup>48</sup>This result comes about because it may pay to wait for a favorable state of nature to occur. Depending on the nature of the uncertainty, however, uncertain returns could, under some circumstances, stimulate investment. One reason is that the act of investing itself sometimes provides additional information that could act to reduce the uncertainty; another reason is that a mean-preserving spread of variance (i.e., an increase in variance with the same mean) with respect to returns would increase the expected value of a project, if the valuation function displays diminishing marginal value of returns. For a recent comprehensive treatment of this literature, see Dixit and Pindyck (1994); for an illustration that the impact of uncertainty on investment is dependent on the way tax regime uncertainty is modeled, see Hassett and Metcalf (1994).

<sup>49</sup>Recent theoretical analyses that lend support to this conclusion include Aizenman and Marion (1993) and Dixit and Pindyck (1994).

<sup>50</sup>Growth effects of inflation are considered below in connection with budget policy. For discussions of the impact of inflation on real tax revenue in the presence of collection lags, see Tanzi (1977, 1978).

<sup>51</sup>The vast literature on the time-inconsistency problem has its origin largely in the seminal work of Kydland and Prescott (1977).

which is a policy that, in general, will not be the same as the optimal policy set by the government in period 1.<sup>52</sup> While it is tempting to interpret the foregoing result as simply another consequence of investment being irreversible, the time-inconsistency problem is in fact fairly general and can occur even in models without capital.<sup>53</sup>

The likely adverse impact on growth of tax regime uncertainty, irrespective of its origin, raises quite naturally questions about the possible ways by which the uncertainty (or at least some types of such uncertainty) could be alleviated. For the time-inconsistency problem, various potential mechanisms have been advanced to precommit the government in a given period to maintaining an optimal policy over time.<sup>54</sup> If the uncertainty stems instead from unexpected shocks to income and/or interest rates, or from unforeseen public expenditure needs, then an appropriate debt management policy could obviate the need for altering the tax regime as a response to such occurrences.<sup>55</sup> Finally, if inflation is the source of uncertainty about the real tax burden, the first-best solution is clearly to implement appropriate policies to reduce macroeconomic instabilities; indexing the tax system and adopting administrative measures to reduce tax collection lags are possible second-best solutions.

---

<sup>52</sup>See Fischer (1980) for a particularly illuminating discussion of this example. Kydland and Prescott (1980) examined essentially the same example in greater generalities. The same demonstration can be made with respect to human capital investment, where a government could find it optimal to tax such investment lightly in the early periods of an individual's life, but to tax the returns from human capital heavily once the capital has been formed.

<sup>53</sup>See, for example, the well-known demonstration by Lucas and Stokey (1983). As it turns out, in a typical intertemporal model with endogenous labor supply but with no capital, whether an optimal tax regime is time-inconsistent or not depends critically on the tax instruments at the disposal of the government. If only an income tax (either on wages or on interest income, or both) is available, the outcome is time inconsistent (Turnovsky and Brock, 1980; and Lucas and Stokey, 1983). Rogers (1987) found that a consumption tax is time consistent under a Cobb-Douglas utility function. When the utility function has a general specification, however, Zee (1994) showed that an optimal tax regime would be time consistent only if both the income and consumption taxes are available. Moreover, Zee (1994) also showed that an optimal time-consistent tax structure could be distortive.

<sup>54</sup>These mechanisms include imposing on the government reputational constraints (Barro and Gordon, 1983), social contractual obligations (Kotlikoff et al., 1988), and particular structures of government debt (Lucas and Stokey, 1983; and Persson et al., 1987).

<sup>55</sup>This is the intertemporal consumption-smoothing argument of Barro (1979, 1995b). By varying the level and structure of public debt, tax rates could be smoothed over time and over states of nature to minimize the intertemporal excess burden of distortive taxes. The ability to restructure public debt varies, of course, across different countries. In many developing countries, this ability is often quite limited.

Based on cross-country regressions of a large sample of developing countries, Aizenman and Marion (1993) presented *empirical evidence* which suggests that, to varying degrees, there is a significant and negative correlation between growth and uncertainty in a number of fiscal variables, such as levels of revenue, public expenditure, and budget deficits.<sup>56</sup> Easterly and Rebelo (1993) also found that the standard deviation in the ratio of domestic tax revenue to consumption and investment had a significant and negative impact on growth.

### B. Budget Policy

Assume for the moment that monetary financing of budget imbalances is not available. Under such circumstances, the evolution of the stock of real public debt is entirely governed by the path of cumulative real budget imbalances over time. If the economy is dynamically efficient (i.e., its long-run real interest rate exceeds its long-run growth rate) and the government is to be solvent, then any indebtedness of the government would have to be eliminated eventually through appropriate budget policy that would bring the present value of the stock of public debt at some future date (which could be infinity) to zero.<sup>57</sup> An important implication of this *solvency requirement* for the conduct of budget policy is that the government would be obligated to accumulate a sufficient level of net primary budget surpluses (in present value terms) over time to pay off its initial debt.<sup>58</sup> This implication, in turn, provides a natural basis for evaluating whether current budget policy, if maintained, is sustainable (Wilcox, 1989), and, if not, to what extent tax rates must be raised (for a given path of public expenditure) to ensure government solvency (Blanchard et al., 1990).

The relevance of policy sustainability for growth is twofold. If current policy is deemed to be unsustainable, then either a regime change in tax (and/or expenditure) policy would be expected to occur, or monetary financing would be resorted to. The former would increase

---

<sup>56</sup>Aizenman and Marion (1993) measured uncertainty in a variable by the standard deviation of the residuals from a first-order autoregressive process of that variable.

<sup>57</sup>This is a widely invoked requirement in the literature. Notable recent examples are Wilcox (1989) and Blanchard et al. (1990).

<sup>58</sup>Whether an economy is dynamically efficient or not is an empirical question; theory cannot rule out the possibility that its long-run growth rate could exceed the long-run real interest rate (see Diamond, 1965). In the latter case, the solvency requirement is no longer meaningful, as the government could sustain some positive stock of public debt forever simply through additional borrowing, without having to run budget surpluses (this phenomenon has sometimes been referred to as a Ponzi finance scheme), because by assumption the debt service cost is lower than income growth. The determination of a sustainable positive stock of public debt was examined by Zee (1988). Recently, however, Abel et al. (1989) found that most capitalistic economies are dynamically efficient.

policy uncertainty, whose impact on growth has already been discussed earlier. The latter would lead to inflation, which raises the important issue of possible growth effects of inflation.

There are a number of conceptual links between *inflation* and growth. One of the oldest is built on the idea that inflation can be viewed as a distortive tax on real money balances and, therefore, has efficiency consequences in much the same way as other, more traditional distortive taxes discussed in Section II above.<sup>59</sup> As pointed out in that earlier discussion, from a purely allocative perspective, any adverse growth impact from distortive taxes would have to stem from increases in the level of taxation, in this case an acceleration in inflation.<sup>60</sup> From a stability perspective, however, arguments have been advanced that higher inflation rates would lead to greater uncertainty about future inflation (Okun, 1971; and Friedman, 1977), thus larger efficiency losses would result simply from higher levels of inflation.

The impact of inflation on growth has also been examined directly in growth models. In the earlier growth literature, the focus was on the issue of the superneutrality of money, i.e., whether inflation could affect the steady-state capital-labor ratio, rather than on the growth effects of inflation per se (as the long-run growth in these models is exogenous).<sup>61</sup> With endogenous growth models, however, a number of direct channels through which inflation could affect growth open up, such as the potential impacts of inflation on both physical and human capital accumulation, as well as the interactions between inflation and a tax system that is based on nominal rather than real magnitudes.<sup>62</sup> On the whole, however, the theoretical results in both the old and new growth models seem to be too dependent on model specifications to render them useful as yet for policy purposes.

---

<sup>59</sup>The seminal work on measuring the welfare cost of inflation as the excess burden of a tax in a partial equilibrium framework was that by Bailey (1956), from which a vast literature ensued. The integration of the inflation tax into a standard optimal taxation model was first carried out by Phelps (1973). Chari et al.'s (1996) recent reexamination of this literature clarified a number of important theoretical points concerning the relationship between the inflation tax and other commodity taxes.

<sup>60</sup>This point notwithstanding, it is worth noting that the recent study by Lucas (1994) indicates that, employing the Bailey (1956) framework, the welfare cost of inflation in the United States is much higher than what is commonly believed to be the case. A large welfare cost was also found by Dotsey and Ireland (1996), who extended the Bailey-type measure into a general equilibrium framework with endogenous labor supply.

<sup>61</sup>The voluminous literature on the superneutrality of money has been recently surveyed by Orphanides and Solow (1990).

<sup>62</sup>Jones and Manuelli (1995) addressed many of these issues. Inflation can render a previously optimal tax system suboptimal through a variety of channels: different collection lags of different taxes, differential tax impacts on different tax bases, and nonproportional tax rates.

While further theoretical explorations of the growth effects of inflation are certainly called for, there is increasing *empirical evidence* which suggests that there exists a significant and negative correlation between *high* inflation and growth.<sup>63</sup> Based on panel data, the inflation threshold above which growth effects become significant ranges from 8 percent to 40 percent.<sup>64</sup> Furthermore, Judson and Orphanides (1996) found that inflation volatility is robustly and negatively correlated with growth at all levels of inflation. Hence, there seems to be a compelling case for believing that an expansionary budget policy that resulted in high rates of inflation would most likely exact a growth penalty.<sup>65</sup>

#### IV. INCOME DISTRIBUTION AND GROWTH

While economists may disagree on the relative importance of the allocative and distributional objectives of fiscal policy, most will accept the proposition that *some* tradeoff is involved in pursuing the two policy objectives. The tradeoff stems, of course, from the disincentive effects of distortive taxes that are required to finance direct or indirect transfer payments from the rich to the poor. Indeed, in a static framework, it is easy to demonstrate that, under fairly general assumptions about (heterogeneous) individual preferences regarding income and work effort, the efficiency cost of pursuing an egalitarian policy could be prohibitively high.<sup>66</sup> Hence, in the traditional view, policies effecting a redistribution of income toward equality would exact a price of (aggregate) output loss that is likely to rise disproportionately to the reduction in income inequality achieved by such policies. When extended to a dynamic context, such a view leads quite naturally to the conclusion that there is increasing marginal cost, in terms of growth forgone, of income redistribution, on account of the saving-depressing effects of taxation.

The validity of this traditional view has, however, been challenged recently by several strands of research. One strand argues that redistributive taxation and the expenditure it finances are a form of *social insurance* against certain types of risk over an economic agent's lifetime for which private insurance may not be available. Consequently, it could stimulate productive risk

---

<sup>63</sup>For recent surveys of the empirical literature, see Briault (1995) and Thornton (1996).

<sup>64</sup>The threshold is found to be 8 percent in Sarel (1996), 10 percent in Judson and Orphanides (1996), 15 percent in Barro (1995a), and 40 percent in Bruno and Easterly (1995).

<sup>65</sup>If the inflationary effects of an expansionary budget policy are countered by a restrictive monetary policy, then the growth penalty would be exacted through high interest rates. Moreover, even though the statistical relationship between growth and *low* inflation is weak, Feldstein (1996) showed that the interactions between an existing distortive tax system and inflation would result in substantial welfare losses even at low inflation rates.

<sup>66</sup>For a particularly simple illustration of this result, see Baumol and Fischer (1969).

taking and output growth, although such behavior does not necessarily result in greater equality in the posttax distribution of income.<sup>67</sup>

A second strand emphasizes the importance of various aspects of *financial market imperfections* for growth. A central idea here is that the *potential* productivity of the poor cannot be fully realized unless they are given the opportunity to do so. If financial markets were perfect, the poor would be able to borrow against their future earnings to acquire, for example, basic needs (nutrition, health care, education, etc.) and human capital. In the absence of such markets, however, redistributive policies are needed to raise the poor's standard of living at least beyond some threshold for them to become productive members of society and, consequently, contribute to output growth.<sup>68</sup> Once gainfully employed, the poor could then begin to acquire assets, accumulate human capital, and gain access into financial markets to further raise their earnings potential. The financial markets, in turn, by benefiting from the increased participation in the intermediation process by economic agents, would become more developed, and the growth prospects for the whole economy would be enhanced as a result.<sup>69</sup> An implication for fiscal policy from this strand of literature is clearly that redistributive policies that result in less income inequality could well promote growth.

Yet another strand of research focuses on the impact of various *political-economy* factors on growth. While model structures differ across different studies, at the core of this literature is the idea that income distribution affects political outcomes, which, in turn, affect the kind of policies that are actually implemented through the voting process.<sup>70</sup> By invoking the standard median-voter theorem, this literature is able to demonstrate that the greater the inequality of income, the higher will be the voted level of taxation, either for the provision of public goods

---

<sup>67</sup>For this argument, see Sinn (1995, 1996). The link between redistributive taxation and social insurance was explored earlier in Eaton and Rosen (1980) and Varian (1980). While the connection between taxation and risk taking is not new, the existing literature on it by and large focuses on the impact of taxation on portfolio investment decisions (see Atkinson and Stiglitz (1980) for a review) rather than on issues of income redistribution.

<sup>68</sup>There is a large basic needs-related literature in development economics. See, for example, Streeten et al. (1981). A recent analytical treatment of the linkage between such needs and redistribution and growth is that by Dasgupta (1993).

<sup>69</sup>A notable recent study on the growth effects of income distribution in a framework of human capital accumulation constrained by imperfect financial markets is that by Galor and Zeira (1993). Greenwood and Jovanovic (1990) stressed the importance of the interrelationship among income distribution, financial market development, and growth.

<sup>70</sup>For various surveys of this literature, which cover issues that go beyond fiscal policy in a number of directions, see Perotti (1992, 1994), Persson and Tabellini (1992), Alesina and Perotti (1994), and Verdier (1994).

(Alesina and Rodrik, 1994) or for purely redistributive transfers (Persson and Tabellini, 1994), as a poorer median voter faces a lower tax price of public expenditure than a richer one. Since higher taxes in turn lower growth by depressing either physical or human capital accumulation, or both, a direct causal effect of income distribution on growth is thus established.

The above political-economy approach takes as given the initial distribution of income (or wealth); consequently, it cannot be used to explain how such a distribution is arrived at in the first place. A potential solution to this limitation could be found in an older but voluminous literature, associated with the seminal work of Kuznets (1966), that focused on just the reverse causation, i.e., the impact of growth on income distribution. Kuznets (1966) argued that growth would first increase income inequality, and then would reduce it after some level of income is reached. This relationship can often be derived from a two-sector economy setting comprising, say, a high growth urban sector and a low growth rural sector. As labor migrates from the rural to the urban sector with economic development, various conventional measures of inequality would first rise and then fall.<sup>71</sup> By combining these two bodies of literature, and perhaps in conjunction with elements of the financial market imperfections literature noted above, it is possible to derive a two-way causal relationship between income distribution and growth.<sup>72</sup> Hence, the tradeoff between the allocative and distributional objectives of fiscal policy is not absolute: growth with redistribution is possible.<sup>73</sup>

Most of the above cited studies employing the political-economy approach present cross-country *empirical evidence*, based on various samples of developed and developing countries, that supports to varying degrees a negative correlation between income inequality (measured in some base year close to the beginning of the sample period over which growth rates are computed) and growth. Clarke (1995) has recently confirmed that this negative correlation is robust across a broad sample of countries and with alternative measures of inequality, after controlling for other variables which are standard in the endogenous growth literature.

While the evidence on the adverse impact of *initial* income inequality on growth seems compelling, what remains unclear is the precise channels through which this impact operates.

---

<sup>71</sup>For recent surveys of this literature, see Adelman and Robinson (1989) and Anand and Kanbur (1993). Bourguignon (1990) has recently found, however, that the Kuznets relationship does not hold up well under a more general two-sector specification with different classes of agents and an endogenous terms of trade between the two sectors.

<sup>72</sup>A recent attempt in this direction is Perotti (1993b), who considered tax and transfer policies explicitly as voting outcomes in a model with imperfect financial markets, and obtained versions of Kuznets-like inverted-U relationship between degrees of income inequality and income levels.

<sup>73</sup>This is the central policy conclusion reached by Bruno et al. (1996).

In the models constructed by Alesina and Rodrik (1994) and Persson and Tabellini (1994), for example, a high degree of income inequality generates an outcome of heavy taxation for high public investment expenditure or large public transfers, but Perotti (1993a) has found rather weak support in the data for these chains of events. Recently, Alesina and Perotti (1996) have identified an alternative transmission mechanism: income equality creates social unrest and political instability, which in turn depress investment and growth. Their empirical analyses, which involve the construction of an index of social-political instability (SPI), found cross-country evidence for negative correlations both between income equality and SPI and between SPI and investment. This latter finding is consistent with other empirical studies that found a negative correlation between political instability and growth, e.g., Barro (1991) and Mauro (1995).

## V. CONCLUDING REMARKS

Economists working in public finance have always believed that fiscal policy, interpreted as the manipulation of fiscal instruments to achieve specific objectives, can affect economic growth. This belief is reflected in the title of many books and articles which refer to the assumed connection between fiscal policy and economic growth. This connection has been thought to originate from various channels such as the negative effect of distortive taxes, the negative effect of progressive taxes on the propensity to save, the scope for mobilizing resources through higher taxation and of using the additional resources to increase the level of public investment, and so on.

While public finance economists seemed to have no doubts that they could influence growth through the policy changes they recommended, the prevailing neoclassical growth theory did not leave much role to policy, except for relatively short-run effects on growth. This dichotomy resulted in part from various assumptions implicit in the theory and in part from the different time horizons contemplated by the public finance economists and the growth theorists. For example, while the neoclassical growth theory gives no role to policy for long-run growth, its definition of the long run could be long enough to leave ample scope for the effect of policy over the time horizon of interest to most governments and individuals.

The present paper has attempted to consider in a systematic and comprehensive way the relationship between various public finance instruments and the growth of countries' economies. It has surveyed a large body of literature, both theoretical and empirical, in an attempt to reach conclusions as to the way in which taxes, public spending, and budgetary policy can influence growth by affecting the allocation of resources, the stability of the economy, and the distribution of income. The existing literature is very extensive and very rich and, at times, it is hard to interpret. Yet it is much less definitive on some of these issues than one would have thought. Especially the empirical literature is somewhat disappointing in its support of theoretically reached conclusions.

In spite of the lack of robust results in the empirical literature, the conclusion of this paper has been that, when interpreted from the perspective of the new endogenous growth theory, fiscal policy could play a fundamental role in affecting the long-run growth performance of countries. Thus, economists should not hesitate to recommend changes in the instruments of public finance in the direction in which theory has deemed it important for enhancing growth, such as policies to improve the neutrality of taxation, promote human capital accumulation, and lessen income inequality.

## REFERENCES

- Abel, Andrew B., N. Gregory Mankiw, Lawrence H. Summers, and Richard J. Zeckhauser, 1989, "Assessing Dynamic Efficiency: Theory and Evidence," *Review of Economic Studies*, Vol. 56, pp. 1–20.
- Adelman, Irma, and Sherman Robinson, 1989, "Income Distribution and Development," in *Handbook of Development Economics*, ed. by Hollis Chenery and T.N. Srinivasan (Amsterdam; New York: North-Holland).
- Aiyagari, S. Rao, 1990, "Deflating the Case for Zero Inflation," *Federal Reserve Bank of Minneapolis Quarterly Review*, Vol. 14 (Summer), pp. 2–11.
- Aizenman, Joshua, and Nancy P. Marion, 1993, "Policy Uncertainty, Persistence and Growth," *Review of International Economics*, Vol. 1, pp. 145–63.
- Alesina, Alberto, and Roberto Perotti, 1994, "The Political Economy of Growth: A Critical Survey of the Recent Literature," *World Bank Economic Review*, Vol. 8, pp. 351–71.
- , 1996, "Income Distribution, Political Instability, and Investment," *European Economic Review*, Vol. 40, pp. 1203–28.
- Alesina, Alberto, and Dani Rodrik, 1994, "Distributive Politics and Economic Growth," *Quarterly Journal of Economics*, Vol. 109, pp. 465–90.
- Anand, Sudhir, and S.M. Ravi Kanbur, 1993, "The Kuznets Process and the Inequality-development Relationship," *Journal of Development Economics*, Vol. 40, pp. 25–52.
- Arrow, Kenneth J., 1962, "The Economic Implications of Learning by Doing," *Review of Economic Studies*, Vol. 29, pp. 155–73.
- Aschauer, David A., 1989, "Is Public Expenditure Productive?," *Journal of Monetary Economics*, Vol. 23, pp. 177–200.
- Atkinson, Anthony B., and Agnar Sandmo, 1980, "Welfare Implications of the Taxation of Savings," *Economic Journal*, Vol. 90, pp. 529–49.
- Atkinson, Anthony B., and Joseph Stiglitz, 1980, *Lectures on Public Economics* (New York: McGraw-Hill).
- Auerbach, Alan J., 1985, "The Theory of Excess Burden and Optimal Taxation," in *Handbook of Public Economics*, ed. by Alan J. Auerbach and Martin Feldstein (Amsterdam; New York: North-Holland).

- Bailey, Martin J., 1956, "The Welfare Cost of Inflationary Finance," *Journal of Political Economy*, Vol. 64, pp. 93–110.
- , 1971, *National Income and the Price Level* (New York: McGraw Hill).
- , 1993, "Note on Ricardian Equivalence," *Journal of Public Economics*, Vol. 51, pp. 437–46.
- Barro, Robert J., 1974, "Are Government Bonds Net Wealth?," *Journal of Political Economy*, Vol. 82, pp. 1095–117.
- , 1979, "On the Determination of the Public Debt," *Journal of Political Economy*, Vol. 87, pp. 940–71.
- , 1989, "The Ricardian Approach to Budget Deficits," *Journal of Economic Perspectives*, Vol. 3, pp. 37–54.
- , 1990, "Government Spending in a Simple Model of Endogenous Growth," *Journal of Political Economy*, Vol. 98, pp. S103–25.
- , 1991, "Economic Growth in a Cross Section of Countries," *Quarterly Journal of Economics*, Vol. 106, pp. 407–43.
- , 1995a, "Inflation and Economic Growth," *Bank of England Quarterly Bulletin*, Vol. 35, pp. 166–76.
- , 1995b, "Optimal Debt Management," NBER Working Paper No. 5327 (Cambridge, Massachusetts: National Bureau of Economic Research).
- Barro, Robert J., and David B. Gordon, 1983, "Rules, Discretion and Reputation in a Model of Monetary Policy," *Journal of Monetary Economics*, Vol. 12, pp. 101–21.
- Barro, Robert J., and Xavier X. Sala-i-Martin, 1992, "Public Finance in Models of Economic Growth," *Review of Economic Studies*, Vol. 59, pp. 645–61.
- , 1995, *Economic Growth* (New York: McGraw Hill).
- Baumol, William J., 1986, "Productivity Growth, Convergence, and Welfare: What the Long-run Data Show," *American Economic Review*, Vol. 76, pp. 1072–85.
- , 1990, "Entrepreneurship: Productive, Unproductive, and Destructive," *Journal of Political Economy*, Vol. 98, pp. 893–921.

- Baumol, William J., and Dietrich Fischer, 1969, "The Output Distribution Frontier: Alternatives to Income Taxes and Transfers for Strong Equality Goals," *American Economic Review*, Vol. 69, pp. 514–25.
- Bernheim, B. Douglas, 1987, "Ricardian Equivalence: An Evaluation of Theory and Evidence," in *NBER Macroeconomics Annual*, ed. by Stanley Fischer (Cambridge: Massachusetts: MIT Press).
- , 1989, "A Neoclassical Perspective on Budget Deficits," *Journal of Economic Perspectives*, Vol. 3, pp. 55–72.
- Blanchard, Olivier, Jean-Claude Chouraqui, Robert P. Hagemann, and Nicola Sartor, 1990, "The Sustainability of Fiscal Policy: New Answers to an Old Question," *OECD Economic Studies*, Vol. 15, pp. 7–36.
- Bourguignon, Francois, 1990, "Growth and Inequality in the Dual Model of Development: The Role of Demand Factors," *Review of Economic Studies*, Vol. 57, pp. 215–28.
- Briault, Clive, 1995, "The Costs of Inflation," *Bank of England Quarterly Bulletin*, Vol. 35, pp. 33–45.
- Bruno, Michael, and William Easterly, 1995, "Inflation Crisis and Long-run Growth," NBER Working Paper No. 5209 (Cambridge, Massachusetts: National Bureau of Economic Research).
- Bruno, Michael, Martin Ravallion, and Lyn Squire, 1996, "Equity and Growth in Developing Countries: Old and New Perspectives on the Policy Issues," Policy Research Working Paper 1563 (Washington: World Bank).
- Buchanan, James, 1958, *Public Principles of Public Debt* (Homewood, Illinois: Irwin).
- Cass, David, 1965, "Optimal Growth in an Aggregative Model of Capital Accumulation," *Review of Economic Studies*, Vol. 32, pp. 233–40.
- Chamley, Christophe, 1986, "Optimal Taxation of Capital Income in General Equilibrium with Infinite Lives," *Econometrica*, Vol. 54, pp. 607–22.
- Chari, V.V., Lawrence J. Christiano, and Patrick J. Kehoe, 1996, "Optimality of the Friedman Rule in Economies with Distorting Taxes," *Journal of Monetary Economics*, Vol. 37, pp. 203–23.
- Clarke, George R.G., 1995, "More Evidence on Income Distribution and Growth," *Journal of Development Economics*, Vol. 47, pp. 403–27.

- Dasgupta, Partha, 1993, *An Inquiry Into Well-being and Destitution* (New York: Oxford University Press).
- DeLong, J. Bradford, and Lawrence H. Summers, 1991, "Equipment Investment and Economic Growth," *Quarterly Journal of Economics*, Vol. 106, pp. 445–502.
- Devarajan, Shantayanan, Vinaya Swaroop, and Heng-fu Zou, 1996, "The Composition of Public Expenditure and Economic Growth," *Journal of Monetary Economics*, Vol. 37, pp. 313–44.
- Diamond, Peter A., 1965, "National Debt in a Neoclassical Growth Model," *American Economic Review*, Vol. 55, pp. 1126–50.
- Diamond, Peter A., and James Mirrlees, 1971, "Optimal Taxation and Public Production II: Tax Rules," *American Economic Review*, Vol. 61, pp. 261–78.
- Dixit, Avinash K., and Robert S. Pindyck, 1994, *Investment Under Uncertainty* (Princeton: Princeton University Press).
- Dotsey, Michael, and Peter Ireland, 1996, "The Welfare Cost of Inflation in General Equilibrium," *Journal of Monetary Economics*, Vol. 37, pp. 29–47.
- Easterly, William, and Sergio Rebelo, 1993, "Fiscal Policy and Economic Growth: An Empirical Investigation," *Journal of Monetary Economics*, Vol. 32, pp. 417–58.
- Eaton, Jonathan, and Harvey S. Rosen, 1980, "Optimal Redistributive Taxation and Uncertainty," *Quarterly Journal of Economics*, Vol. 95, pp. 357–64.
- Engen, Eric M., and Jonathan Skinner, 1992, "Fiscal Policy and Economic Growth," NBER Working Paper No. 4223 (Cambridge, Massachusetts: National Bureau of Economic Research).
- Feldstein, Martin, 1996, "The Costs and Benefits of Going from Low Inflation to Price Stability," NBER Working Paper No. 5469 (Cambridge, Massachusetts: National Bureau of Economic Research).
- Fischer, Stanley, 1980, "Dynamic Inconsistency, Cooperation, and the Benevolent Disassembling," *Journal of Economic Dynamics and Control*, Vol. 2, pp. 93–107.
- Friedman, Milton, 1977, "Nobel Lecture: Inflation and Unemployment," *Journal of Political Economy*, Vol. 85, pp. 451–72.
- Galor, Oded, and Joseph Zeira, 1993, "Income Distribution and Macroeconomics," *Review of Economic Studies*, Vol. 60, pp. 35–52.

- Greenwood, Jeremy, and Boyan Jovanovic, 1990, "Financial Development, Growth, and the Distribution of Income," *Journal of Political Economy*, Vol. 98, pp. 1076–107.
- Hassett, Kevin, and Gilbert E. Metcalf, 1994, "Investment with Uncertain Tax Policy: Does Random Tax Policy Discourage Investment?," NBER Working Paper No. 4780 (Cambridge, Massachusetts: National Bureau of Economic Research).
- International Monetary Fund, 1995, *Unproductive Public Expenditures: A Pragmatic Approach to Policy Analysis* (Washington).
- , 1996, *World Economic Outlook: May 1996* (Washington).
- Jones, Larry E., Rodolfo E. Manuelli, and Peter E. Rossi, 1993, "Optimal Taxation in Models of Endogenous Growth," *Journal of Political Economy*, Vol. 101, pp. 485–517.
- Jones, Larry E., and Rodolfo E. Manuelli, 1995, "Growth and the Effects of Inflation," *Journal of Economic Dynamics and Control*, Vol. 19, pp. 1405–28.
- Judson, Ruth, and Alhanasios Orphanides, 1996, "Inflation, Volatility and Growth," *Finance and Economics Discussion Series No. 96–19* (Federal Reserve Board).
- Kaldor, Nicholas, 1961, "Capital Accumulation and Economic Growth," in *The Theory of Capital*, ed. by Friedrich A. Lutz and Douglas C. Hague (New York: St. Martin's Press).
- Karras, Georgios, 1994, "Government Spending and Private Consumption: Some International Evidence," *Journal of Money, Credit, and Banking*, Vol. 26, pp. 9–22.
- Knight, Malcolm, Norman Loayza, and Delano Villanueva, 1996, "The Peace Dividend: Military Spending Cuts and Economic Growth," *Staff Papers*, International Monetary Fund, Vol. 43, pp. 1–37.
- Koopmans, Tjalling C., 1965, "On the Concept of Optimal Economic Growth," in *The Econometric Approach to Development Planning* (Amsterdam; New York: North-Holland).
- Kotlikoff, Laurence J., Torsten Persson, and Lars E.O. Svensson, 1988, "Special Contracts as Assets: A Possible Solution to the Time-consistency Problem," *American Economic Review*, Vol. 78, pp. 662–77.
- Kuznets, Simon S., 1966, *Modern Economic Growth: Rate, Structure, and Spread* (New Haven, Connecticut: Yale University Press).

- Kydland, Finn E., and Edward C. Prescott, 1977, "Rules Rather Than Discretion: The Inconsistency of Optimal Plans," *Journal of Political Economy*, Vol. 85, pp. 473-91.
- , 1980, "Dynamic Optimal Taxation, Rational Expectations and Optimal Control," *Journal of Economic Dynamics and Control*, Vol. 2, pp. 79-91.
- Leiderman, Leonardo, and Mario I. Blejer, 1988, "Modeling and Testing Ricardian Equivalence," *Staff Papers*, International Monetary Fund, Vol. 35, pp. 1-35.
- Levine, Ross and David Renelt, 1991, "Cross-country Studies of Growth and Policy," WPS 608 (Washington: World Bank).
- , 1992, "A Sensitivity Analysis of Cross-country Growth Regressions," *American Economic Review*, Vol. 82, pp. 942-63.
- Lucas, Robert E., Jr., 1988, "On the Mechanics of Development Planning," *Journal of Monetary Economics*, Vol. 22, pp. 3-42.
- , 1990, "Supply-side Economics: An Analytical Review," *Oxford Economic Papers*, Vol. 42, pp. 293-316.
- , 1994, "On the Welfare Cost of Inflation," CEPR Technical Paper No. 394 (London: Centre for Economic Policy Research).
- Lucas, Robert E., Jr., and Nancy L. Stokey, 1983, "Optimal Fiscal and Monetary Policy in an Economy Without Capital," *Journal of Monetary Economics*, Vol. 12, pp. 55-93.
- Mankiw, N. Gregory, David Romer, and David N. Weil, 1992, "A Contribution to the Empirics of Economic Growth," *Quarterly Journal of Economics*, Vol. 107, pp. 407-37.
- Martin, Ricardo, and Mohsen Fardmanesh, 1990, "Fiscal Variables and Growth: A Cross-sectional Analysis," *Public Choice*, Vol. 64, pp. 239-51.
- Mauro, Paolo, 1995, "Corruption and Growth," *Quarterly Journal of Economics*, Vol. 110, pp. 681-712.
- Murphy, Kevin M., Andrei Shleifer, and Robert W. Vishny, 1989, "Industrialization and the Big Push," *Journal of Political Economy*, Vol. 97, pp. 1003-26.
- , 1991, "The Allocation of Talent: Implications for Growth," *Quarterly Journal of Economics*, Vol. 106, pp. 503-30.
- Musgrave, Richard A., 1959, *The Theory of Public Finance* (New York: McGraw-Hill).

- Nordhaus, William D., and James Tobin, 1973, "Is Growth Obsolete?," in *The Measurement of Economic and Social Performance*, ed. by Milton Moss (New York: Columbia University Press).
- Okun, Arthur M., 1971, "The Mirage of Steady Inflation," *Brookings Papers on Economic Activity*, Vol. 2, pp. 485–98.
- Organization for Economic Cooperation and Development, 1994, *Taxation and Investment Flows: An Exchange of Experiences Between OECD and the Dynamic Asian Economies* (Paris: OECD).
- Orphanides, Alhanasios and Robert M. Solow, 1990, "Money, Inflation and Growth," in *Handbook of Monetary Economics*, ed. by Benjamin M. Friedman and Frank H. Hahn (Amsterdam; New York: North-Holland).
- Perotti, Roberto, 1992, "Income Distribution, Politics, and Growth," *American Economic Review*, Vol. 82, pp. 311–16.
- , 1993a, "Fiscal Policy, Income Distribution, and Growth," mimeo, Department of Economics (New York: Columbia University).
- , 1993b, "Political Equilibrium, Income Distribution, and Growth," *Review of Economic Studies*, Vol. 60, pp. 755–76.
- , 1994, "Income Distribution and Investment," *European Economic Review*, Vol. 38, pp. 827–35.
- Persson, Mats, Torsten Persson, and Lars E.O. Svensson, 1987, "Time Consistency of Fiscal and Monetary Policy," *Econometrica*, Vol. 55, pp. 1419–31.
- Persson, Torsten, and Guido Tabellini, 1992, "Growth, Distribution, and Politics," *European Economic Review*, Vol. 36, pp. 593–602.
- , 1994, "Is Inequality Harmful for Growth?," *American Economic Review*, Vol. 84, pp. 600–21.
- Phelps, Edmund S., 1973, "Inflation in the Theory of Public Finance," *Swedish Journal of Economics*, Vol. 75, pp. 67–82.
- Plosser, Charles I., 1992, "The Search for Growth," in *Policies for Long-run Economic Growth* (Kansas City: Kansas City Federal Reserve Bank).
- Quah, Danny T., 1996a, "Empirics for Economic Growth and Convergence," *European Economic Review*, Vol. 40, pp. 1353–75.

- , 1996b, "Twin Peaks: Growth and Convergence in Models of Distribution Dynamics," *Economic Journal*, Vol. 106, pp. 1045–55.
- Ram, Rati, 1986, "Government Size and Economic Growth: A New Framework and Some Evidence from Cross-section and Time-series Data," *American Economic Review*, Vol. 76, pp. 191–203.
- Ramsey, Frank P., 1927, "A Contribution to the Theory of Taxation," *Economic Journal*, Vol. 37, pp. 47–61.
- Rebelo, Sergio, 1991, "Long-run Policy Analysis and Long-run Growth," *Journal of Political Economy*, Vol. 99, pp. 500–21.
- Rogers, Carol Ann, 1987, "Expenditure Taxes, Income Taxes, and Time-inconsistency," *Journal of Public Economics*, Vol. 32, pp. 215–30.
- Romer, Paul M., 1986, "Increasing Returns and Long-run Growth," *Journal of Political Economy*, Vol. 94, pp. 1002–37.
- , 1989, "Capital Accumulation in the Theory of Long-run Growth," in *Modern Business Cycle Theory*, ed. by Robert J. Barro (Cambridge, Massachusetts: Harvard University Press).
- Sala-i-Martin, Xavier X., 1996a, "The Classical Approach to Convergence Analysis," *Economic Journal*, Vol. 106, pp. 1019–36.
- , 1996b, "Regional Cohesion: Evidence and Theories of Regional Growth and Convergence," *European Economic Review*, Vol. 40, pp. 1325–52.
- Sandmo, Agnar, 1985, "The Effects of Taxation on Savings and Risk Taking," in *Handbook of Public Economics*, ed. by Alan J. Auerbach and Martin Feldstein (Amsterdam; New York: North-Holland).
- Sarel, Michael, 1996, "Nonlinear Effects of Inflation on Economic Growth," *Staff Papers*, International Monetary Fund, Vol. 43, pp. 199–215.
- Schumpeter, Joseph A., 1934, *The Theory of Economic Development* (Cambridge, Massachusetts: Harvard University Press).
- Shah, Anwar, ed., 1995, *Fiscal Incentives for Investment and Innovation* (New York: Oxford University Press).
- Sinn, Hans-Werner, 1995, "A Theory of the Welfare State," *Scandinavian Journal of Economics*, Vol. 97, pp. 495–526.

- , 1996, "Social Insurance, Incentives and Risk Taking," *International Tax and Public Finance*, Vol. 3, pp. 259–80.
- Solow, Robert M., 1956, "A Contribution to the Theory of Economic Growth," *Quarterly Journal of Economics*, Vol. 70, pp. 65–94.
- Stokey, Nancy L., and Sergio Rebelo, 1995, "Growth Effects of Flat-rate Taxes," *Journal of Political Economy*, Vol. 103, pp. 519–50.
- Streeten, Paul, Shahid J. Burki, Mahbub U. Haq, Norman Hicks, and Frances Stewart, 1981, *First Things First: Meeting Basic Needs in Developing Countries* (New York: Oxford University Press).
- Swan, Trevor W., 1956, "Economic Growth and Capital Accumulation," *Economic Record*, Vol. 32, pp. 334–61.
- Tanzi, Vito, 1977, "Inflation, Lags in Collection, and the Real Value of Tax Revenue," *Staff Papers*, International Monetary Fund, Vol. 24, pp. 154–67.
- , 1978, "Inflation, Real Tax Revenue, and the Case for Inflationary Finance: Theory with an Application to Argentina," *Staff Papers*, International Monetary Fund, Vol. 25, pp. 417–51.
- , 1995, "Long-run Growth and Public Policy," in *Social Capability and Long-term Economic Growth*, ed. by Bon Ho Koo and Dwight H. Perkins (New York: St. Martin's Press).
- Tanzi, Vito, and Ludger Schuknecht, 1995, "The Growth of Government and the Reform of the State in Industrial Countries," IMF Working Paper 95/130 (Washington: International Monetary Fund).
- Tanzi, Vito, and Parthasarathi Shome, 1992, "The Role of Taxation in the Development of East Asian Economies," in *The Political Economy of Tax Reform*, ed. by Takatoshi Ito and Anne O. Krueger (Chicago: University of Chicago Press).
- Tanzi, Vito, and Howell H. Zee, 1993, "Time Constraints in Consumption and Savings Behavior," *Journal of Public Economics*, Vol. 50, pp. 253–59.
- , 1995, "Human Capital Accumulation and Public Sector Growth," IMF Working Paper 95/95 (Washington: International Monetary Fund).
- Thornton, Daniel L., 1996, "The Costs and Benefits of Price Stability: An Assessment of Howitt's Rule," *Federal Reserve Bank of St. Louis Review*, Vol. 78 (March/April), pp. 23–38.

- Turnovsky, Stephen J., and William A. Brock, 1980, "Time Consistency and Optimal Government Policies in Perfect Foresight Equilibrium," *Journal of Public Economics*, Vol. 13, pp. 183–212.
- Uzawa, Hirofumi, 1965, "Optimal Technical Change in an Aggregative Model of Economic Growth," *International Economic Review*, Vol. 6, pp. 18–31.
- Varian, Hal R., 1980, "Redistributive Taxation as Social Insurance," *Journal of Public Economics*, Vol. 14, pp. 49–68.
- Verdier, Thierry, 1994, "Models of Political Economy of Growth: A Short Survey," *European Economic Review*, Vol. 38, pp. 757–63.
- Wilcox, David W., 1989, "The Sustainability of Government Deficits: Implications of the Present-value Borrowing Constraint," *Journal of Money, Credit, and Banking*, Vol. 21, pp. 291–306.
- World Bank, 1995, *Bureaucrats in Business* (New York: Oxford University Press).
- Xu, Bin, 1994, "Tax Policy Implications in Endogenous Growth Models," IMF Working Paper 94/38 (Washington: International Monetary Fund).
- Young, Alwyn, 1995, "The Tyranny of Numbers: Confronting the Statistical Realities of the East Asian Growth Experience," *Quarterly Journal of Economics*, Vol. 110, pp. 641–80.
- Zee, Howell H., 1988, "The Sustainability and Optimality of Government Debt," *Staff Papers*, International Monetary Fund, Vol. 35, pp. 658–85.
- , 1994, "Time-consistent Optimal Intertemporal Taxation in Externally-indebted Economies," *Public Finance*, Vol. 49, pp. 113–25.
- , 1996a, "Empirics of Cross-country Tax Revenue Comparisons," *World Development*, Vol. 24 (forthcoming).
- , 1996b, "Endogenous Time Preference and Endogenous Growth," *International Economic Journal* (forthcoming).