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ABSTRACT: This is a review of the so-called "Optimal tax systems" approach to the economic analysis of taxation. This approach acknowledges the bunch of instruments the public sector has to collect revenues, but also the multiple responses of taxpayers to them. In a way, this is a more realistic approach to taxation, and so should provide reliable guides to action.

MAIN RESULT: It stresses the importance of a Tax-systems approach in contrast with the tradition optimal taxation approach.
This approach consists of three blocks: multiple sources of cost of taxation (compliance, administrative and deadweight loss), multiple responses to taxes (not only behavioral) and a bunch of instruments (not only statutory parameters).
The future of this integrated approach to taxation will be very much influenced by the foreseen information revolution.

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INTRODUCTION

The modern theory of taxation, which I think of as starting around 1970, began with the work of Peter Diamond, James Mirrlees, and several others. This line of research represented a major breakthrough in how economics addressed the evaluation of taxation. The normative literature before 1970 was largely rhetorical, and evaluated taxation against fairly vague standards such as fairness, and what that meant from one writer to another often varied. Starting in 1970, the analysis of taxation became rigorous, yes, mathematical, and the advantage of rigor is that one could compare one contribution to another and that facilitated making progress. However, rigorization comes at a cost, because the models that we use to analyze taxation are stylized: they have to focus on particular features of taxation and make certain simplified assumptions about how the world works. The standard models also unavoidably emphasize certain aspects of taxation at the expense of others.

But this way of modelling taxation misses much that is important about taxes. It does not address many current tax policy issues—for example, should Greece raise revenue to meet its bailout conditions by increasing tax rates or by cracking down on tax evasion?—providing one reason why there is often a disconnect between topical tax issues of the day and the economic theory of taxation. And, in my view, it misses much of what is intellectually fascinating about taxes.

I accept that there had to be stylization, but claim that the kind of stylization that was chosen at the beginning of the modern era in taxation didn't provide a rigorous way to address many key issues due to several limitations.

SIX LIMITATIONS OF THE STANDARD MODEL OF TAXATION

1. Administration and Compliance Costs

In the standard toolkit, little attention is paid to the administrative and compliance costs of taxation. Those costs are not trivial. Most empirical studies conclude that they are an order of magnitude higher than the tax authority's budget. In many situations the sum of these costs, often identified as costs of collection, is the same order of magnitude as the type of costs that the modern toolkit does emphasize, which is the distortionary costs of taxation, called excess burden or deadweight loss. The great majority of the modern theory of taxation simply ignores these issues.

2. The Vector of Tax Policy Instruments

The second limitation is the focus on tax rates and bases--what is the optimal tax rate or pattern of tax rates and, to a lesser extent, what the tax base should be. But the government has a vast array of other tax policy instruments such as enforcement tools (i.e., audits), the penalty that is owed upon detected evasion, public disclosure of tax information, and information reporting. Third-party information reporting is key to why, although in the United States only 1 percent of returns are audited, the probability of detection of evasion if you try to cheat on your income taxes by understating wage or salary income, is closer to 99 percent. The difference between the 1 percent figure and the 99 percent figure is the system of information reporting.

3. Behavioral Response to Taxation

The standard model focuses on what I refer to as the real behavioral response to taxation, for example labor supply and savings decisions, to the relative exclusion of often equally important avoidance and evasion responses. In the seminal article in the modern theory of taxation, the Mirrlees (1971) paper on optimal tax

progressivity, the only choice an individual has is how much to work. Shortly thereafter, the Allingham and Sandmo (1972) paper introduced evasion as a choice and analyzed what affects people's choice about evasion. But relatively little research has been devoted to integrating the choice of evasion into the optimal tax models of the kind that Mirrlees (1971) introduced -- not none, but very little.

4. Assumptions about Information

Although the standard model recognizes the central role in taxation of asymmetric information between the government and private citizens, the assumptions of these stylized models have tended to be very extreme. For example, Mirrlees (1971) assumes (1) that the tax authority can costlessly and perfectly measure a person's income, and (2) that at no cost can it measure somebody's ability or effort. We know the first is certainly wrong: It isn't costless for a tax authority to measure income. It's also true that one can get some sense of individuals' ability or effort at some cost.

5. The Role of Firms

The standard modern analysis of taxation has no meaningful role for firms. From the beginning of modern tax analysis, the assumption was made that firms have constant returns-to-scale production technology, under which there's no meaning to where one firm ends and another begins. The production technology doesn't distinguish between whether there is one big firm or a million tiny firms. There is no determinate firm size and, in fact, firms are irrelevant. For example, in models of optimal commodity taxation, what matters is consumer choices, and firms don't enter. But, in fact, consumption taxes are collected from firms. Even though most states in the United States have retail sales taxes, under which taxes are all remitted by the retail firms, every other country levies value-added taxes, under which the taxes are remitted by businesses at all stages of production and

distribution. In no actual consumption tax system are consumption taxes remitted by individual consumers. This strongly suggests that economizing on collection costs dictates that commodity taxes be collected from firms, and also suggests that the value-added tax has features that make it the best firm-based commodity tax system. A model without firms cannot address these facts. Moreover, a model without firms cannot address heterogeneous firms, so for example one can't address size-based exemptions from the tax system.

6. Tax Remittance

Finally, and related to the fifth limitation, there is no concern with the details of tax remittance in the standard toolkit. It doesn't matter which side of the market a tax is imposed "on" —buyer or seller, for example. The incidence of the tax, as well as its effects on sales or output, should be the same either way. This irrelevance result is a folk theorem asserted in every undergraduate public finance textbook. I call it a folk theorem because the assumptions under which it might be true are never actually formally presented and proven. Those conditions are close to being true in some cases, and far being true in others: sometimes who remits is critically important.

TAX-SYSTEMS APPROACH

I posit that there is another way of thinking about taxation that can aspire to overcome all of these limitations. A tax-systems perspective can provide insight into many important issues of taxation that the standard toolkit misses. Tax administration, broadly defined, is central to a tax-systems perspective.

I define a tax system as a set of rules, regulations, and procedures with three aspects. First, it defines what events or states of the world trigger tax liability, for example the earning of income, or the ownership of a residence that might be subject to property tax, or the sale of a capital asset—this first aspect is *tax bases and rates*. This is what the standard model is mostly about, but that's only the

first piece of a tax system. Second, a tax system specifies who or what entity must remit that tax and when. I call these *remittance rules*. For example, under most income tax systems although I am subject to tax on my labor income, it is my employer that remits—actually sends to the government—an approximation of what tax I owe on that income. Third and finally, a tax system details procedures for ensuring compliance, including third-party information-reporting requirements, as well as the consequences, including penalties, of not remitting legal liability: these are the *enforcement rules*. We might argue about the relative importance of deterrence versus non-deterrence models of tax compliance, but I'm quite sure that if there were no enforcement, tax collections would dwindle pretty quickly towards zero.

Recall that the standard model, as in Mirrlees (1971), assumes that tax liabilities can be ascertained and collected costlessly; income is known to the government at no cost. If that is true, of course, remittance rules are irrelevant, as is worrying about enforcement rules—in fact, no country needs a tax administration. Alas, this is not the world we live in.

THE THREE BUILDING BLOCKS OF TAX-SYSTEMS ANALYSIS

In sum, there are three building blocks to a tax-systems approach. The first is to recognize that there are multiple sources of cost. The standard model stresses excess burden or deadweight loss. That is, distortion costs of taxes and it is certainly true that most taxes distort choices, and that has a social cost, but there are multiple sources of cost. There are also administrative costs and compliance costs. Second, there are multiple behavioral responses. They're not just real behavioral responses, say, the effect on labor supply or on saving, but there's also evasion of various kinds and there is also avoidance. Third, there are multiple tax instruments. A tax system not only has to pick tax rates and tax bases, but also many, many other aspects of a tax system.

OPTIMAL TAX SYSTEMS

So far, I have proposed that there are multiple sources of costs, multiple behavioral responses, and multiple tax instruments. But, given this new perspective, how do we evaluate tax systems? I suggest that there are two aspects to consider. The standard tax instruments need to be analyzed taking into account these issues. Plus, there is a whole new set of tax instruments to think about. What are optimal audit rates and rules? Should the employer or employee remit taxes on labor income? Should there be public disclosure of tax information? How much information reporting should the tax authority require of businesses? Luckily, the sorts of rigorous models that the standard model has developed can be brought to bear to these questions, so we don't need to start all over again to develop new approaches to analysis. We do, though, need to recognize that, because taxation is at its heart an issue about information and in particular asymmetric information, think hard about how to integrate the economics of information into the economics of taxation. This is especially true because we're in the midst of an information revolution that has profound implications for taxation.

ADMININSTRATIVE COSTS

Up to now excess burden, also known as deadweight loss, has received most of the attention in the standard model. But there are other costs. For example, administration costs need to be considered, especially in countries where there are limited government resources. Collecting tax requires a costly bureaucracy, especially if taxes are collected non-capriciously, which a government that seeks legitimacy should certainly try to do. A capricious tax system, which assigns tax liabilities randomly--or at least in a way that is unrelated to income, assets, or other indicators of ability to pay--is relatively easy to administer. What makes administration more expensive is when a legitimate government wants to be able to defend how tax liability is related to factors that society thinks appropriate, such as income or wealth or patterns of consumption in some cases.

For any given objective, there are more and less effective ways for a tax administration to operate. Should a tax administration be organized by tax levy—say into a corporate tax division, value-added tax division and customs division—or by taxpayer segment, corporations versus high-income individuals, large taxpayer units, etc.? These are important points to think about in order to use what resources the tax administration has available to it most efficiently.

Market transactions facilitate administration of a legitimate tax system because they generate an arm's-length number there that can help measure income, for example, or the value of consumption. But not all market transactions facilitate tax administration. Cash transactions are particularly hard for the tax authority to monitor. South Korea, and in some South American countries, offer subsidies for using credit or debit cards and for businesses dealing with the financial sector, because it is easier for the tax administration to monitor those transactions.

Administrative cost is a function of the physical size and the tangibility of the tax base, the visibility and the mobility—it's harder to tax diamonds than windows. In most countries it's easier to tax cars, or owners of cars, because they have to go through a registration procedure that is integrated with the tax authority. It's more efficient for a tax authority to deal with a smaller number of large units because there's some element of fixed administrative costs for each entity that must be dealt with. Moreover, one expects that larger entities have a more sophisticated financial operation, so that the cost to them would actually be lower dealing with their tax liabilities. Administrative cost is an increasing function of the complexity and the lack of clarity of the tax, and tends to be discontinuous and have decreasing average costs in respect of the tax rates. For example, once you have an administration set-up with a value-added tax at a 5 percent rate, the administrative cost certainly doesn't double when you increase the rate to 10 percent. That observation tends to apply to all taxes.

COMPLIANCE COSTS

The other non-standard cost is compliance cost, defined as the cost of collecting revenue borne in the first instance by taxpayers. For the individual income tax, this consists of the time people spend on their tax affairs and the money they pay to advisors to help them with their tax affairs, plus the cost incurred by third parties in the tax collection process such as employers that remit on behalf of their employees (i.e., withhold). In most, if not all, quantitative studies, compliance costs tend to dwarf administrative costs. For example, I would estimate that the compliance costs for the U.S. income tax are about 10 percent of revenue collected, compared to administrative costs of about 0.6 percent of revenues. The IRS public relations office will, for obvious reasons, focus on the latter figure and say the United States has a tremendously efficient tax system with a cost of just 60 cents per 100 dollars raised, but in fact, the truth is closer to 10 dollars and 60 cents. Many policy decisions can shift the cost of collection shows up in the tax authority's budget to un-reported compliance costs. Shifting to compliance costs, by for example requiring that taxpayers submit receipts with their tax returns rather than having to provide them only upon audit, makes the tax authority look more efficient, but doesn't necessarily lower the social cost per dollar raised.

Just as taxes can be shifted, so too can compliance costs. If a tax system places more compliance cost on businesses one can expect that, in equilibrium, the prices they charge to their customers will be higher. Thus both administrative and compliance costs ultimately burden citizens, although only the administrative costs show up in official budgets. The standard problems of measuring compliance costs include: how does one value the time, say, of preparing the individual income tax? If I spend 30 hours a year preparing my tax return, how do we value that? The standard way economists do it is by valuing my time at my after-tax wage rate, but that is correct only under certain assumptions. For someone who actually enjoys doing their taxes, that's way too high. Second, how do we differentiate between voluntary and involuntary costs? Take a typical big

business. Some of the costs that they incur are mandatory to comply with the law; however, much of the cost they incur is voluntary, what we might call tax planning. These are two different things but, from the point of view of society, both are resource costs. Another issue is that, for businesses, it's especially problematic to measure a marginal cost of compliance because a business wants to keep track of what they're doing with or without tax-filing requirements, for managerial accounting purposes. How much of what they do would they have done anyway, in the absence of taxes?

MULTIPLE BEHAVIORAL RESPONSES

The canonical model of evasion choices, due to Allingham and Sandmo (1972), was published early in the modern tax analysis revolution, but I don't believe made too much of a dent in the standard theory at first. It is a deterrence model, so that evasion is constrained by the threat of punishment to risk-averse taxpayers. I accept that deterrence is the first-order explanation for what determines—limits—evasion. I also accept that deterrence is not the whole story, that non-deterrence factors such as duty and social norms, explain differences across individuals and businesses in how much evasion they do. There is, though, clear empirical evidence for the deterrence effect on evasion, but only mixed empirical support for non-deterrence theories. A colleague of mine once said, sarcastically but accurately, that the empirical analysis of tax evasion is very straightforward, except for two things: (1) you can't measure the right-hand-side variables, and (2) you can't measure the left-hand-side variable. Almost all the empirical analyses of evasion, including the credible ones, don't actually have a measure of evasion, but instead rely on indirect measures of evasion. Tax administrations have the same problem: it's not easy to measure evasion.

There are, though, several promising developments in measuring tax evasion and, more importantly, how to measure the determinants of tax evasion and how different policies might affect tax evasion. Let me discuss three promising

developments.

A. Traces-of-Income Methods

The first method I call, following Slemrod and Weber (2012), the traces-of-income approach. In the United States, there are posted speed limits on most roads, but the typical driver (especially in my home state of Michigan) likes to drive faster than that. Many people have a device in their cars called a fuzz buster, where fuzz is a slang term for police. A fuzz buster can detect police radar within a certain area; when it does, it makes a sound and the driver knows he had better slow down. Why would a person have a fuzz buster if they weren't thinking of evading the speed limit? There would be no point. So, one can imagine the presence of fuzz busters, their change over time and across states, as a trace of the amount of speed-limit violations that occurs.

The classic research design of the traces-of-income approach to measuring evasion is due to Pissarides and Weber (1989). Here's their approach. First assume, reasonably in my opinion, that how much food someone purchases is a function of income, but doesn't depend on what *kind* of income—salary versus self-employment—a person has. Next look at what the ratio of food purchases to reported income is, separately for employees and self-employed people. Pissarides and Weber discovered that the ratio of food purchases to the income reported by self-employed people is considerably higher than that reported by employees. This could mean two things: (1) self-employed people of a given income just eat a lot more than employees, or (2) self-employed people are more likely to underreport their income. I think the latter is what the study found. With Naomi Feldman, I did something similar using actual income tax returns in the United States where, instead of food we examined charitable contributions (Feldman and Slemrod, 2007). We find that charitable contributions as a fraction of reported income is substantially higher for people who are self-employed. This means either that self-employed folks are (way) more charitable, which is conceivable, but I think the bigger explanation is that they're underreporting their

income. Under this methodology, we have no direct information about evasion, but can infer something about its patterns under reasonable assumptions.

B. Analysis of Administrative Data

The second promising development is the analysis of administrative tax return data, sometimes linked to other administrative records, often on the whole population of a country. These kinds of data first became available in Scandinavia but now they're available under varying protocols in Canada, in the United Kingdom, many other European countries, and the United States. What if you have the universe, you have much more power in making conclusions about the effect of taxation, and you can do all sorts of fascinating analyses, taking advantage of anomalies and tax schedules such as notches.

C. Randomized Field Experiments

Third, we can take advantage of randomized field experiments. Randomized field experiments have been heralded as the "credibility revolution" (Angrist and Pische, 2010) in empirical economics because, when done correctly, you don't have to worry about getting a control group. The control group is built into the randomization. You have two otherwise statistically identical groups, one that gets the policy intervention and the other that doesn't.

When the promise of randomized field experiments became widely recognized, as a tax researcher I was concerned, even despairing, because I presumed there was no way any country was ever going to let researchers randomize on tax rates: "half of our citizens will be subject to one tax rate schedule, and half will be subject to another tax rate schedule." I was afraid that the credibility revolution was going to leave tax researchers behind. It turns out that I was way too pessimistic. Although it's true that tax rates and bases are probably never going to be randomized, for other tax system instruments policy randomization is possible. I conducted a study in Minnesota many years ago where we randomized the

content of letters sent to taxpayers, providing different sets of information such as an audit threat or an appeal to social conscience (Slemrod, Blumenthal, and Christian, 2001). We then analyzed taxpayer behavior subsequent to receiving the letter and compare the responses of groups that received the various letter treatments. Recently randomized field experiments have received more attention. Henrik Kleven et al. (2011) have done a wonderful field experiment about income tax in Denmark; Pomeranz (2013) has done an interesting study on the value-added tax in Chile; and Fellner, Sausgruber, and Traxler (2013) on TV fees in Austria. We tax researchers need to join the credibility revolution and do our best to persuade tax authorities to work with us to do credible randomized experiments.

AVOIDANCE

Avoidance is different than evasion. If you ask an economist what's the difference between evasion and avoidance, the first answer you would get is evasion is illegal and avoidance isn't. The distinction was put most vividly by Denis Healey, the former U.K. Chancellor of the Exchequer, when he said *"The difference between tax avoidance and tax evasion is the thickness of a prison wall."* What this definition doesn't do is distinguish a legal real behavioral response to tax instruments, such as working less when tax rates go up, from the kinds of legal responses we would naturally consider as avoidance. In Slemrod and Yitzhaki (2002), we offer the following distinction: avoidance consists of taxpayers' efforts to reduce their tax liability in ways that do not alter their consumption basket other than due to income effects. The consumption basket includes items such as labor supply. Many kinds of behavior fit this definition. Paying a tax professional to search for deductions. Buying and selling essentially equivalent assets with different tax treatment, known as tax arbitrage. Slightly retiming a transaction to get in or just past when the tax law changes. In our book, *Tax Systems* (2014), Christian Gillitzer and I discuss some fascinating examples of vehicles that would never have been produced absent tax incentives —like 3-wheeled jeeps and panel trucks with carpet in the back. They only make

sense because the tax system is such that you want to just be on the low-tax side of a line that determines what tax or tariff rate a vehicle is subject to.

Sometimes the avoidance behavior occurs because tax liability is based on a surrogate tax base, which may be justified on administrative or compliance costs' grounds. Consider capital gains in an income tax. In principle, accrued capital gains should be included in the tax base, but are very difficult to measure on an annual basis. So, instead many countries tax capital gains realizations. Taxing realizations is reasonable, but it triggers all sorts of income tax avoidance. That's my first example. Probably the most important economic example of this is the tax treatment of debt versus equity. Under most income tax systems, if a corporation raises funds by debt, the interest payments are deductible as an expense of doing business through the corporation. If, on the other hand, a corporation raises money by issuing shares, the payments to the stockholders are not considered a deductible expense of doing business. Many very smart people, often with MBAs, go to Wall Street and spend their careers inventing securities that provide the stochastic cash flows that the corporation wants, but make sure the security is just on the debt side of the line for tax purposes. In the neighborhood of the dividing line, these securities attain deductibility but are not substantively different than neighboring—in characteristics' space—equity instruments. This is a classic tax-systems issue because it is practically infeasible to have a different tax treatment for every security, although in principle one can. Why do payments to those who provide funds to a corporation have to be 100 percent deductible or not deductible at all? You could have rules where, depending on what the security's characteristics are, the payments could be 38 percent deductible or 73 percent deductible, but this doesn't happen.

INTERACTIONS

Interactions among the responses can be important. Consider the example of Puerto Rico, a territory of the United States. For many years income earned in Puerto Rico was not taxed when earned and not taxed when repatriated to a U.S.

parent company. This made Puerto Rico a very attractive place for U.S. businesses to be. During this period there was an inordinate amount of U.S. companies investing in Puerto Rico in particular kinds of businesses such as electronics, pharmaceuticals, and high-fashion clothes. What do these three lines of business have in common? Consider a U.S. pharmaceutical company that puts a subsidiary in Puerto Rico, where the subsidiary essentially takes as an input the powder for a pill that was formulated and discovered in the United States, and basically just presses the powder into pills. Subsequently, they would sell the pills back to the United States, and the accounting is done so that to the tax authorities it looks like the Puerto Rican subsidiary was enormously profitable. Why? Because the inter-company pricing is set in such a way that the powder was sold to the subsidiary very cheaply and the pills are sold back to the U.S. parent at a nice profit. For pharmaceuticals, electronics, and high-fashion clothing, the real value-producing activity, be it drug research, computer programming, or fashion advertising, was done in the United States, but all the income for tax purposes looked like it was in Puerto Rico.

What does this have to do with interactions among real and avoidance responses? A U.S. company couldn't get away with this kind of transfer pricing unless it had an actual plant in Puerto Rico, doing *something*. A company had to put some real investment there, but what was driving the attractiveness of Puerto Rico was not that Puerto had a comparative advantage or a labor force that was particularly good at these tasks, it was that the company could only get the tax benefits of the income shifting from the United States to Puerto Rico if they had some real activity there.

NON-BASE POLICIES

I will now address a few non-rate, non-base policies, such as withholding and information reporting. We know that, for income sources in the United States, where there is both withholding and substantial information reporting, the non-compliance rate is about 1 percent. When there's little or no information

reporting and no withholding, it's 56 percent. Why is it different? It's different because, with information reporting and withholding, the probability of getting caught if you evade is near one. The probability of getting caught for, say, self-employment income when there's no information reporting and no withholding is close to zero, and so the deterrence theory explains this critical fact. There's an enormous difference between the compliance rates when the chance of being caught if you cheat is high compared to when it isn't. The fact that information reporting and withholding are so important suggests the central role for firms.

A. Public Disclosure

Let me say a little bit about public disclosure. In the United States, we had public disclosure of income tax returns for our first income tax, which was during the Civil War in the 1860s; we had it again in the 1920s and 1930s, and then it was abolished. It is current policy in Norway, Sweden, and Finland and was policy in Japan for a half century until 2004.

Public disclosure of tax return information is supported on the grounds that it improves policy transparency and that it helps enforcement. If I can look up and see what my neighbor declares his or her income to be, and I see they have a BMW in the garage, I might have some information that might be of use to the tax authority. If people understand this dynamic, they might be less inclined to understate their income. Opponents decry the invasion of privacy.

As social scientists, as an input to pondering whether public disclosure is a good idea or not, we should investigate whether it works -- does it actually improve tax compliance? I have studied that question in Japan using the end of the policy in 2004 as the policy change and in Norway, where tax returns have been public information since the 19th century, but were made easily available on the Internet in 2001. We can study the impact on reported income in Norway because of the availability of a type of control group. Before the move to the Internet, in some towns in Norway everybody had easy access to their neighbors' tax returns

because the local football teams would go door-to-door and as a fundraiser sell little books of this information they got from the tax offices. For people living in these municipalities, putting the information on the Internet was no big change. However, in other municipalities, they didn't have the tax return information readily available. So using that research design, we find that there was actually about a 2 to 3 percent increase in reported income in the municipalities that had no such information prior to going on the Internet, pretty convincing evidence of a disclosure effect on tax compliance.

B. Enforcement

I stated that optimal tax-systems considerations change the answers to some optimal tax questions. It also raises many new questions, such as how many resources to devote to enforcement. An optimal tax-systems approach can, in principle, determine what the enforcement budget of the tax authority should be—at the margin, the social benefit should equal the social cost. Importantly, the social benefit is not the same as revenue raised, because revenue represents a transfer from private to public hands, not a social gain. Thus, an oft-suggested criterion is wrong. The wrong rule is to allocate budget to the tax authority as long as an extra billion dollars it's given will produce more than a billion dollars tax collection. We know this criterion is not right because it compares apples and oranges. A billion-dollar budget is a real resource cost. A billion dollars in extra remittances is a transfer. That's not to say it doesn't have some social value, but it is a transfer.

Another issue is the point of remittance, or collection, of taxes. In a recent paper (Kopczuk et al., 2014), I and co-authors analyze the collection of state diesel taxes in the United States over a period where the collection point changed from retail gas stations to distributors of gasoline to the terminal. We show that the pass-through rate of the tax and revenues, for a given tax rate, both changed as the collection point changed, suggesting that the collection point changed the amount of evasion.

Finally, consider the tax exemption of small businesses. Many countries do it, explicitly by law or implicitly by lax enforcement. The standard model says you should never exempt small businesses for tax because it provides an incentive for production to move to a small scale from a larger scale, which violates what we call production efficiency. One of the seminal articles in optimal taxation, Diamond and Mirrlees (1971), teaches us that, whatever other distortions a tax system creates, it should always preserve production efficiency. It turns out that this isn't true anymore if you make one simple assumption: there's some per-firm fixed cost element of the tax authority dealing with firms. As soon as you have that, then ceteris paribus you want to exempt some smaller firms because the potential revenue from these firms is small relative to the compliance and administrative costs per dollar. Thus there's a clear, principled reason for why a tax authority might consider exempting small firms; the standard model can't address the issue, but models with heterogeneous firms can clarify when and how to have special treatment for small businesses.

C. Line Drawing

The last topic I wish to address is line drawing --how do we draw the line between two diverse items that are taxed differently? Which corporate finance instruments will be taxed as equity, and which as debt? A more mundane example is the retail sales tax. In Michigan if you buy food at a grocery store, the purchase is exempt from sales tax but if you buy food at a restaurant, the expenditure is subject to sales tax. Consequently, at the "characteristic border" between those two, one observes salad bars in grocery stores and then, just beyond the cash register, tables with napkins and silverware provided. You can buy your food and eat it right there, but presumably it's not subject to sales tax. The tax authority has to draw a line between what's taxed and what isn't. In such real-live scuffling about tax systems, line drawing is critically important, but the standard models can't handle this phenomenon.

For commodity taxes, as an example, there's hundreds of thousands of different commodities, and probably thousands more introduced each week. No tax system can levy a separate tax rate for each one, as the standard optimal tax theory prescribes. Maybe we can have two or three different tax rates, but how do you draw the line in the space of commodities about which ones get which tax rate? Usually the line is drawn based on the characteristics of the consumption goods. As I suggested, as soon as these lines have been identified you're going to have tax-driven product innovation. Consequently, there will be new commodities created in the market that are just on the low-tax side of the line that would never have been produced otherwise. In Indonesia, the preferential tax treatment of motorcycles led to the creation of a new type of motorcycle with three wheels and long benches at the back seating up to eight passengers. In Chile, the market responded to high taxes on cars, but not on panel trucks, by introducing a redesigned panel truck that featured glass windows instead of wood panels and upholstered seats in the back.

I recently learned that the Swedish pop group AꞨBA, who wore those outrageous costumes at their performances, admitted that one reason for their flamboyant outfits was the income tax law in their country that held that the cost of the costumes was deductible if and only if the costumes could *not* be worn on the street. Thus, the tax authority had to somehow draw a line between what could be worn on the street and would could not. Line drawing affects not only pop musicians' garb. The same issues apply to the important distinction between debt versus equity finance.

Information Revolution

Tax systems are, at their core, largely an issue of asymmetric information among the taxpayers, remitting agents, and the tax authority. Thus, the revolution in information technology is bound to have profound implications for tax systems. The most obvious one is the computerization of the tax collection process, which can make tax administration and enforcement much more efficient, but that's not

the only implication. In principle, a tax authority can now base tax liability on a much wider range of information than before. For example, in Finland speeding fines can be related to the violator's income and instantly assessed; the police officer can tell just by clicking into the system—one rich speeder was fined €116,000! Naritomi (2013) evaluates an anti-tax evasion program in the state of Sao Paulo, Brazil called Nota Fiscal Paulista (NFP) that provides tax rebates and monthly lottery prizes for consumers who ask for receipts, and establishes a direct communication channel between the tax authority and consumers through an online account system, where consumers can verify receipts reported by establishments and can act as whistle-blowers by filing complaints. Smart tax cards can personalize consumption tax rates, depending on how much is spent and on what is purchased.

Zappers provide another good example of the influence of new technology. Zappers are automated sales suppression devices that a retailer can install into their point-of-sale system—their electronic cash register. The zapper randomly deletes sales transactions, so then when the sales tax or income tax auditor asks for the sales register the firm owner says "Sure, here it is", and the auditor might never suspect the skimming of taxable sales. My point is that technology impacts both sides of the tax enforcement game.

CONCLUSION

Frank Hahn (1973, p. 106) once wrote that optimal tax formulas are either guides to action or nothing at all. My view is that, although the modern analytical methods that came into prominence more than 40 years ago represented a tremendous advance, they feature stylized models that are so far from the reality of taxes on the ground—withholding, information reports, audits, tax havens, evasion, and line drawing and notches—that they cannot be reliable guides to action. Tax-systems analysis applies rigorous economic analysis to issues that are prominent in the formulation and administration of real-world tax policies. Policy makers should ponder the inter-relationship among tax rates, tax bases,

enforcement, and administration, recognizing that tax policy is really tax-systems policy. A tax-systems approach can ward off substantial policy errors, such as foregoing tax increases because the existing base is too narrow or too poorly enforced.

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