How Big Should Our Government Be?

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CHAPTER THREE

Would a Bigger Government Hurt the Economy?

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If the United States is going to meet the rising costs of promised government retirement benefits and health care for the elderly while doing more to promote economic security, equality of opportunity, and shared prosperity, it will eventually need to increase taxes. Is this the best solution, or should we scale back government and cut taxes, thereby improving incentives for productive economic activity? This is the fundamental political dilemma of our times.

A thoughtful answer ought to depend on many different considerations, but one of the most critical is the long-run economic costs and benefits of larger government and the taxes that go with it. I begin by briefly reviewing some theory that helps to put the debate into perspective. Then I consider evidence on three key empirical questions: How does the long-run economic growth of countries relate to the overall level of taxes and size of government? What is the effect of taxation on peoples' decisions about whether and how much to work? How do taxes affect effort to earn income more generally, especially at the top of the income distribution?

Here is a preview of what the evidence suggests. Among the set of countries comparable to the United States, some have chosen to increase the size of government as a share of GDP much more than others. When looking at data on these countries from the past five or ten decades, there is no convincing evidence that the countries choosing larger government suffered any significant loss of GDP per person as a result. Healthy skepticism is in order regarding claims that growth of government, at least within the range we've seen in countries comparable to the United States, is bad for the economy in the long run.

It is true that *some* econometric studies of cross-country data have found an association between higher taxes and slower economic growth when looking at shorter time frames and controlling for enough other possible influences on economic growth. But even if we take those studies at face value, what they are concluding is that, in the industrialized countries that chose to increase taxes more over time, any negative economic effects of higher taxes seem to have been offset by positive economic effects that are the result of productive government investments (e.g., education, infrastructure) paid for by those taxes and by the more economically efficient public policies that these countries (not coincidentally) tended to choose.

Those studies also raise a number of questions, most notably about whether the associations they find between taxes and growth represent temporarily low taxes during a recession being associated with economies returning to their long-term trends more quickly, or whether permanent changes in taxes are changing the long-run trend of the economy. If we want to know whether making US public policies more like those of Nordic nations would cause significant economic harm in the long run,

only the latter is relevant. The longer-run evidence emphasized in this chapter suggests that growth of government probably *hasn't* on balance harmed the long-run trend of real incomes in countries comparable to the United States, even when the tax increases were largely used to finance social transfers.

Tax rates and hours worked are negatively correlated across rich countries, which could reflect the incentive effects of taxes. But this might instead reflect the influence of other policies and institutions that happened to go along with higher taxes, such as legal restrictions on working hours, mandated lengthy vacations, and incentives in government pension systems for early retirement, which are not necessary components of a well-designed welfare state. The best available research—which, if anything, still does too little to address the concerns just noted—suggests that any economic costs of taxes in terms of reduced work are probably modest.

Reductions in top income tax rates are strongly associated with increases in before-tax incomes earned (or reported) by people at the top of the income distribution, both across countries and over time. That *could* reflect a response of productive economic activity to improved incentives caused by tax cuts. If that were the whole explanation, it would imply that progressive taxes (i.e., taxes that are a larger percentage of income for higher-income people) are especially costly in economic terms. But it might instead reflect some combination of other hard-to-measure influences on inequality of pretax incomes that happened to coincide with tax cuts, shifting of reported income from corporate to personal tax returns, or the responses of unproductive but remunerative (i.e., "rent-seeking") activity to tax cuts, none of which would imply that progressive taxes have large economic costs. Across countries, there is no relationship

between how much top marginal income tax rates have been cut over the past few decades and the rate of growth in real GDP per person, which lends support to these latter explanations and suggests that the economic cost of highly progressive taxation may not be so large after all.

THE COSTS AND BENEFITS OF TAXATION: A CONCEPTUAL FRAMEWORK

The economic cost of taxation is greater than the amount of tax revenue collected from taxpayers. This is because any tax that is related to a measurable indicator of one's ability to pay taxes, such as income or consumption, reduces the incentive to do economically productive things, and taxpayers change their behavior in response.

For example, suppose someone has the opportunity to earn an extra $1,000 before taxes by doing some additional work, and the leisure that would have to be foregone is only worth $800 to the person. In the absence of taxes, the work gets done. But if there is a 30 percent tax on labor income that reduces the after-tax gain from the work to $700, the person decides it is not worth it to do the extra work. In that case, there's a hidden economic cost of $200—the amount by which the value of the work would have exceeded the value of the foregone leisure. Economists call the $200 cost in this example the "deadweight loss" or the "economic efficiency cost" of the tax.[1]

There are many other ways that people might change their behavior in response to taxation, and these can involve deadweight loss too. Taxes on capital income and corporate profits reduce the incentive to save and invest. Highly progressive taxes take away a particularly large share of the rewards from coming

up with a profitable new technology or other innovation, which could in theory reduce the rate of technological advance, a key driver of economic growth. Decisions about schooling and choice of occupation can be distorted by taxes as well. Depending on how tax policy is designed, in some cases it can also negatively influence business decisions about which kinds of investments to undertake, as well as decisions about how much time, effort, and money to put into sheltering one's income from taxes.

Some of these costs could be avoided or mitigated by well-designed tax reform.[2] But if we want a tax system where taxes increase with some measurable indicator of one's ability to pay taxes, it is inevitable that there will be at least some harm to the incentive to do the things that help you get ahead economically. When we design the tax and transfer system to do more to reduce economic inequality, it necessarily weakens those incentives more, resulting in a correspondingly higher economic cost. The size of this economic cost depends on how much people change their behavior in response to the weakened incentives, which is an empirical question. A larger change in behavior corresponds to a larger economic cost.

While taxes impose economic costs, the government spending that those taxes finance produces benefits that can outweigh the costs. The question, then, is how to weigh the benefits against the costs. For example, suppose that for every additional dollar of tax revenue that we collect from affluent taxpayers, we have to make those taxpayers worse off by two dollars, with the difference representing the deadweight loss of the tax. As Arthur Okun memorably put it, taxing the better-off to finance government spending that benefits the worse-off is like carrying water in a leaky bucket, and in this hypothetical example, half the bucket leaks out before reaching its destination.[3]

If we're using the revenue, say, to help pay for high-quality preschool education for kids from disadvantaged families, we might nonetheless decide that the benefits exceed the costs. This might be because we think the gains from spending one more dollar on the education of a disadvantaged child exceed the costs of making an affluent taxpayer worse off by two dollars when the benefits and costs are considered not in dollars but rather in terms of human welfare or happiness, or in terms of promoting justice or equal opportunity.[4] Or it might be because the spending finances an economically sound investment that would not have happened otherwise, in which case even the dollar-valued benefits might eventually exceed the dollar-valued costs.[5] Or it might be some combination of the two.

More generally, the net impact of a change in taxes and government spending on "social welfare" (the aggregate well-being of members of society) can be positive when it promotes "distributive justice" or when it helps to correct a "market failure." Distributive justice is about questions of ethics and philosophy—for example, what is the ethically right policy response to economic inequality that is due to bad luck? Market failure is an economic concept referring to a case where the market fails to do something for which the dollar-valued benefits exceed the dollar-valued costs, in which case we say the market outcome is "economically inefficient." Some market failures arise due to imperfect competition or imperfect information. Another sort of market failure is an externality, which is a case where participants in a market produce benefits for or impose costs on third parties but have no incentive to take those benefits or costs into account. Pollution is a classic example of this. Market failure also arises in the case of public goods, which produce benefits that are non-excludable (meaning people cannot be excluded from benefitting if they don't

pay) and non-rival (meaning that when one person benefits from the good, it does not diminish others' ability to benefit from the same unit of the same good). Basic law and order and the resulting reduction in the probability of theft and fraud is a good example of this.[6]

An especially pertinent example of government intervention that could be justified on these grounds is social insurance, which accounted for about 59 percent of US federal government spending in fiscal year 2014.[7] The markets for some important types of insurance are plagued by market failures and also involve important distributive justice concerns.

People value insurance at more than its expected cost because it helps protect them from risk. But if customers know more about their own probability of adverse events than insurance companies do—a problem of imperfect information—then the insurance companies cannot adjust prices to reflect each customer's true expected cost. In that case, some lower-risk customers might no longer find it beneficial to purchase the insurance, resulting in them losing access to a product for which the benefits otherwise would have exceeded the costs. This in turn drives up insurance premiums, which drives even more potential low-risk customers out of the market, pushing up premiums further in a vicious cycle. This is a market failure known as "adverse selection," and the result is economically inefficient. Government could potentially enhance economic efficiency here with government-supplied insurance, or with government mandates and subsidies to individuals to purchase private insurance from a competitive market.

Even in the absence of market failures, unregulated firms in free markets will only insure against events where the good luck or bad luck has not yet been revealed. Thus, those with bad luck in

the "lottery of life" in terms of genetics or family background cannot insure against those outcomes in the market. So, for example, should someone who faces high lifetime health care expenses because of genetic bad luck have to bear the full cost of much higher health insurance premiums? This would be economically efficient (as it would reduce adverse selection), but many would also view this as unfair. That's a question of distributive justice. Government could potentially enhance distributive justice in these cases by using taxes and spending to help people to insure themselves against bad luck that the market will not insure against.

The point is that government has both benefits and costs. Some of those benefits and costs will be reflected in economic statistics, and some will not.

We can infer something about the economic costs of taxation by looking at how the level of taxes or government spending correlates with observable economic indicators such as gross domestic product (GDP) or hours worked. GDP is a measure of the total market value of goods and services produced in a country in a given year. It is also a measure of the nation's income, since all production that is sold leads to corresponding income for someone. But even if we were confident that we had identified the causal effect of taxes on GDP, which is challenging enough, we would still have to be careful when interpreting this evidence. For instance, if taxes cause a reduction in hours worked and that in turn causes a decline in GDP, it does suggest there is some deadweight cost from taxation. But the decline in GDP overstates that cost because it does not account for the value of the increased leisure that occurs as a result.

Similarly, some of the benefits of government spending might show up in GDP, but many do not. For example, if government does a good job of addressing market failures that would other-

wise lead to underinvestment in education, infrastructure, and scientific research, that can lead to higher measured GDP. Government provision of social insurance might make people more willing to take the risks associated with entrepreneurship and innovation, leading to faster technological progress—that would show up in GDP too.[8] But some benefits of government policy, such as the intrinsic value of greater security, distributive justice, and equality of opportunity or the benefits of a cleaner environment are not reflected in economic statistics such as GDP.

There is an enormous amount of empirical literature in economics documenting evidence of benefits and costs of government interventions that don't show up in GDP, but that is beyond the scope of this chapter. The relevant point here is that, even if the empirical evidence reviewed below were to establish that big government and the taxes that go with it have costs in terms of reducing GDP or hours worked, it would not be sufficient to establish that the costs outweigh the benefits. This is important to keep in mind as we consider the evidence.

CROSS-COUNTRY EVIDENCE ON THE RELATIONSHIP BETWEEN ECONOMIC PROSPERITY AND THE OVERALL LEVEL OF TAXES AND GOVERNMENT SPENDING

A first strategy for inferring the net economic effect of taxation and government spending is to look at how the overall level of taxes or government spending correlates with the level and growth of real GDP per person (i.e., GDP adjusted for inflation and divided by population). As a measure of the well-being of societies, real GDP per person is subject to both the caveats noted earlier and others, but it does have the distinct advantage

that it has been measured on a comparable basis for a large number of countries over a long period of time.[9]

My measures of the size of government will be tax revenues and government spending as a percentage of GDP. These are at best rather crude indicators of the role of government in the economy and how that affects incentives. Two countries could be identical along those dimensions, but one might distort incentives much more than the other because, for example, its tax system is riddled with special subsidies, deductions, and loopholes that require higher marginal tax rates. But unlike more refined measures, data for tax revenue and government spending as percentages of GDP are available on a consistently measured basis for many countries over long periods of time. If we wish to identify the *long-run* economic effects of taxes and government spending, that is critical.

Comparison across Countries at a Given Point in Time

Figure 3.1 illustrates what Joel Slemrod has called "an embarrassing fact for those who maintain that high, and highly progressive, taxes are seriously detrimental to a country's prosperity": across all countries in the world for which data are available, there is a strong *positive* correlation between taxes as a share of GDP and real GDP per person.[10] The figure shows, for 182 countries, the relationship between tax revenue as a percentage of GDP and real GDP per person (measured in thousands of 2011 US dollars and adjusted for purchasing power parity) on average during the years 2002 to 2011.

Where possible, I use data on tax revenue raised by general government—that is, the national central government plus any subnational governments such as state, provincial, or local; 110 countries fell into this category, represented by the black dots. In

the case of the other 72 countries, represented by the white dots, data are available only for central government tax revenue, so that is what I use. Almost all of the latter are low-income countries, and for the low-income countries where data on subnational government are available, the subnational governments account for only a tiny fraction of general government tax revenue.[11] So, for most of these countries, the white dots should be pretty good indicators of the overall size of government. Nonetheless, just to be safe, when summarizing the average relationship between taxes and GDP per person, I will focus on the black dots.

The upward-sloping grey line in figure 3.1 is the regression line that best fits the cloud of black dots, in a sense summarizing the average relationship between general government tax revenue as a percentage of GDP and real GDP per person. It suggests that, on average, each additional one percent of GDP collected in taxes is associated with $519 dollars of additional income per person, and the relationship is statistically significant (meaning it is unlikely to be due to pure chance).

The vast majority of countries fit the pattern closely: high-income OECD countries, with high taxes and high per capita income, are clustered in the upper right-hand portion of the graph, while large numbers of low-income countries, with low tax revenues relative to GDP and low per capita income, tend to be clustered in the lower left-hand portion of the graph. A similar positive correlation persists within the subgroups of rich and poor countries.[12] A small number of countries, in the upper-left-hand portion of the graph, are inconsistent with this pattern, but all are countries, such as Qatar, that raise large amounts of non-tax revenue through natural resource wealth, particularly oil, meaning that the small levels of tax revenue greatly understate the overall size of their governments.

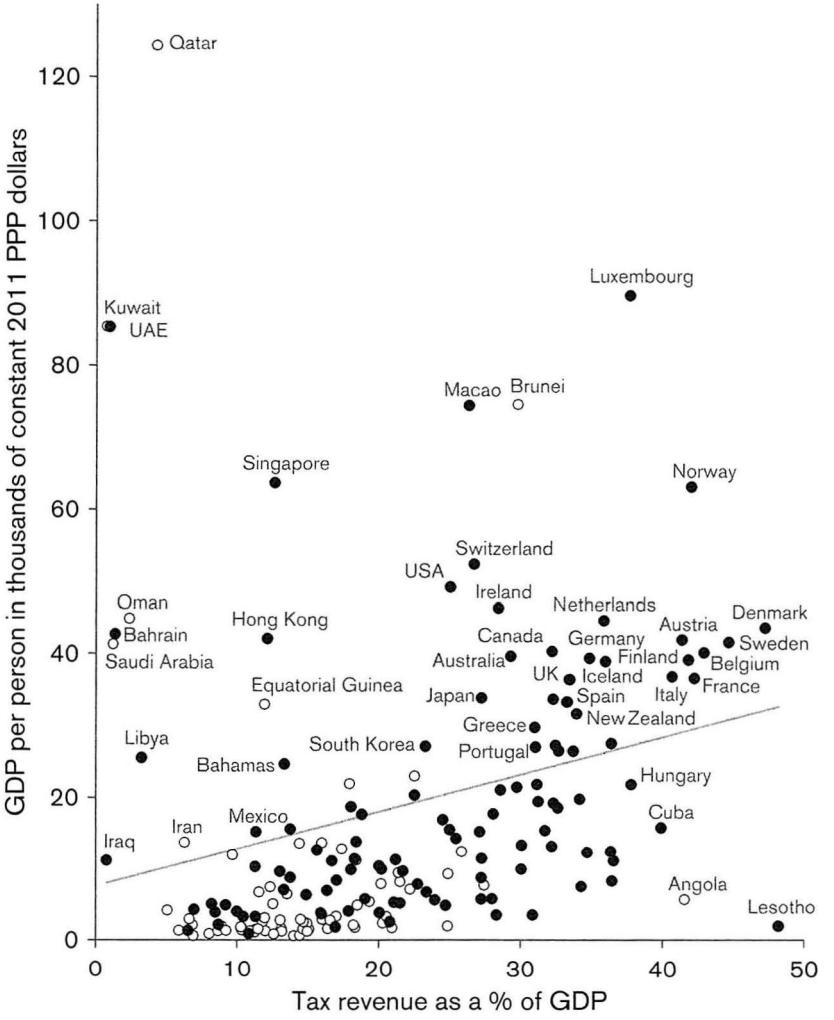


Figure 3.1. GDP per person versus taxes as a percentage of GDP, 2002–2011 averages. GDP per person is given in thousands of constant year 2011 US dollars and is adjusted for purchasing power parity (PPP). Black dots are countries for which general government data are available, and white dots are countries for which only central government data are available. The 2002–2011 averages for a given country are computed using only data from years when both variables are available for that country. Sources: World Bank 2015; International Centre for Tax and Development 2015.

As Slemrod and others who have studied this question are quick to point out, we shouldn't necessarily conclude, based simply on a cross-sectional relationship like that depicted in figure 3.1, that there is no negative causal effect of taxes on GDP per person. Many other factors that are also correlated with GDP per person influence the level of tax revenue as a percentage of GDP. For one thing, higher-income countries clearly have much better administrative capacity to collect taxes and fight tax evasion.[13] So it is possible that taxes have a negative causal effect on GDP per person but that this is obscured in figure 3.1 by the fact that rich countries are the only ones capable of collecting large amounts of tax revenue.

In addition, the causality underlying the positive association in figure 3.1 probably runs in both directions. In particular, higher incomes may cause citizens of a country to demand a larger government. This idea is commonly known as Wagner's law,[14] and there is a large cross-country empirical literature attempting to estimate the causal effect of income on demand for government.[15] It's conceivable that there is a negative causal effect of government size on income (through incentives) but that it is dominated by the positive causal effect of income on government size (through demand for government), with the net result of the bidirectional relationship being the positive correlation we see in figure 3.1.

Advantages of Comparing Relative Changes over Time across Countries, and Cautions

Given the problems involved in trying to infer the causal effects of taxes on GDP from evidence like that in figure 3.1, economists have tended to focus instead on "panel" data, which follow

multiple high-income countries over reasonably long periods of time.[16] Using such data, they estimate whether affluent countries that increased taxes and government expenditure by more over time experienced lower economic growth.

Focusing on comparisons of relative changes over time in government size and GDP across countries helps to control for unobservable country differences that are persistent over time. For example, characteristics such as trust and social cohesion might influence both demand for government and level of income, contributing to the positive association shown in figure 3.1. But, to the extent that these characteristics are fairly stable over time, they probably cannot explain why some countries experienced larger increases in the size of government or faster economic growth than others during particular time periods.

Evidence based on relative changes over time also helps to control for influences on growth that are changing in similar ways over time across the set of countries included in the analysis. For instance, the advance of technological knowledge is an important driver of economic growth, but economic researchers lack a good summary measure of technological knowledge. To the extent that the set of countries included in the study have access to similar technological knowledge at each point in time covered in the study, differing trends in technological knowledge would not be able to explain why countries that experienced relatively larger increases in the size of government over a particular time period had better or worse economic growth than similar countries that did not. Limiting comparisons to countries that were at fairly similar levels of economic development at the beginning of the time period studied makes it more likely that the analysis will work well, and it also mitigates the

confounding effects of other factors, such as administrative capacity to collect taxes.

Despite these advantages, questions remain about whether such an approach identifies the true effect of government and taxation on economic growth. For example, when some countries experience faster economic growth than similar countries for reasons unrelated to taxes, there still might be reverse causality where the faster rise in income causes a faster rise in the demand for government. An unverifiable hope in this kind of research is that, among the group of countries that have been industrialized for a long time, changes in the size of government relative to GDP were largely driven by the voting public, whose changing tastes—unrelated to income—led them to want more government, rather than by a mechanical effect of rising incomes on demand for government. Moreover, it is sometimes argued that any reverse causality induced by Wagner's law would tend to bias our estimated effect of taxes on the level or growth of income away from the hypothesized negative effect so that our estimates would be a conservative test of the hypothesis that high taxes are harmful to economic prosperity.

A study that examines a set of countries that all have high incomes today, but which started the time period under study at very different levels of economic development, is particularly suspect. In that case, we have to worry that the selection of the sample itself might influence the conclusions in a misleading direction. To understand why, consider the example of the small handful of countries, such as Singapore and South Korea, that have transformed from very low-income developing countries back in the early 1960s to high-income developed countries today.[17] It is true that countries such as Singapore and South Korea experienced excellent economic growth since the 1960s and have

small governments as a percentage of GDP compared to other high-income countries today. But including them in a panel analysis of the effects of taxes on economic growth while omitting all the other countries that had low incomes back in the 1960s could misleadingly attribute the success of the included countries to their small governments. Figure 3.1 makes clear that there were enormous numbers of other poor countries in the 1960s with small governments that did not experience fast economic growth (as evidenced by their low incomes today). Small governments are *not* what distinguished the fast-growing East Asian "tiger" countries from other low-income countries that did not grow.[18]

It's also true that countries that experienced rapid industrialization since the 1960s, such as the East Asian tigers (Hong Kong, Singapore, South Korea, and Taiwan), did typically follow market-friendly policies in some regards. But their stories are hardly examples of doctrinaire free market orthodoxy. Many of these countries had governments that were quite interventionist in ways that don't show up in tax revenue or government expenditure statistics, such as engaging in extensive industrial policy, relying heavily on state-owned enterprises, redistributing land ownership to reduce inequality, requiring their citizens to save large shares of their income in quasi-public pension schemes, and more.[19]

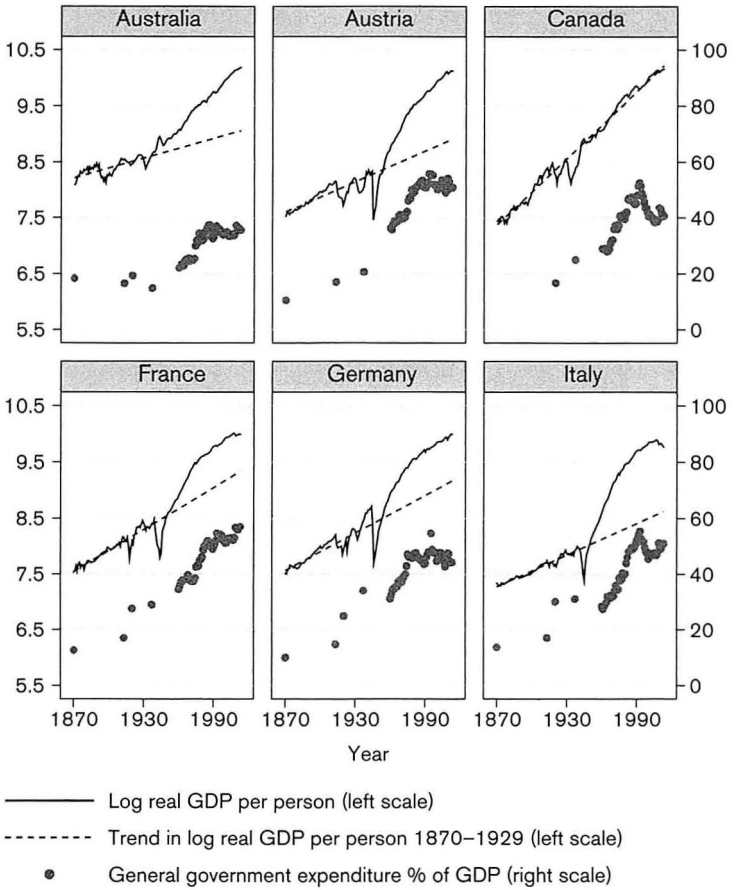
Another issue is that the process of transforming from a poor country to a rich country is likely to be very different than the process of achieving continued economic growth once a country is already rich, so it is not so clear we can learn much from the former that applies to the latter. Furthermore, one needs data following the same countries over very long period of time to infer the long-run effects of big government, and such data are only available for the small number of countries that indus-

trialized long ago. For these reasons, it makes sense to focus on a smaller set of countries that have had high incomes for a long time and therefore are more comparable to the United States.

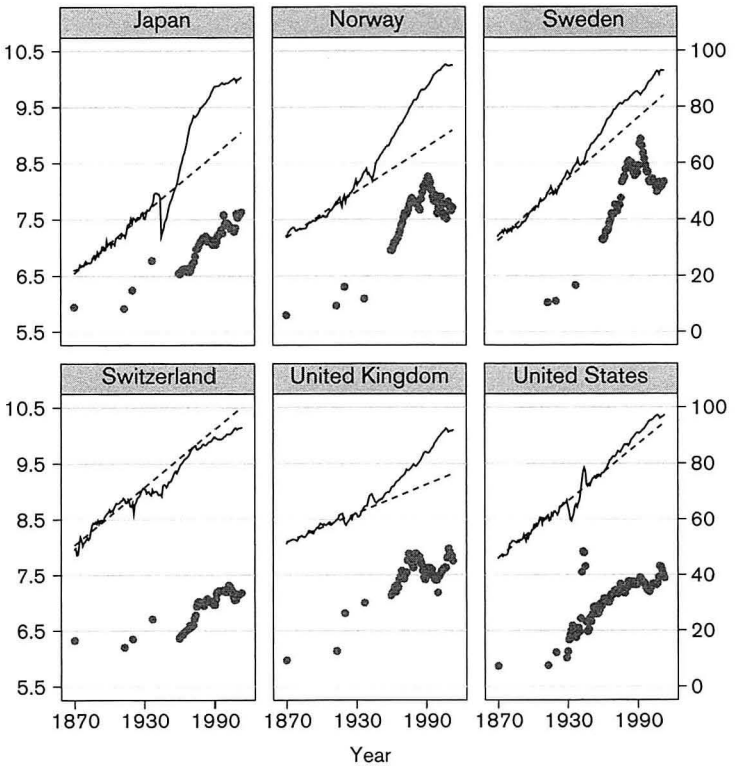
Cross-Country Comparisons of Changes in the Size of Government and Economic Growth over the Very Long Run

Figures 3.2a and 3.2b depict how the natural logarithm of real GDP per person (the solid black line) and general government expenditure as a percentage of GDP (the dotted gray line) each evolved between 1870 and 2013 for twelve industrialized nations for which data are available on a reasonably consistent basis going back to the late 1800s or early 1900s.[20] It is useful to express real GDP per person in logarithmic form because then the slope of the line represents the annual growth rate. If a country were to experience a constant annual growth rate over the whole period, its log real GDP per person would be a perfectly straight upward-sloping line. The dashed black line in each graph in figures 3.2a and 3.2b depicts the trend in log real GDP per person for each country from 1870 through 1929, and the forecast of log real GDP per person for each country for subsequent years through 2013 based on the pre–Great Depression trends.[21]

The country time-series graphs in figures 3.2a and 3.2b illustrate some other facts that don't fit the hypothesis that big government has adverse effects on long-term economic growth. Aside from the obvious fact that there is a positive correlation over time between the size of government and the level of real GDP per person (which might be explained away by Wagner's law and improved administrative capacity to collect taxes), there



Figures 3.2a *(this page)* and 3.2b *(opposite)*. Log real GDP per person and general government expenditure as a percentage of GDP in industrialized nations, 1870–2013. Real GDP per person is in constant 1990 US dollars and is adjusted for purchasing power parity. Sources: Maddison Project 2013; World Bank 2015; Tanzi 2011; Organization for Economic Cooperation and Development 1982, 1992, 2000, 2015e; US Bureau of Economic Analysis 2015.


Japan
Norway
Sweden
Switzerland
United Kingdom
United States
10.5
9.5
8.5
7.5
6.5
5.5
100
80
60
40
20
0
1870
1930
1990
Year
Log real GDP per person (left scale)
Trend in log real GDP per person 1870–1929 (left scale)
General government expenditure % of GDP (right scale)

is also the fact that, among the major industrialized countries of the world for which we have consistent data going far back in time, government expenditure was a much larger percentage of GDP in the second half of the 1870–2013 period than it was in the first half, yet there is no evidence of a slowdown in the long-run economic growth rate in the era of big government.

If anything, the countries with the largest increases in the size of government over time tended to be the ones where the log of real GDP per person experienced a persistent *increase* above the previous long-term historical trend. For example, for the United States, Canada, and Switzerland, the 1870 to 1929 trend in log real GDP per person predicts its subsequent levels through 2013 almost perfectly, despite the fact that government grew dramatically and permanently as a share of GDP in these countries around the time of World War II.[22] The other countries shown in figures 3.2a and 3.2b tended to have larger increases in the size of government than those three, and their log real GDPs per person actually rose significantly *above* their pre-Depression trends in the later era of big government.

We should not necessarily attribute the increase above the trends to beneficial effects of larger increases in government, since the countries with larger increases in the size of government also tended to be ones that started out the poorest. These countries experienced a temporary period of rapid catch-up growth after World War II as they converged toward the income and technology of the United States and restored the capital that was destroyed during the war.[23] Nonetheless, the fact that long-run economic growth in the advanced industrialized nations has been so remarkably stable since the late 1800s despite huge increases in the role of government is striking and inconsistent with the notion that big government is bad for the economy.

In an important 1995 article, Charles I. Jones demonstrated that, for the major industrialized nations of the world, we can reject, with a high degree of statistical confidence, the hypothesis that there have been any *permanent* changes in the growth rate of real GDP per person at all since the late 1800s. Appreciating the significance of this insight and its implications requires a bit of a detour into time-series econometrics jargon.

Technically, Jones demonstrated with formal statistical tests that we could reject the hypothesis that the economic growth rate since the late 1800s was "non-stationary" for each of many advanced industrial nations. A variable is non-stationary if it experiences permanent changes—that is, when the variable increases in a particular period, it is no more likely to go up than to go down in future periods, so changes to the variable tend to persist. By contrast, a variable is "stationary" if it is mean-reverting. In other words, if a stationary variable increases in a certain period, then it is more likely to go down than to go up in future periods, and in the long run it eventually reverts to a stable mean that does not change over time.[24] Jones's evidence suggested that economic growth rates in rich countries since the late 1800s have been stationary. Consistent with what the graphs in figures 3.2a and 3.2b show, log real GDP per person might rise above or fall below its long-run historical trend in a permanent way, but the evidence rejected the notion that there are any permanent changes in the *slope* of log real GDP per person over time (i.e., in the growth rate), at least for the industrialized nations since the late 1800s.[25]

By contrast, visual inspection of figures 3.2a and 3.2b suggests that government expenditure as a percentage of GDP during the period 1870–2013 is non-stationary. In all of these countries, the government expenditure share of GDP experienced a very

large and apparently permanent increase over time, with no prospect of being fully reversed.[26] This poses a serious problem for those who believe an increase in government spending and taxes will have a permanent negative effect on the rate of economic growth and more generally to "endogenous growth" models that posit that changes in policy variables can have permanent impacts on growth rates by causing changes in the rate of technological progress.[27]

Responding to the evidence that economic growth rate is stationary while many policy variables that supposedly have persistent effects on the rate of economic growth are non-stationary, Jones noted: "Two possibilities are suggested: either by some astonishing coincidence all of the movements in variables that can have permanent effects on growth rates have been offsetting, or the hallmark of the endogenous growth models, that permanent changes in policy variables have permanent effects on growth rates, is misleading." As a result, the idea that the net effect of big government is to permanently damage the rate of economic growth probably does not make much sense.[28]

The notion that permanent tax increases can't have permanent negative effects on the growth rate narrows the range of possible impacts of taxes and government spending on the economy considerably, but it still leaves room for taxes and government spending to have long-run effects on the *level* of GDP per person. For example, a permanent increase in government's share of GDP could, in principle, cause GDP per person to permanently dip below its historical long-run trend. But figures 3.2a and 3.2b seem to suggest the opposite has occurred over the long run in most rich countries.

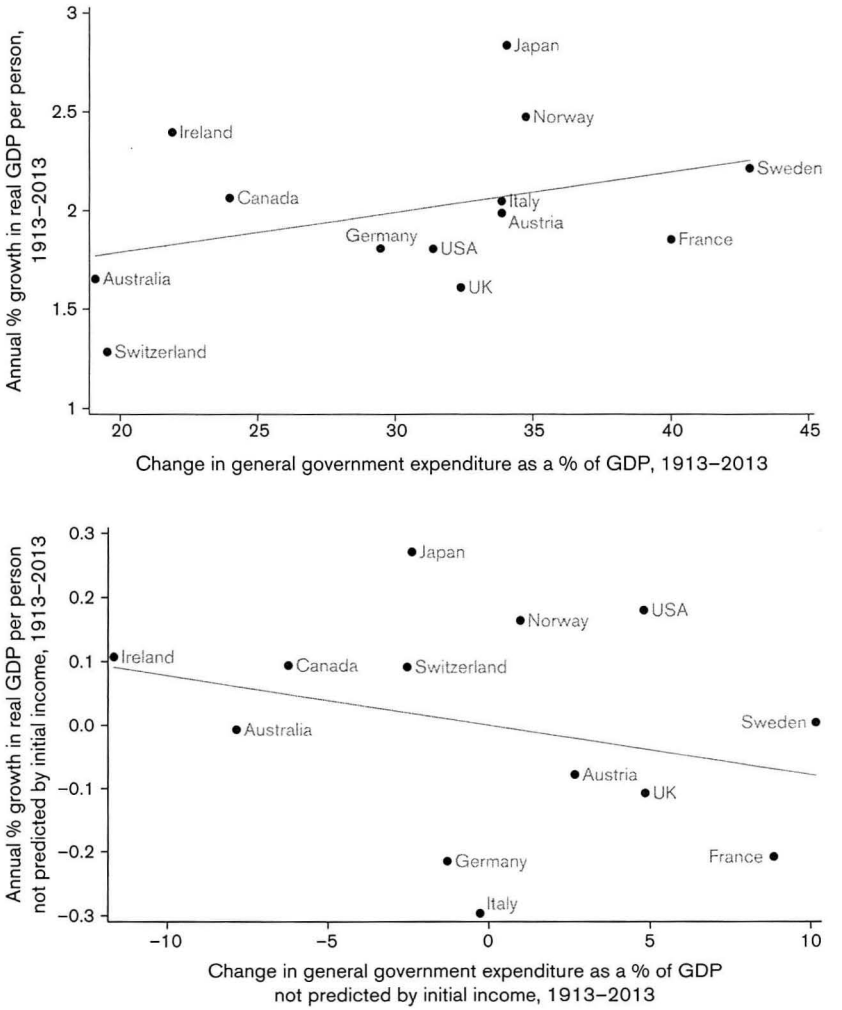
To illustrate more clearly whether countries that chose larger increases in government over time experienced any penalty in

economic growth over the very long run, figures 3.3a and 3.3b show how the average annual rate of growth in real GDP per person in thirteen countries (the twelve countries in figures 3.2a and 3.2b plus Ireland) between 1913 and 2013 relates to the change in general government expenditure as a percentage of GDP over that same time span.[29]

Even if changes in government spending do not have permanent effects on the long-run growth rate, such changes could, in theory, cause GDP per person to permanently dip below its previous long-run trend, and that would show up as a reduced average annual growth rate when measured over the span of one hundred years. Figure 3.3a shows that, although all of the thirteen countries increased the size of their governments significantly over the past century, there was also enormous variation in how much they increased them, ranging from an 18.5 percent of GDP increase in Australia to a 44 percent of GDP increase in Sweden. Given these magnitudes, if government has an adverse effect on economic growth, the odds are good that we'd be able to detect it here.

Figure 3.3a shows that there is a weak *positive* correlation between the size of the increase in government spending and the long-run growth rate. The estimated regression line, representing the straight line that best fits the dots on the scatterplot, suggests that an increase in government spending of 10 percent of GDP is associated with a 0.2 percentage point *increase* in the annual growth rate, on average, over one hundred years. The relationship, however, is not statistically significant. This means, roughly speaking, that the points on the scatter plot are so randomly scattered that we can't have much confidence that there is a real relationship there.[30]

A potential confounding factor arises because economic theory suggests that countries starting at lower levels of GDP per



Figures 3.3a *(top)* and 3.3b *(bottom)*. Growth in real GDP per person versus change in government expenditure as a percentage of GDP in industrialized nations, 1913–2013. Real GDP per person is given in constant 1990 US dollars and is adjusted for purchasing power parity. Data for Ireland and Canada are for 1920–2013. Sources: Maddison Project 2013; World Bank 2015; Tanzi 2011; Organization for Economic Cooperation and Development 2015e; US Bureau of Economic Analysis 2015.

person might find it easier to grow quickly. One reason is that poorer countries tend to have lower levels of physical capital (productive machinery, equipment, factories, buildings, and tools) per worker, so additional accumulation of physical capital will tend to have a higher payoff than it will for richer countries, due to the principle of diminishing returns. Another reason is that the richest countries need to innovate and come up with new technologies in order to grow, which is difficult, whereas poorer countries can still achieve a lot of growth by simply copying and applying the technology of the richer countries, which might be easier.

This implies that we ought to expect some convergence in income levels across countries in the long run, as poorer countries experience temporary periods of accelerated growth as they catch up to the leaders.[31] A concern with figure 3.3a is that the countries that started off poorer (relative to other countries at the time) might have subsequently grown faster due to this convergence (or catch-up-growth) just described. This could obscure any negative effects of taxes on growth if starting out relatively poorer was also positively correlated with the subsequent growth in the size of government. Countries that started out poorer did tend to begin with smaller governments because of both weaker administrative capacity to collect taxes and less demand for government (Wagner's law). In that case, we might expect size of government to converge too as the poorer countries catch up to the richer ones in terms of administrative capability and demand for government.

To help control for this, figure 3.3b shows the same relationship as in figure 3.3a, except that it controls for the initial level of GDP per person in 1913. Formally, the way it does this is by estimating a regression of growth against initial income and a

regression of change in government size against initial income and then plotting the portions of growth and change in government size that are not predicted by initial income against each other.[32] The slope of the regression line through the scatterplot in figure 3.3b is the association between change in government and growth, holding initial income constant.

In figure 3.3b, the regression line that best fits the data is now downward sloping (suggesting larger increases government are associated with slower income growth), but the implied effect of government on growth is both statistically insignificant and tiny (as suggested by the loose scattering of the dots and the very small scale of the vertical axis). The slope of the regression line suggests that increasing government spending by an additional 10 percent of GDP is associated with a reduction in the average annual growth rate over one hundred years of just 0.08 percentage points per year. The 95 percent confidence interval ranges from -0.26 percentage points to +0.10 percentage points.

Small differences in annual growth rates can have significant consequences over a hundred years, but the point estimate here suggests that a country that otherwise would have the average annual growth rate for the sample (about 2 percent per year) would be only 7 percent poorer after one hundred years if it increased government spending by an extra 10 percent of GDP during that period than if it had not done so.[33]

Given the statistical uncertainty, which is reflected in how seemingly randomly the dots in the scatterplot are scattered and exacerbated by the fact that we have only thirteen data points, we shouldn't draw conclusions from this too confidently. But these thirteen countries accounted for about half of the world's GDP in 1913 (and over a third today), and the data

follow them over a hundred years yet reveal no significant association between increase in size of government and economic growth, despite enormous differences in the magnitude of changes in the size of government. That should give us at least a bit of confidence that the economic harm from bigger government is not necessarily large.[34]

The 95 percent confidence interval, which appropriately takes into account the uncertainty arising from the small sample size, rules out the effects of a 10 percent of GDP increase in government spending on economic growth that are more negative than -0.26 percentage points per year and cannot rule out zero or positive effects. So our best guess based on these data is that, among the countries in the sample that chose to increase the size of their governments most dramatically over the past century, the long-run economic cost of doing so, if any, was probably at most very small.

Cross-Country Comparisons of Changes in the Size of Government and Economic Growth since the Early 1960s

If we shift our focus to the period since the early 1960s and switch to using general government tax revenue as a percentage of GDP as our indicator of government size, the available data enable us to expand the analysis to a larger number of countries. Figures 3.4a and 3.4b depict, for each of eighteen industrialized nations, how general government tax revenue as a percentage of GDP and log real GDP per person evolved between the early 1960s and 2013 and how the values of both of these variables compares to those for the United States.[35] In each graph, log real GDP per person for the country in question is shown as a black solid line, while tax as a percentage of GDP is shown as a solid

black line with black dots running along it. US log real GDP per person is shown as a dashed line, and US tax as a percentage of GDP is shown as a gray solid line with gray dots.

These graphs make it clearer when the size of government diverged most dramatically across countries. Countries such as Belgium, Denmark, Finland, France, Italy, Netherlands, Norway, and Sweden all had taxes as a percentage of GDP that were pretty close to US levels in the early 1960s, but all of them subsequently increased taxes by around 10 to 15 percent of GDP while the United States held taxes as a percentage of GDP comparatively steady over this period. Much of that divergence occurred during the 1960s and 1970s. Despite this, there is no discernable tendency for the countries that increased taxes more to experience slower economic growth.

Cases where the trajectories of log real GDP per person are particularly steep (meaning growth is especially high) seem associated mostly with countries that started out poorer compared to other countries at the time, which is consistent with the convergence story mentioned earlier. Those countries whose GDP per person started out relatively close to the US level in 1960 had subsequent paths of GDP per person that roughly paralleled that of the United States, regardless of how much taxes increased. Countries such as Denmark, Finland, and Sweden now have much higher tax rates than the United States and do have slightly lower incomes per person than the United States does today, but that small gap in incomes per person was already there in 1960, when the taxes of these countries were not a significantly larger percentage of GDP than in the United States, and the gap in incomes has not widened significantly since then.

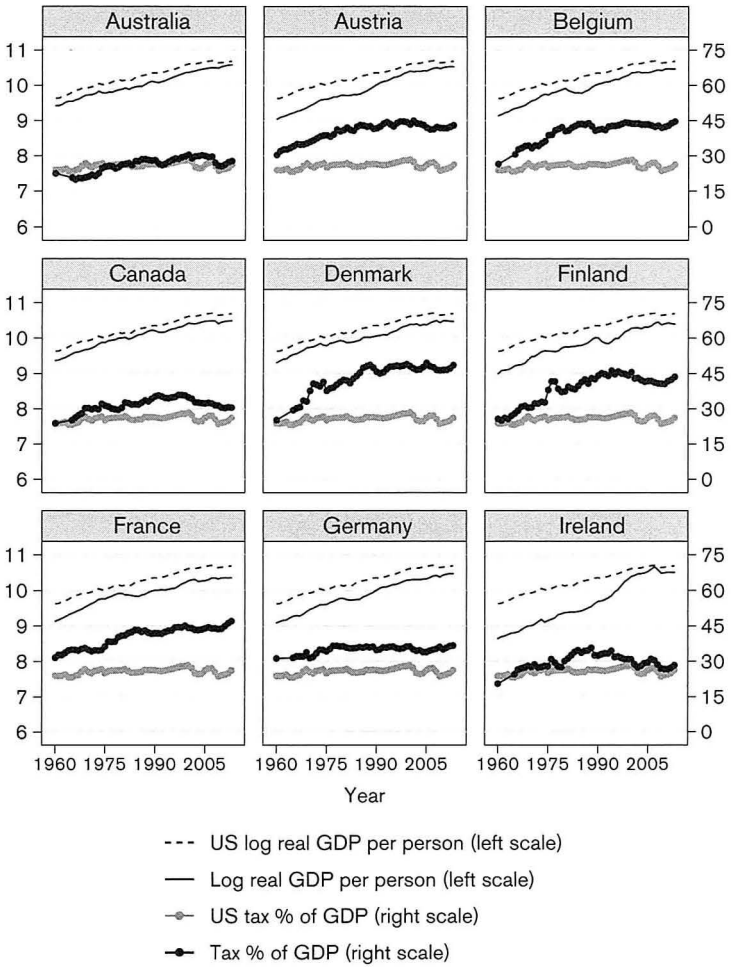
Figure 3.5a shows, for twenty-three industrialized countries (adding Greece, Luxembourg, Portugal, and Turkey to the set

of countries in figures 3.4a and 3.4b), that countries that had larger increases in tax revenue as a percentage of GDP between the early 1960s and 2013 actually had higher rates of growth of real GDP per person on average. Figure 3.5b shows the same relationship, controlling for the initial level of real GDP per person and the 2013 unemployment rate. Unemployment is a potentially important confounder, as some countries such as Spain and Greece were, as of 2013, still operating well below capacity due to a massive recession that had little or nothing to do with taxes and consequently were suffering unemployment rates well above 20 percent. Once again, the correlation between the change in taxes and the economic growth rate is weakly positive, the opposite of what we would expect if big government had a deleterious long-run effect on the economy.[36]

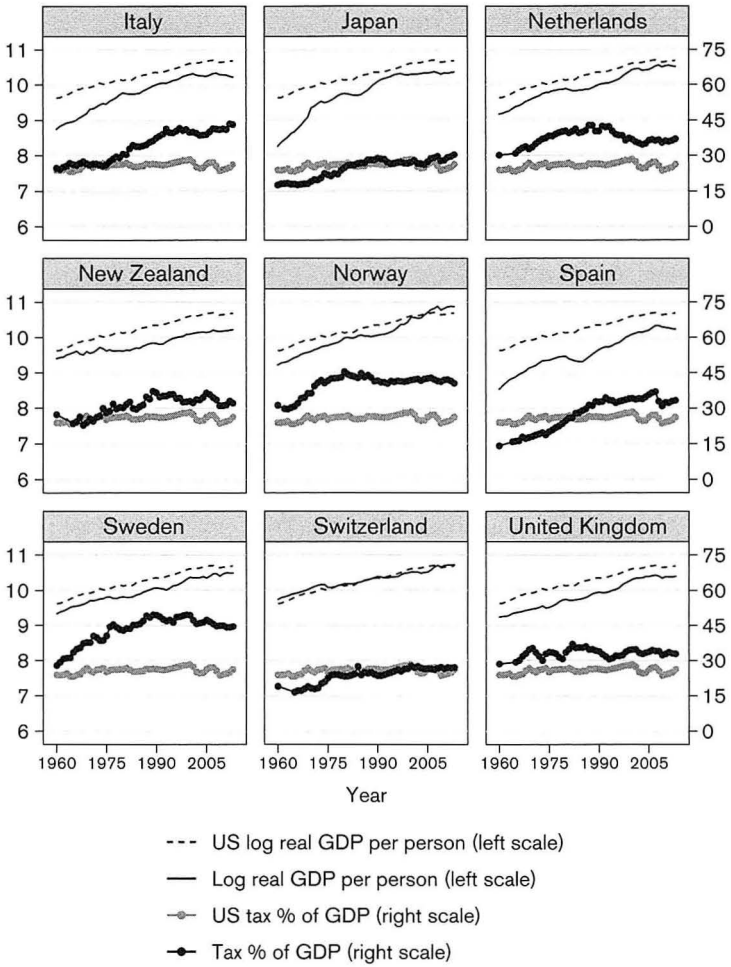
Econometric Evidence on the Effects of Taxes on Economic Growth

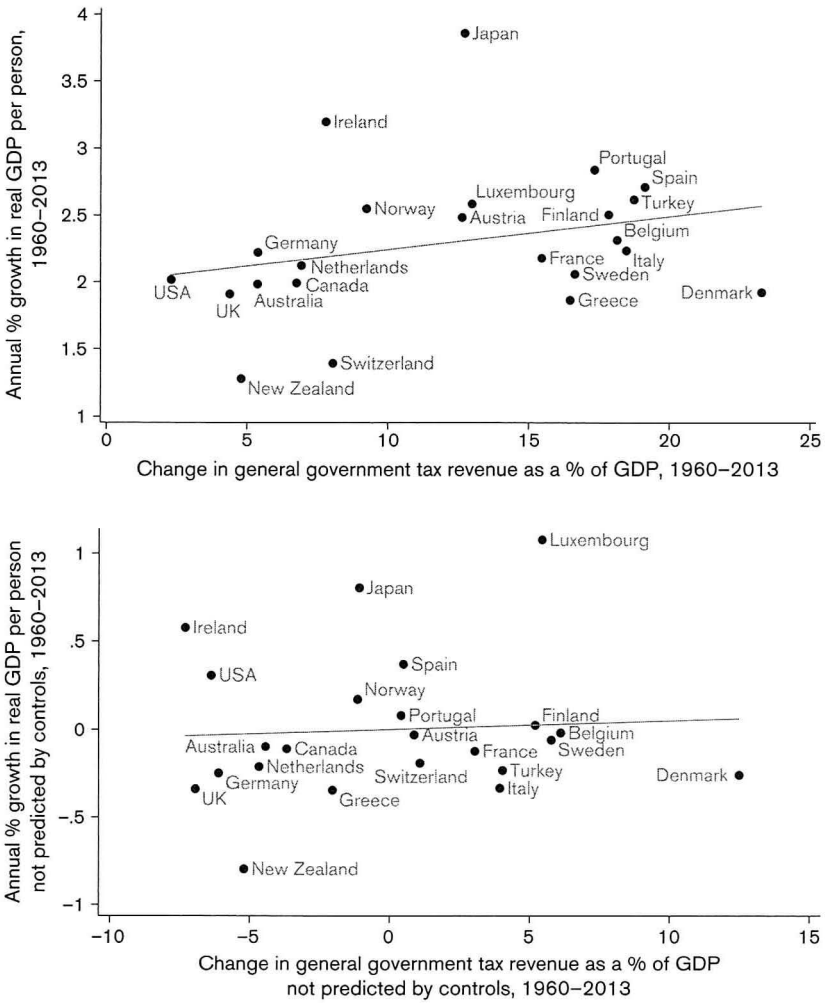
While graphs of the sort presented above are informative, they alone cannot be decisive. They don't do much to control for other factors that might influence economic growth, and they fail to make full use of available information on how the timing of changes in taxation or government spending relates to the timing of changes in the economy. More formal econometric (regression) analysis has the potential to do a better job of this.

There is now a very large body of research that uses multiple regression techniques to estimate the effects of the overall level of taxes and/or government spending on economic growth. Many reviews of this literature express considerable skepticism about whether any of the research has managed to convincingly identify a significant negative causal effect of the overall level of



Figures 3.4a *(this page)* and 3.4b *(opposite)*. Log real GDP per person and general government tax revenue as a percentage of GDP of rich nations compared to the United States, 1960–2013. Real GDP per person is given in constant 2005 US dollars adjusted for purchasing power parity. Sources: Penn World Tables Version 8.0 (Feenstra, Inklaar, and Timmer 2015); World Bank 2015; Tanzi 2011; Organization for Economic Cooperation and Development 2015a, 2015e.


Italy
Japan
Netherlands
New Zealand
Norway
Spain
Sweden
Switzerland
United Kingdom
11
10
9
8
7
6
75
60
45
30
15
0
1960 1975 1990 2005
Year
US log real GDP per person (left scale)
Log real GDP per person (left scale)
US tax % of GDP (right scale)
Tax % of GDP (right scale)



Figures 3.5a *(top)* and 3.5b *(bottom)*. Growth in real GDP per person versus change in general government tax revenue as a percentage of GDP, 1960–2013. Data for Greece, Luxembourg, and Turkey are for 1965–2013. Controls in the bottom panel are the 1960 real GDP per person and the 2013 unemployment rate. Sources: Penn World Tables Version 8.0 (Feenstra, Inklaar, and Timmer, 2015); World Bank 2015; Tanzi 2011; Organization for Economic Cooperation and Development 2015a, 2015e.

taxes or government spending on long-run economic growth, for similar reasons to those I point out above and below.[37] A few recent reviews argue that a consensus is emerging from the econometric literature that high overall levels of taxation do have negative effects on economic growth in the long run.[38] The fact that the authors of these reviews disagree suggests, at the very least, that claims of consensus are premature.

The lack of consensus should not be surprising given how many challenges are involved in efforts to produce convincing evidence on this question. We have already considered several reasons why it is difficult to tease out the long-run causal effect of taxes on economic growth from the data, but the problems don't end there.

One class of problems arises because there are many other confounding factors that could influence the level and growth of real GDP per person. To the extent that we can measure those other factors, we can control for them in a regression and solve the problem. But there are many factors that we would expect to affect economic growth that we can't measure, and if these factors are also changing over time in different countries in a way that is correlated with changes in taxes and the size of government, then our estimates will be biased.

Another, less commonly appreciated, problem is that adding control variables to a regression can give us a more inaccurate answer to the question we are interested in when those variables are channels through which the main explanatory variable of interest (in our case, taxation or government spending) influence the outcome (in our case, economic growth). For example, one way taxes might harm the economy is by reducing the incentive to save, invest, and accumulate capital and to supply labor. If we control for capital and labor supply in our regression, as economists who

estimate growth regressions often do, then we might underestimate the negative effect of taxes on the economy. On the other hand, controlling for educational attainment or national saving might cause us to overstate the costs of high taxes, because facilitating public investment in education and promoting national saving (through the reduction of budget deficits) are channels through which high taxes might benefit the economy.[39]

Yet another critical class of problems arise because correlations in the data between economic growth on the one hand and tax revenues and government expenditure on the other might be driven by the business cycle and political responses to it, and this correlation might tell us nothing at all about the long-run economic effects of taxes and government spending. Referring back to the graph for the United States in figure 3.2b, we can see that log real GDP per person experienced lots of short-term fluctuations, most notably during the Great Depression in the 1930s, but more or less always returned to its long-run trend eventually.

The short-run fluctuations apparent in figures 3.2a and 3.2b are mainly temporary recessions and booms, which are primarily driven by fluctuating aggregate demand. For example, a drop in consumer confidence might cause consumption spending in the economy to fall, and the resulting increase in saving might not translate into demand for investment if the central bank fails to move the interest rate down enough to make that happen. The result is a recession, where reduced aggregate demand leads to unemployment and underutilized capital. But long-run economic growth is driven not by aggregate demand but rather by aggregate supply, which increases when we accumulate more and better capital, workers, and skills and when we achieve technological progress that enables us to use those resources more productively.

If our goal is to figure out whether permanently switching to a larger Nordic-style government would have costs in terms of lower GDP per person in the long run, we need our estimates to isolate how the incentive effects of taxes affect the long-run growth of aggregate supply, and we need to purge them of correlations that are about the temporary fluctuations of the business cycle. But that is hard to do econometrically, and depending on the technique used, econometric estimates might very well be dominated by those short-run effects.

The business cycle creates more concerns about reverse causality as well. When the economy falls into a recession, tax revenues automatically fall (for example, because people lose their jobs or their incomes shrink, pushing them into lower tax brackets) and government expenditures automatically rise (for example, because of increased spending on unemployment insurance benefits). This induces reverse causality from growth to taxes and government spending, which might obscure the causal effect of taxes and government spending on growth.

Some researchers have attempted to address this by focusing on the effects of tax revenues on economic growth, based on the supposition that the reverse causality described above would bias us against finding a negative effect of taxes on growth. If tax revenues automatically decline in bad economic times and go up in good times, this might be expected to induce a positive correlation between taxes and growth. In that case, we would have a conservative test of the causal effect of taxes, and if we nonetheless found a negative effect of taxes on growth, we could be more confident that any negative effect that we estimate is causal.

Unfortunately, things are considerably more complicated than that. Tax revenues tend to be lowest relative to GDP at the

bottom of a recession (for example, because people have reduced incomes, which then fall into lower tax brackets). Politicians tend to amplify this by enacting tax cuts at the bottoms of recessions or when recovery is already underway, since there is a lag between when a recession is identified and when political action is taken. Recoveries from recessions tend to be periods of the highest economic growth, since it is easier to grow fast when the economy has significant unused capacity and can grow just by putting existing idle workers and capital to work. Growth in normal times, by contrast, requires the harder task of accumulating more capital, labor, and skills and improving technology.

When tax revenues are unusually low at the bottom of a recession, the econometrics used in many recent studies will tend to give the low taxes credit for the rapid growth that ensues in the recovery from the recession. This rapid growth might happen because tax cuts boost consumption spending and thus aggregate demand, helping to get a country out of a recession more quickly. However, even if a tax cut helps to get a country out of a recession and back to the economy's long-run trend sooner, that does not necessarily tell us anything about how taxes affect the long-run trend itself.

To illustrate why econometric evidence suggesting that taxes hurt long-run economic growth is not so convincing, let's consider two recent studies that are among the most up-to-date and best-done examples of studies reaching that conclusion. In each case, there are good reasons for skepticism about whether a long-run causal effect has really been identified.

In their study, Andreas Bergh and Martin Karlsson used panel data on twenty-nine currently high-income countries, most of them OECD nations but also including several countries that transitioned from developing to high-income status

relatively recently, such as Singapore and Taiwan.[40] Each country was observed for a varying number of years, with the longest span being from 1970 through 2005. In an effort to purge short-run business cycle effects from the estimates, Bergh and Karlsson collapsed the data into a series of non-overlapping five-year averages and controlled for the unemployment rate. They also tried controlling for an array of other variables, including income per person at the beginning of each five-year period, average years of educational attainment, the national saving rate, the inflation rate, and an index of "economic freedom" (discussed below), among others.

The gist of Bergh and Karlsson's evidence, roughly speaking, is as follows. Holding certain other factors constant, when some countries increase their taxes as a percentage of GDP from one five-year period to another, their economic growth rate goes down by more across those time periods when compared to countries that did not change their taxes as a percentage of GDP over those same periods.[41] They estimated that an increase in taxes of 10 percent of GDP is associated with a reduction in the average annual growth rate of GDP of 1 percentage point.

While the Bergh and Karlsson study is a valiant effort, it still raises many questions. Some of the control variables in their analysis, such as educational attainment, are channels through which high taxes and big government might promote economic growth, so it is important to recognize that their estimate is, at best, an estimate of the economic cost of taxes after removing some of the economic benefit of what the taxes pay for. Still, their estimates would seem to imply that an increase in taxes that are used to pay for social transfers (which they do not include as a control variable) would have a negative effect on growth.

A big question about their study is whether that estimated effect of taxes on the growth rate is a temporary effect or a permanent effect. It matters a great deal whether increasing taxes by 10 percent of GDP reduces the growth rate of GDP by 1 percent a year for five years or by one percent per year forever, but we have no way of knowing which it is from their study. While collapsing the data into five-year averages and controlling for the unemployment rate might help reduce concerns that they are just estimating a short-run relationship between taxes and growth over the business cycle, it does not necessarily solve the problem. It could still be the case that their study is simply picking up on a tendency for tax revenues to be lowest at the troughs of recessions, which are then followed by rapid recoveries, in which case their estimates would really be about a correlation between low taxes and reversion of the economy to its long-run trend, and they wouldn't tell us anything about how taxes affect the long-term trend.

Moreover, the estimated effects of their study are highly inconsistent with what we find when we make comparisons over much longer spans of time. As figures 3.2 through 3.5 above attest, many rich countries increased taxes relative to GDP by a great deal over the last five or ten decades. As Peter Lindert has shown, the increased government revenue from these taxes was mostly used to expand social insurance. Yet there is no apparent correlation with lower growth rates over the long run.[42] The discrepancy between that and the effect estimated by Bergh and Karlsson might have arisen because Bergh and Karlsson's study just picked up a short-run business-cycle-related effect. The inclusion of countries like Singapore and Taiwan also raises concerns about sample selection bias of the sort discussed earlier.

In another study, Norman Gemmell, Richard Kneller, and Ismael Sanz analyzed panel data on seventeen OECD countries

from the early 1970s through 2004.[43] Gemmell and his colleagues estimated how changes in overall taxes as percentage of GDP correlate with changes in economic growth, while controlling for "productive" government spending (such as spending on education and infrastructure) and for the less distortionary forms of taxes (such as consumption taxes), among other things. They concluded that an increase in "distortionary" taxes (such as income taxes) relative to GDP, used to finance "unproductive" government expenditure (such as social insurance), will have a negative effect on the economic growth rate that will persist for a number of years. They admitted that it is difficult to determine exactly how long the effect persists given their data.

The econometric strategy that Gemmell, Kneller, and Sanz apply to distinguish long-run from short-run effects of taxes on growth is too technical to explain in detail here.[44] But the reasons for concern about the validity of their approach are easy to understand given the evidence discussed earlier in this chapter. A critical concern is that, as Gemmell and his colleagues demonstrate statistically, they analyzed a period of time and a sample of countries where both taxes as a percentage of GDP and economic growth rates were stationary. Changes in economic growth rates and in taxes relative to GDP during this period tended to be small and to reverse themselves over time, so there were no permanent changes in either variable. As a result, their study amounts to extrapolating from relationships between short-run changes in taxes and growth rates that keep reversing themselves in order to infer what the long-run effect of a tax change on growth would have been if the tax change had not later been reversed.

There are big questions about whether such extrapolations are valid. As figures 3.2a, 3.2b, 3.4a, and 3.4b demonstrate, most of

the large, permanent changes in the size of government relative to GDP in high-income countries were already complete by the early 1970s. The major changes had occurred in the 1960s and earlier. By focusing only on years after the large permanent changes in the size of government had already occurred, Gemmell, Kneller, and Sanz did not take advantage of the best available opportunity to determine whether permanent changes in taxes relative to GDP actually have long-run effects on GDP.[45]

One piece of evidence that corroborates these concerns is a study by Georgios Karras that examined panel data on eleven OECD countries from 1960 through 1992. Karras verified statistically that, during this period, taxes as a percentage of GDP were non-stationary, while the growth rate in real GDP per capita was stationary. This suggests that permanent increases in tax rates relative to GDP (which *were* enacted during the 1960s) could not be having a *permanent* negative effect on the growth rate. Karras estimated that a permanent increase in taxes as a percentage of GDP would have only a very temporary and modest negative effect on the growth rate, reducing the *level* of GDP per person permanently but only by a small amount.[46]

Where Is the Common Ground?

While some of the disagreement about whether high taxes have identifiable negative long-run economic effects reflects disagreement about the issues I've highlighted above, in some ways, the disagreements are not as large as they might at first appear. Peter Lindert, in his 2004 book, *Growing Public*, and in chapter 2 here, presents copious evidence that a large social welfare state is a "free lunch" in the sense that there is no detectable long-run

cost to it in foregone GDP. He argues that this makes sense partially because the countries with the biggest welfare states, especially the Nordic states, have adopted very efficient public policies in other regards. These include keeping tax rates on capital income relatively uniform and low, adopting broad tax bases with few deductions, relying heavily on relatively efficient value-added taxes, making large investments in education, subsidizing complements to work such as child care, and maintaining openness to free trade, among many other things.[47] The theory is that this has helped offset any negative incentive effects of high taxes.

Gemmell, Kneller, and Sanz and Bergh and Karlsson seem to agree with this general point. Gemmell and his colleagues find that "productive" government expenditures such as public investment in infrastructure and education have positive effects on economic growth that roughly offset the negative effects of taxes. They conclude:

> Hence, Jones's (1995) view that it would be an "astonishing coincidence" if two non-stationary variables that drive growth compensate for each other in such a way as to generate a stationary growth process, is not so astonishing in this context. Rather, our results largely confirm Dalgaard and Kreiner's (2003; p. 83) *a priori* conjecture that: "it may well be the case that a higher tax rate has a significant negative effect on the growth rate, but that this is roughly offset by a significant positive growth effect of the productive government expenditure that is financed by the higher tax rate, thus resulting in a small overall net effect."[48]

Relatedly, a major theme in Bergh and Karlsson is that uncovering the negative causal effect of taxes on economic growth requires controlling in a thorough way for all the other efficient

policies and institutions that the large social welfare states, especially the Nordic countries, have adopted to help offset the hypothesized negative effects of high taxes. For instance, Bergh and Karlsson show that the estimated effect of taxes on economic growth in their 1970–2005 panel switches from a small positive to a large negative when they add the Fraser Institute's Economic Freedom Index (excluding the part that depends directly on government size)—which is basically a summary measure of the efficiency of government policy and its implementation—as a control variable.[49]

So, despite all the other reasons for disagreement noted earlier, if the question is posed as "Would the economy of a country like the United States suffer in the long run if it were to adopt the Nordic package of public policies wholesale?" we might actually have a consensus among these researchers that the answer is no. The researchers discussed here who find negative effects of taxes on growth are essentially arguing that the Nordic countries could have even higher economic growth if they maintained all their market-friendly policies but scaled back on their taxes and social welfare policies. That is plausible, but it has by no means been convincingly demonstrated.

It is also possible that the market-friendly policies adopted by the Nordic countries are only politically palatable and social welfare enhancing if implemented in conjunction with generous social programs and the high taxes that finance them. For example, economically efficient policies such as openness to free trade have the potential to expose people to considerable risk and to exacerbate the inequality of market incomes. So the high-tax, high–social insurance combination might be necessary to ensure that those efficient policies produce broadly shared prosperity and earn the support of voters.

whenever the pension fund's "balance ratio" (i.e., capitalized assets divided by capitalized obligations) drops below 1.

3. WOULD A BIGGER GOVERNMENT HURT THE ECONOMY?

I would like to thank Melissa Caplen for outstanding research assistance and Peter Pedroni, Joel Slemrod, and Lant Pritchett for helping me think more clearly about some of the issues in my chapter.

1. A thoughtful person might respond to this example by saying, "Hey, isn't it possible that the tax would make you work *harder?*" It is true that any tax that is related to ability to pay has both an income effect (the tax makes you poorer, which induces you to work harder to make up for it) and a substitution effect (the tax reduces the incentive to work by making market consumption relatively more expensive compared to leisure). Whether a tax causes you to work more or less does indeed depend on which of these two countervailing effects is stronger. However, the deadweight loss of a tax is entirely about the substitution effect, and any tax that has a substitution effect involves deadweight loss, even if there is an offsetting income effect. To see why, consider the only kind of tax that causes no deadweight loss at all—a lump-sum tax, which is a tax of a fixed amount that does not change, no matter how you change your behavior. Such a tax would mean that the rich and poor alike would pay the same dollar amount of tax. If we were to replace a labor-income tax with a lump-sum tax that raised the same amount of revenue from you, there would still be an income effect that would encourage you to work more, but there would be no substitution effect that would encourage you to work less because the tax would no longer depend on how much you work. In that case, the harm to you from the tax would be exactly equal to the tax revenue collected by the government, and there would be no deadweight loss. Moreover, compared to a lump-sum tax that raises the same amount of revenue, the labor-income tax would encourage you to work less because the income effect is the same in both cases, but only the labor income tax would have a substitution effect. Deadweight loss is fundamentally the extra economic cost that comes from

operating a system where taxes increase with ability to pay relative to what would happen with lump-sum taxes that raise the same revenue. The further that taxes get from lump-sum taxes, i.e., the more that taxes mitigate economic inequality, the larger the deadweight loss is. For a more formal diagrammatic demonstration of this point, see, for example, Rosen and Gayer (2009, ch. 15).

2. For example, a progressive consumption tax could be designed to raise the same tax revenue as our current tax system and to do about as much as the current system does to mitigate economic inequality without distorting incentives to save or invest or distorting incentives regarding which types of investment to do. See Slemrod and Bakija (2016) for further discussion of options for fundamental tax reform and their pros and cons.

3. Okun 1975.

4. For further discussion of the relevant issues here, see Okun 1975; Saez and Stantcheva, 2016; Diamond and Saez 2011; Mankiw, Weinzierl, and Yagan 2009; Kaplow 2008; Arneson 2012; Roemer 1998; Dworkin 2000; Rawls 1971; and Layard, Mayraz, and Nickell 2008.

5. Heckman (2012) offers an accessible discussion of evidence that investments in high quality preschool for children from disadvantaged homes have a high long-run economic payoff. Furman (2015) discusses a variety of credible empirical studies presenting evidence of long-term economic payoffs from a variety of social programs that involve investment in children from disadvantaged backgrounds. Stiglitz and Weiss (1981) offer the seminal theory for why asymmetric information can cause credit markets to fail, which in turn causes people without sufficient collateral to undertake less than the economically efficient amount of investment. The Organization for Economic Cooperation and Development (2015b) reviews arguments and evidence for why policies that reduce economic inequality can have economic benefits.

6. A full discussion of market failures and their implications for government policy can be found in any undergraduate public finance textbook, including, for example, Gruber 2013; Stiglitz and Rosengard 2015; and Rosen and Gayer 2009.

7. The 59 percent figure is from Center on Budget and Policy Priorities (2015) and includes 24 percent for Social Security, 24 percent for

health insurance programs such as Medicare, Medicaid, CHIP, and Affordable Care Act exchange subsidies, and 11 percent for safety net programs such as unemployment insurance, food stamps, and the refundable portion of the earned income tax credit, among other programs.

8. See Frick (2015) for an argument along these lines. Kenworthy (2014, ch. 4) presents evidence that the pace of innovation in the United States was at least as strong during the 1950s and 1960s, when economic inequality was much lower than it is today, and that observable indicators of innovation in Nordic countries have been robust and comparable to those in the United States in recent times.

9. That GDP is an imperfect measure of well-being is not a novel insight to economists. GDP is not intended to measure social welfare. Essentially, every introductory macroeconomics textbook begins with a discussion of this. See, for example, Frank and Bernanke 2013.

10. The quote is from Slemrod (2006, 82–83). Here and throughout this chapter, I define "taxes" to include "social contributions," where the latter involve mandatory payments to the government that are related in some way to benefits received, as is the case of the social security payroll tax in the United States. Certain data sources sometimes separate out social contributions from taxes, but in those cases I combine the data on taxes and social contributions.

11. Gadanne and Singhal 2014.

12. For a scatterplot that just includes OECD countries, which also demonstrates a strong positive correlation between taxes as a percentage of GDP and GDP per person, see chapter 4 of Slemrod and Bakija's (2016) book.

13. Gordon and Li (2009) show that low-income countries and high-income countries have similar statutory tax rates on average, but the low-income countries collect much smaller fractions of GDP as tax revenue. The low revenue yield for a given tax rate in low-income countries reflects some combination of rampant tax evasion and a larger share of economic activity (such as income earned below tax-filing thresholds) being legally exempt from taxation, the latter of which is partly motivated by the administrative difficulty of enforcing taxes on that activity. Robinson and Slemrod (2012) and Kleven (2014) also show

that, among relatively high-income countries, there is a strong positive correlation between tax collections as a percentage of GDP and objective measures of a country's ability to effectively administer a tax system, such as the fraction of economic activity that is subject to third-party information reporting to the tax administration.

14. Wagner (1883) 1958.

15. Slemrod 1995.

16. "Panel data" in this context means that multiple countries are followed over time, as opposed to "cross-section" data, which compares across countries at a given point in time.

17. According to data from the Penn World Tables Version 8.0 (Feenstra, Inklaar, and Timmer 2015), extended from 2011 through 2013 with data from World Development Indicators (World Bank, 2015), the countries experiencing the fastest growth in real GDP per person on average between 1960 and 2013 were mainland China, Equatorial Guinea, Botswana, South Korea, Singapore, Thailand, and Hong Kong. Taiwan also had a comparably high growth rate but is not represented in the Penn World Tables.

18. This point is emphasized by Agell, Ohlsson, and Thoursie (2006) and applies in particular to such studies as those conducted by Folster and Henrekson (2001) and Bergh and Karlsson (2010).

19. Rodrik (2007) offers a detailed discussion of the various ways that recent success stories of the economic growth of developing countries have not always followed doctrinaire free-market scripts, and Hausmann, Pritchett, and Rodrik (2005) and Pritchett and Werker (2012) offer interesting analyses of what sorts of policy and institutional changes preceded sustained rapid episodes of growth in developing countries. There is no evidence that the sustained growth takeoffs were generally preceded by significant tax cuts.

20. In figures 3.2a and 3.2b, data on GDP per person from 1870 through 2010 are measured in constant year-1990 dollars adjusted for purchasing power parity and are from the Maddison Project (2013). I extended that series through 2013 by applying the growth rate in GDP per person in constant year-2011 dollars adjusted for purchasing power parity from World Development Indicators (World Bank 2015). I used several different series on government expenditure as a percentage of

GDP from Tanzi (2011) and the Organization for Economic Cooperation and Development (1982, 1992, 2000, 2015e, 2015c), but I was careful only to use data where the different series overlap each other closely in years when both were available. Data on the two variables in figures 3.2a and 3.2b are also available over fairly long periods of time for Ireland and New Zealand, but the Maddison Project data on GDP per person in Ireland has large gaps, while the long-ago historical series on government expenditure in New Zealand from Tanzi (2011) appears to involve significant inconsistencies in the way it was measured when compared to more recent data from New Zealand, based on the fact that the series do not overlap closely in the years when both are available.

21. The 1870–1929 trend is constructed for each country based on a separate regression for each country, in which log real GDP per person is the dependent variable and year is the only explanatory variable.

22. The point that the log of real GDP per person in the United States and many other industrialized countries can be predicted well by extending the trends from the late 1800s through the beginning of the Depression was brought to prominence in economics by Jones (1995). Stokey and Rebelo (1995) cited evidence of this nature about the United States to argue that fundamental tax reform would be highly unlikely to have a significant effect on the long-run economic growth rate in the United States.

23. Another issue is that constructing trends using 1870–1929 data probably understates the pre-Depression trend in log real GDP per person for some countries because these countries were already suffering from recession in the 1920s. Lant Pritchett makes available on his web site (www.hks.harvard.edu/fs/lpritch/EG%20-%20NEW.html) graphs like this for sixteen industrialized countries, with the only difference being that the pre-Depression trend is constructed using the range of years between 1890 and 1929 that yield the best predictions of subsequent growth. When calculated this way, the pre-Depression trends do a remarkably good job of predicting subsequent growth, with a median prediction error for 2003 GDP per person of just 3.9 percent.

24. For further information on the concepts of stationarity and non-stationarity and how to test for them, see any time-series econometric textbook, such as Harris and Solis (2003).

25. To verify that this still holds over the full 1870–2013 period for each of the twenty-three countries depicted in figure 3.5 (excluding Ireland, Luxembourg, and Turkey, which do not have continuous data on GDP per person for the full period), I performed augmented Dickey-Fuller unit root tests on the growth rate in real GDP per person, using a step-down procedure to select the number of lags of first-differenced growth rates (with a maximum of six lags). The tests strongly reject the null hypothesis of non-stationarity for each of the twenty countries, confirming that Jones's point still holds true even with a now considerably longer time series. I also performed a similar test on each country of the null hypothesis that the log of real GDP per person is non-stationary after controlling for a country-specific time trend, and the test failed to reject the null hypothesis of non-stationarity for all of the twenty countries. This means that there is evidence that a country's log real GDP per person can diverge from its long-run historical trend in a permanent way.

26. We cannot perform a formal test of whether government spending as a percentage of GDP has been non-stationary for the full 1870–2013 time period because there are big gaps in data availability before 1960, but we can test for non-stationarity in taxes as a percentage of GDP for twenty-three industrialized countries between the early 1960s through 2013. A similar test to that described in the previous note fails to reject the null hypothesis of non-stationarity for taxes as a percentage of GDP for fourteen of twenty-three industrialized countries and for twenty of twenty-three countries when controlling for a country-specific linear time trend.

27. Romer (1986, 1987, 1990) has made seminal contributions to the theory of endogenous growth.

28. Jones 1995, 496.

29. Due to data availability constraints, both variables are measured for 1920 through 2013 in Ireland and Canada.

30. In all cases throughout this chapter where I say estimates are not statistically significant, they are not significant in their difference

from zero at the 10 percent significance level. In all cases where I say estimates are statistically significant, they are significantly different from zero at the 1 percent significance level. For more precise explanations of regression and statistical significance that should be accessible to people with no background in statistics, see Bakija (2013).

31. The ideas about how capital accumulation and technological change relate to economic growth were brought to prominence in economics by Solow (1957) and Swan (1956). Easterly (2001) offers an accessible and entertaining explanation of leading theories of economic growth, including the ones mentioned here.

32. The slope of the regression line through the scatter plot in the bottom panel of figure 3.3 is identical to the coefficient on change in government spending as a share of GDP in a multiple regression where the dependent variable is the growth rate and the explanatory variables include both change in government spending as a percentage of GDP and initial income. Angrist and Pischke (2009, section 3.1.2) provide a demonstration of why this is so in their discussion of "regression anatomy." See also Bakija (2013) for a less technical demonstration and example.

33. At the average growth rate (2.001 percent per year), real GDP per person after one hundred years would be $1.02001^{100} = 7.252$ times as large in one hundred years as it is initially. Changing the growth rate by the point estimate of the effect of a 10 percent of GDP increase in government spending of -0.078 leads to a real GDP per person that would be 6.72 times as large in one hundred years relative to the initial level, which is about 7 percent smaller than we would have had with the higher growth rate.

34. Fraction of world GDP represented by the thirteen countries in figure 3.3 is my calculation, based on data from the Maddison Project (2013) and Maddison (2010).

35. In figures 3.4a and 3.4b, real GDP per person is measured in constant year 2005 US dollars and is adjusted for purchasing power parity, based on data from the Penn World Tables Version 8.0 (Feenstra, Inklaar, and Timmer 2013) for 1960 through 2011, and extended from 2011 through 2013 by applying the growth rate in real GDP per person in constant year-2011 dollars and adjusted for purchasing power

parity from World Development Indicators (World Bank, 2015). To compute economic growth rates for figure 3.5, I used a similar approach, except that I measured GDP per person in constant local currency units, as recommended by Feenstra, Inklaar, and Timmer (2015). Data on real GDP growth and taxes as a percentage of GDP are also available dating back to the early 1960s for Greece, Luxembourg, Portugal, and Turkey. These are excluded from figures 3.4a and 3.4b to improve their readability, but they are included in figure 3.5. These additional four countries do fit the general patterns of figures 3.4a and 3.4b described in the text. Iceland is excluded due to large gaps in the available data on tax revenue relative to GDP in the earlier years.

36. The point estimate of the slope of the regression line in the bottom panel in figure 3.5 is that a 10 percentage point increase in taxes as a percentage of GDP is associated with an increase in the annual growth rate of real GDP per person of 0.05 percentage points, with a 95 percent confidence interval ranging from -0.3 to +0.4 percentage points. Unfortunately, data on unemployment rates are unavailable for many countries in our sample for the early 1960s. Using the same data as in figure 3.5, a regression of growth rate on change in taxes as a percentage of GDP and initial level of GDP per person, omitting the 2013 unemployment rate, yields a very small and statistically insignificant negative effect of taxes on growth, so the main point emphasized in the text does not actually depend on controlling for the unemployment rate. In that regression, an increase in taxes of 10 percent of GDP, holding initial income constant, is associated with a 0.02 percentage point reduction in the annual growth rate, with a 95 percent confidence interval ranging from -0.4 percentage points to +0.4 percentage points. Krugman (2012) offers a clear and accessible explanation of the most likely causes of the continuing severe recession in the peripheral European countries, which have to do with these countries being tied to the Euro currency at a time when currency devaluation to promote exports would otherwise have been a critical method of boosting their economies in response to the shock of a severe recession, together with being stuck at the zero lower bound for nominal interest rates at a time of weak aggregate demand and very low inflation. Greece, unlike almost all other European countries, also had problems due to

accumulating too much government debt prior to the crisis, but that is as much an issue of tax revenue being too low as it is an issue of high government spending.

37. Slemrod 1995; Myles 2000; Huang and Frentz 2014; Gale and Samwick 2014.

38. Bergh and Henrekson 2011; McBride 2012; Gemmell and Au 2013.

39. See Angrist and Pischke (2009), section 3.2.3, for discussion of "bad control." King (2010) explains the same problem but refers to it as "post-treatment bias."

40. Bergh and Karlsson 2010.

41. Technically, they are estimating a panel regression where the data are collapsed to non-overlapping five-year averages and are controlling for country fixed effects and year fixed effects; the words in the text roughly convey what kind of comparison their evidence is based on.

42. Lindert 2004.

43. Gemmell, Kneller, and Sanz 2011.

44. Gemmell, Kneller, and Sanz (2011) estimate a "single equation error correction model." Enns, Masaki, and Kelly (2014) explain this approach and point out some problems with it.

45. A better way to identify whether there is a long-run equilibrium relationship among variables in time-series data is to work with non-stationary variables and test them for "cointegration," which, roughly speaking, means that the variables tend to return to their long-run equilibrium relationship with each other in the long-run and do not diverge from that relationship in a persistent way. For an introduction to cointegration methods in econometrics, see, for example, Harris and Sollis (2003). In ongoing research (Bakija and Narasimhan 2016), my coauthor and I use panel cointegration techniques on cross-country panel data to test what is essentially the following question: when taxes as a percentage of GDP rise above their historical trend in a persistent way, does that lead log real GDP per person to drop below its historical trend in a persistent way as well, and does that relationship persist over the long run? The results of our panel cointegration tests suggest that the answer to those questions is no.

46. Karras 1999.

47. See, for example, Lindert 2004; Kleinbard 2010; and Kleven 2014.

48. Gemmel, Kneller, and Sanz 2011, F54.

49. Bergh and Karlsson 2010, table 7. In one of the recent literature reviews that argues that taxes do harm economic growth, Bergh and Henrekson (2011, 872) emphasize that they "discuss ... explanations of why several countries with high taxes seem able to enjoy above average growth.... [One] explanation is that countries with large governments compensate for high taxes and spending by implementing market-friendly policies in other areas." They go on to say that this particular explanation is "supported by ongoing research," and they spend much of the latter part of their literature review providing stylized facts to support this conclusion.

50. Chetty 2012.

51. Alesina, Glaeser, and Sacerdote (2005) and Constant and Otterbach (2011) provide further discussion of why individual choice over labor supply might be limited.

52. Prescott 2004a.

53. See, for example, Conard (2012) or Prescott's (2004) own op-ed in the *Wall Street Journal.*

54. Essentially, Prescott assumed a utility function that implied large offsetting substitution and income effects and also assumed that government revenue is given back to people as lump-sum transfers. He then chose the parameters of that utility function to match the observed data. He could have equally well matched the data with a utility function that implied smaller offsetting income and substitution effects and less deadweight loss. See Alesina, Glaeser, and Sacerdote (2005) and Jäntti, Pirttilä, and Selin (2015) for further discussion of these issues.

55. Alesina, Glaeser, and Sacerdote 2005.

56. Gruber and Wise 1999.

57. Data on hours worked are from the Conference Board (2015). Data on population aged fifteen to sixty-four are from World Development Indicators (World Bank 2015). Data on general government tax revenue as a percentage of GDP are from Tanzi (2010) and the Organization

for Economic Cooperation and Development (2015f, 2015c). For a few countries, data on tax as a percentage of GDP is available for 1960 and from 1965 on, but missing for 1961 through 1964. In those cases, I compute the 1960–1969 average of tax as a percentage of GDP by replacing the 1961 through 1964 values with linear interpolations.

58. In the United States, from 2004 to 2013, taxes averaged 25.4 percent of GDP, and hours worked per person aged fifteen to sixty-four averaged 1,243 per year. An increase in taxes of 10 percent of GDP would reduce the net-of-tax share (that is, one minus the tax rate) from 0.746 to 0.646, a 13.4 percent reduction. If that increases annual hours worked per person aged fifteen to sixty-four by 63 hours, that is a 5.07 percent increase in hours worked. 5.07/13.4 is approximately 0.4, which implies a 10 percent increase in after-tax wage would be associated with approximately a 4 percent increase in hours worked.

59. A regression using the annual cross-country panel data for all available years from 1960 through 2013 of the log of average annual hours worked on the log of one minus the tax rate (which is a measure of the incentive to earn income, analogous to the after-tax wage), controlling for country fixed effects and year fixed effects, suggests that a 1 percent increase in the incentive to earn income is associated with a 0.20 percent increase in hours worked, but this is again statistically insignificant, with a wide 95 percent confidence interval ranging from -0.33 to 0.72. Country fixed effects control for any influences on labor supply that differ across countries that are constant over time, and year fixed effects control for any factors that are changing in the same way over time for all countries. I compute robust clustered standard errors with clustering by country, which allows for correlation in the error terms over time within a country. The lack of statistical significance once one controls for country and year fixed effects is consistent with the previous literature—for example, Davis and Henrekson (2005) also found that, in a cross-country panel regression of annual hours worked per adult on the tax rate, statistical significance disappeared when country and year fixed effects were added to the specification.

60. Faggio and Nickell (2007) discuss which European countries had unions that pushed for work-sharing arrangements.

61. Kleven 2014.

62. This is especially counterintuitive given the fact that, when we are talking about participation decisions, both the income and substitution effects of taxes and means-tested transfers ought to go in the direction of less work.

63. Rogerson (2007) and others also made this point previously, but Kleven (2013) brings better data to bear on the question.

64. Jäntti, Pirttilä, and Selin 2015.

65. Jäntti, Pirttilä, and Selin 2015, table 4, column 3. In the regression specification just described, the estimated income effect is close to zero, so the estimated substitution effect, which is what is relevant for determining deadweight loss, is also very close to a 10 percent increase in after-tax wage being associated with a 3 percent increase in hours worked. Among the many specifications Jäntti and his colleagues estimate, there is one that relies exclusively on difference-in-differences variation in after-tax wages across countries for identification. In that specification (table 3, column 4), a 10 percent increase in after-tax wage is associated with a 6.4 percent increase in hours worked. However, this specification also estimates that a 10 percent increase in non-labor income, holding after-tax wage constant, is associated with an *increase* in hours worked of 7 percent, which is implausibly large and the opposite of the expected sign. If both were true at the same time, that would imply a very small substitution effect and thus little deadweight loss from taxation. However, the positive estimated effect of income on hours worked in that specification is most likely due to reverse causality. For example, in the countries where hours worked declined by more for some other reason, it caused non-labor income, such as capital income, to decline because people had less disposable labor income left over to save. This casts that particular regression specification into suspicion. Reverse causality in the estimation of income effects is a pervasive problem in estimating labor supply elasticities. The most credible evidence that we have of income effects on hours worked is from examining how labor earnings respond to randomly winning moderate-sized lottery prizes, and this evidence suggests a very modest elasticity of labor supply with respect to non-labor income of about -0.03, which is much more consistent with the

findings from the Jäntti et al. regression discussed in the text. See Imbens, Rubin, and Sacerdote 2001; and Alesina, Glaeser and Sacerdote 2005, 24.

66. Recent reviews of the literature that send a consistent message about this include Meghir and Phillips 2010; Alesina, Glaeser, and Sacerdote 2005; Chetty 2012; and Chetty et al. 2012. Keane (2011) offers a somewhat contrary view, but see Meghir and Phillips (2010) for a response.

67. Chetty et al. 2012.

68. Chetty 2012.

69. Blomquist and Simula 2012.

70. The 24 percent figure comes from dividing the deadweight loss (0.31) by 1.31.

71. In 2010, the 6 percent of individuals in the United States with annual wage and salary income above $100,000 earned 29 percent of all wage and salary income (this is my calculation, based on Form W2 data available at IRS Tax Stats, which can be viewed at www.irs.gov /file_source/pub/irs-soi/10in02w2.xls). The top 1 percent of the income distribution accounted for about 30 percent of federal government tax revenue in the United States in 2014 (Urban-Brookings Tax Policy Center 2013a). Among US income tax returns with adjusted gross income above $500,000 in 2010, which was somewhat above the threshold to qualify for the top 1 percent in that year, men earned 86 percent of all wage and salary income (this is my calculation, based on Form W2 data available at IRS Tax Stats, which can be viewed at the link given above).

72. Moffitt and Wilhelm 2000.

73. Meghir and Phillips 2010.

74. In figure 3.7, data on real GDP per hour worked are from the Conference Board (2015). Data on educational attainment are from Cohen, Leker, and Soto (2014); see Cohen and Soto (2007) and Cohen and Leker (2014) for further details. Data on taxes as a percentage of GDP are from Tanzi (2011) and OECD (2015a and 2015e).

75. Lindert 2004.

76. Blundell, Bozio, and Laroque 2013.

77. More specifically, economists estimate the percentage change in pre-tax gross income or taxable income that is associated with a 1

percent increase in the "marginal retention rate" (that is, one minus the marginal tax rate). This is known as the "elasticity of taxable income." Saez, Slemrod, and Giertz (2012) provide a comprehensive and critical review of the empirical literature on this subject.

78. It is important to emphasize that the top panel of figure 3.8 shows percentage growth in *pre-tax* incomes over time. So the relationship between cuts in marginal income tax rates and income growth shown in the figure is not due to some mechanical relationship where cutting taxes leaves you with more income after taxes. Figure 3.8 is about what happened to incomes measured before taxes got subtracted out.

79. Saez, Slemrod, and Giertz 2012; Weber 2014.

80. See, for example, Feldstein's (2011) article in the *Wall Street Journal.*

81. For a more complete explanation of the various competing theories and citations to the seminal studies on each topic, see, for example, Bakija, Cole, and Heim (2012).

82. See Gordon and Slemrod 2000.

83. Piketty, Saez, and Stantcheva 2014. I update their top income share series using data from the World Top Incomes Database (Alvaredo et al. 2015) and update their marginal tax rate series using data from the Organization for Economic Cooperation and Development (2015a). Growth rates in the bottom panel of figure 3.9 are based on real GDP per person in constant local currency units from the Penn World Tables Version 8.0 (Feenstra, Inklaar, and Timmer 2015), extended from 2011 through 2013 by applying the growth rate in real GDP per person in constant local currency units from World Development Indicators (World Bank 2015).

84. Using the data in the top panel of figure 3.9, I estimate a regression of the change in the log of the top 1 percent income share against the change in the log of the retention rate. The coefficient on the log retention rate, which is the estimate of the elasticity of taxable income, is 0.469, with a 95 percent confidence interval ranging from 0.202 to 0.734. This is roughly similar to the elasticity of taxable income that Piketty, Saez, and Stantcheva (2014) estimated using similar data but a somewhat different approach.

85. Here, I translate what Piketty, Saez, and Stantcheva (2014) estimated into what they imply about revenue-maximizing tax rate and deadweight loss based on an analysis in Giertz (2009).

86. 1.59 / (1.59 + 1) = 61 percent.

87. In their article, Piketty, Saez, and Stantcheva (2014) also show that the lack of a statistically significant correlation between change in top tax rates and economic growth persists after controlling for initial GDP per person, among other things, and I've verified that this is still true by estimating similar regressions on the updated data used here.

88. To corroborate this point, Piketty, Saez, and Stantcheva (2014) show that a significant portion of executive pay rewards luck. For example, stock options reward executives for market-wide increases in stock market valuations as opposed to the relative performance of the executive's firm compared to the stock market as a whole. Compensation for luck should not be part of an optimal incentive pay scheme for executives. Piketty and his coauthors then show that the portion of pay that rewards luck is higher during periods of recent US history when top marginal tax rates were lower.

89. Bakija, Cole, and Heim 2012.

90. In 2009, there were only about 5,000 publicly traded firms in the United States, compared to about 150,000 tax units in the top 0.1 percent of the income distribution (Stuart 2011; Piketty and Saez 2003. Piketty and Saez updated their tables and figures in 2015, and the updated information can be viewed at http://eml.berkeley.edu//~saez/TabFig2014prel.xls). However, large publicly traded firms could have large numbers of executives and managers represented in the top 0.1 percent.

91. For accessible, interesting, and provocative discussions of these issues by leading financial economists, see Zingales 2015; Malkiel 2013; Greenwood and Scharfstein 2013; and Cochrane 2013.

92. Cutler (2014, ch. 2) offers an accessible discussion of evidence on this topic.

93. Murphy, Shleifer, and Vishny (1991) discuss various ways in which the legal profession might be involved in rent-seeking, and they demonstrate a cross-country correlation between the proportion of college students who go into law and slower economic growth.

94. See Saez, Slemrod, and Giertz's (2012) discussion of "fiscal externalities" for an explanation of why, if estimated elasticities of taxable income reflect shifting of reported income between the corporate and personal tax base, the implied deadweight loss per dollar of revenue raised by a tax increase is smaller. Part of the explanation is that, if we increase the personal income tax rate and some of the reduction in personal taxable income represents shifting of income to the corporate tax base, then decline in personal income tax revenue is partly offset by an increase in corporate tax revenue, so that deadweight loss per dollar of overall government revenue raised is much smaller than we'd infer when we just look at the personal income tax in isolation.

95. Giertz 2009.

96. 0.33 / (1 + 0.33) = 24.8 percent. Ideally, we ought to also take into account the marginal change in compliance and administrative costs in this calculation. In our book, *Taxing Ourselves* (Slemrod and Bakija 2016), my coauthor and I show that estimates of the *average* administrative and compliance costs of the US tax system are on the order of 10 to 15 percent of revenue raised. However, *marginal* administrative and compliance costs (that is, how such costs *change* when we raise the top marginal tax rate) are what matter here, and these could be much lower than the average cost, since many compliance and administrative costs are fixed relative to the marginal tax rate. In other words, raising the income tax rate in the top bracket by 1 percentage point is unlikely to have much effect on the overall costs to the taxpayer of complying with the tax code or the costs to the IRS of collecting the revenue.

97. Diamond and Saez (2011) argue for much higher tax rates on high-income taxpayers in the United States on these grounds.

4. THINKING SENSIBLY ABOUT THE SIZE OF GOVERNMENT

1. See chapter 1; and Madrick 2009.

2. This includes all levels of government: federal, state, and local.

3. Libertarians regard most government programs, other than those protecting safety and property rights, as illegitimate infringements on

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