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HOW TO REPLACE THE EARNINGS TAX IN KANSAS CITY

By Joseph H. Haslag

EXECUTIVE SUMMARY

In an earlier report, I demonstrated that earnings taxes are negatively correlated with the size of a city's economy relative to its suburbs. After developing a simple economic model to explain this relationship, I concluded that the earnings tax creates an economic distortion by encouraging residents and businesses to relocate outside of the city limits in order to avoid the tax.

In this study, I argue that a land-value tax is more efficient because it is non-distortionary. Individuals cannot alter their behavior to avoid taxes on land. I use an economic model to demonstrate that it's possible to eliminate the Kansas City earnings tax in a revenue-neutral fashion by replacing it with a two-tier property tax. If we can eliminate the distortions created by the earnings tax, jobs will be created and residents will flow into the city. My model takes into account the dynamic effects that the elimination of the earnings tax would have on migration and job creation.

I find that at the end of the phase-out period, the revenue-neutral land-value tax rate would be 6.7 percent. The model predicts that Kansas City could eliminate the earnings tax in a revenue-neutral fashion over 10 years, replacing it with a 6.7 percent tax on the assessed value of land. The number of people working in Kansas City would increase by 50 percent in the long run.

Replacing the earnings tax with higher sales taxes is not a viable option. Like the earnings tax, the sales tax is distortionary. Higher sales taxes will simply cause consumers to shop outside of the city.

Although a land-value tax would be more costly to administer than the earnings tax, the economic gains of eliminating the earnings tax would be substantial. Therefore, a two-tier property tax deserves serious consideration as an alternative to the earnings tax.

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This report recommends adopting a tax that economists have long regarded as non-distortionary: a tax based on land value.

INTRODUCTION

City governments face difficult challenges. They must raise revenue from individuals and businesses who have many choices in where they live and work. Traditionally, suburbs provided places to live and educate children while the central business district offered employment opportunities. Increasingly, however, suburbs are competing successfully with cities for businesses. Such competition often involves incentives from different tax structures.

In a previous report, I presented evidence of a significant negative correlation between a city's earnings tax rate and the ratio of personal income in the city to personal income in its Metropolitan Statistical Area. Using a standard economic growth model and applying it to a sample of 101 cities, I showed that an earnings tax lowers the return to physical and human capital. Consequently, businesses and residents move from the city to the suburbs to avoid the tax. Eliminating the earnings tax would eliminate this disincentive to live and work in the city.

There is an important question left unanswered by the first report: What source of tax revenue could offset the revenue lost by eliminating the earnings tax and create the smallest distortion? This report recommends adopting a tax that economists have long regarded as non-distortionary: a tax based on land value. According to my calculations, the Kansas City earnings tax can be phased out over ten years without reducing city revenue if a tax on land value is created and gradually increased to 6.7 percent.

Model simulations indicate that Kansas City would enjoy an economic rejuvenation as the increased return to physical and human capital lured people back into the city. The model suggests that city population and employment would both increase. These predictions have been borne out in the real world. Economists have shown that Pennsylvania cities that implemented a two-tier property tax experienced an increase in economic growth relative to cities that did not use the two-tier structure.

The model economy suggests that the city sales tax would have to rise to about 20 percent in order to replace lost revenue from the earnings tax. The high rate reflects the ease with which consumers could avoid the tax by shopping outside of the city; a city sales tax is highly distortionary. A two-tier property tax is a better choice.

ECONOMIC THEORY OF TAXATION

Governments raise revenue using a combination of income taxes, property taxes, sales taxes and user fees. Not all taxes are created equal. People change their behavior in response to taxes, and different types of taxes affect people's behavior in different ways. Economists distinguish between two effects taxes can have on behavior: the income effect and the substitution effect.

Every tax results in people having fewer resources to spend on goods and services. This is known as the income effect. When taxes are increased, each taxpayer's consumption necessarily

decreases. But under the income effect the taxpayer does not attempt to reduce his tax burden by changing his consumption patterns. The taxpayer's reaction under the income effect is passive: he reduces his total consumption, but he doesn't alter the mix of goods and services he consumes.

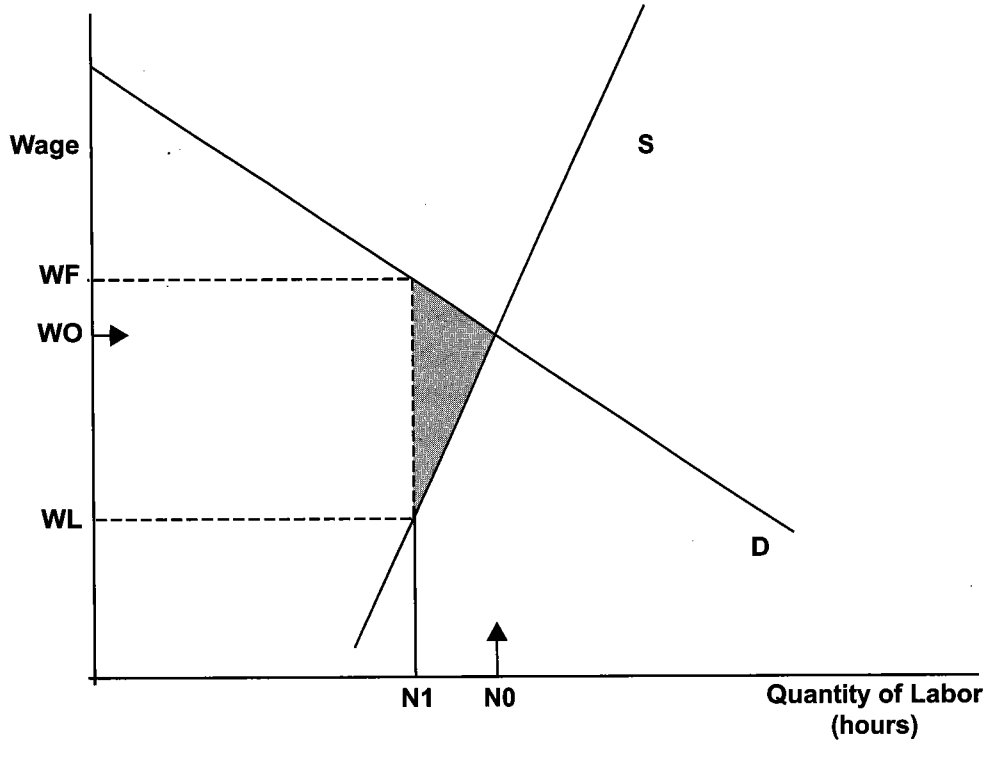
In contrast, the substitution effect occurs when a consumer actively avoids a tax by changing his consumption patterns. A distortionary tax causes a substitution effect by changing the relative prices of goods and services. People respond to the change in relative prices by buying less of highly taxed goods and more of other goods.

The substitution effect is economically wasteful, because tax avoidance reduces consumer welfare without increasing government revenues. An efficient tax is one that minimizes the substitution effect. A tax is efficient to the extent that people cannot avoid it by changing their behavior. It's good public policy to reduce taxes that cause large substitution effects and replace them with taxes that cause smaller substitution effects.

Optimal Tax Policy

Consider a tax on income from labor. At any point in time, a worker has predetermined cognitive abilities, experience and education. However, the worker can vary his level of effort. Imposing a tax on income generated by effort lowers the after-tax wage. In most cases a reduction in the after-tax wage leads to a corresponding decrease in effort since the reward for working is diminished. In short, work effort is positively related to the after-tax wage. The person's decision to work fewer hours or not to take the second job is a reaction to an increase in the tax on labor income. The decision to work fewer hours is an example of the substitution effect. The worker avoids the tax by working less.

Figure 1



It's good public policy to reduce taxes that cause large substitution effects and replace them with taxes that cause smaller substitution effects.

Without the distortions of the earnings tax, the city's economy is likely to grow and it is reasonable to expect that land will become more productive.

Figure 1 depicts the distorting effect of an income (or earnings) tax on the market for labor. In the absence of an income tax, the labor supply curve, denoted S, and the firms' demand curve, denoted D, determine the market-clearing wage rate (W0) and quantity of labor (N0).[1] The labor supply curve is a compensated labor supply curve, meaning that the worker's income is held constant. The worker's income is compensated to offset the income effect of the tax, leaving only the substitution effect.[2]

Figure 1 depicts the income tax's distorting effect on labor market decisions. A tax on labor income affects relative prices. Workers receive an after-tax wage that is lower than it would have been without the tax. Note that in Figure 1 there is a wedge between what firms pay workers and the wage that those workers receive after the tax is paid. The difference between the wage the firm pays (WF) and the wage labor receives (WL) is the tax.[3] The firm pays a wage slightly higher than the original market-determined wage of WO. But labor bears the brunt of the tax, as its after-tax wage declines from WO to WL. Because the after-tax wage is lower, workers expend less effort and reduce their hours worked, depicted in Figure 1 in the decline from N0 to N1.

Imposing an income tax generates revenue for the government. In Figure 1 the revenue generated by the tax is the area of the rectangle bordered by the dotted lines. I assume that the government uses this revenue to purchase goods that are perfect substitutes for those lost by households; the tax is basically a transfer from the private sector to the government and back. But the tax also imposes an economic loss on society. The loss is shown in Figure 1 as the shaded triangle. The value of the triangle represents an economic loss to society since both workers and firms are better off at the market determined wage. This is referred to as a deadweight or welfare loss.

The welfare loss associated with imposing the income tax comes from the reduction in hours of work. The tax distorts wages and labor supply from their optimal levels, making the economy worse off. How big is the welfare loss associated with a tax on labor income? This is debated among economists because the answer depends on the shape of the compensated labor supply curve. That is, if the worker's decision on how many hours to work is very responsive to the wage rate (the compensated supply curve is relatively elastic or flat) then imposing an income tax is very distortionary, resulting in a large change in labor supply. On the other hand, if the compensated wage elasticity of supply is small, then the distorting effect on people's actions is small and the inefficiency is small.

Some deny the importance of the substitution effect of income taxes, pointing out that a higher earnings tax does not seem to alter the length of the work week. But that ignores the tax's effect on an individual's decision to take on overtime work, take a second job or make retirement decisions. On the margin, a higher tax on labor will reduce the quantity of labor supplied to the market.

For municipalities, the substitution effect is a much bigger concern because they face high labor mobility. Compensated wage elasticity is larger for a city than for a nation because people

can avoid the city wage tax by choosing where to work without losing much of the location's amenities. As reported in my earlier study, a worker's decision may not be simply to work more or fewer hours when facing an earnings tax but to work the same number of hours in a location with a lower tax burden.[4]

Haughwout, Inman, Craig, and Luce (2004) quantify the impact of tax rates in four U.S. cities: New York, Philadelphia, Houston, and Minneapolis. They report a significant negative correlation (in each of the four cities) between property tax rates and the property tax base. They proceed to ask whether the marginal dollar of local property taxation generates a dollar of compensating gross benefits. They present evidence suggesting that the answer is no. They find a significant negative correlation between the city sales tax rate in New York City and the sales tax base, and between New York City's income tax rate and income tax base. In Philadelphia, the evidence is weaker with respect to both the sales tax and the wage tax, but they provide evidence that an increase in Philadelphia's city wage tax has significantly reduced the overall size of the city economy.

A Non-Distortionary Tax

After considering the distortionary effects of income taxes, the natural question to ask is whether there are taxes that reduce or eliminate the deadweight loss. In some respects, a lump-sum tax is an example of such a tax.[5] A lump-sum tax levies a constant dollar figure on every citizen. Using the same framework as I did in Figure 1, the lump-sum tax induces no change in behavior that can lessen a person's tax burden.

For example, suppose everyone in Missouri pays a tax of $1,000 regardless of income. Because this lump-sum tax does not increase with income, it does not create a disincentive to work. Indeed, there is no welfare loss when the government collects lump-sum taxes and uses the proceeds to buy things that are perfect substitutes for what taxpayers would have bought without the tax.

However, the lump sum tax has one fatal flaw that prevents it from being used in practice. It is highly regressive and therefore not equitable. With lump-sum taxes, low-income people pay a far greater share of their income in taxes than high-income people. For this reason, political support for a lump-sum tax is likely to be nonexistent.

Land Supply is Inelastic

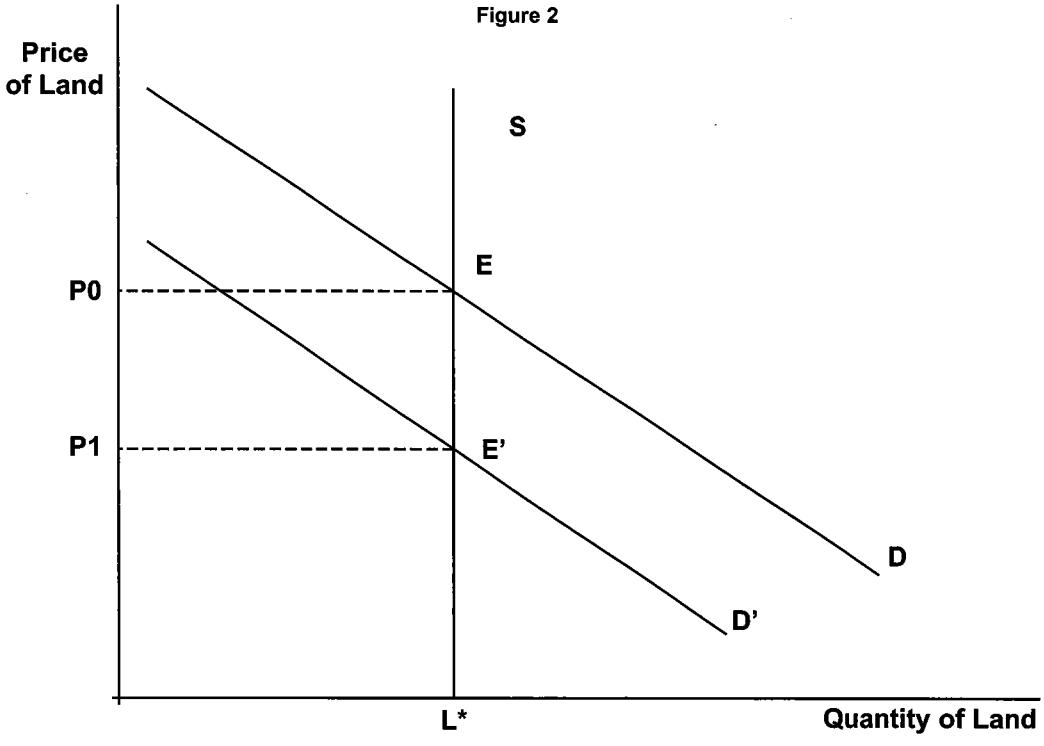
I have shown that taxes on labor, such as the earnings tax, are distortionary because of the elasticity of the supply of labor. Are there other taxable resources whose supply is less elastic? One example is land. Reclamation projects like the Dutch Zeider Zee are very expensive, so the supply of land can be treated as fixed. Could a tax on the undeveloped value of land be a suitable replacement for an earnings tax?[6]

Figure 2 depicts the compensated supply and demand curves describing the market for land. The compensated demand curve for municipal land (pre-tax) is represented by the curve labeled D and the compensated supply of land by the curve labeled S.[7]

L* denotes the total quantity of land that is available (and taxable) in Kansas City. This quantity is not likely to change

Economists have long recognized that land-value taxes are economically efficient.

Figure 2



It is likely that replacing the earnings tax with a land-value tax would lead to more efficient land use and a larger city economy.

in response to economic incentives. The supply of land is fixed, so the effective supply curve is a vertical line at L*. That implies that the price of land has no impact on the city's boundaries: a higher price does not make the city bigger.

The intersection of the supply and demand curves for city land determines the market price. The equilibrium pre-tax price of land, shown as P0 in Figure 2, depends on the forces underlying the demand curve (since the supply is fixed), which captures the many factors that determine the price of land. Formally, researchers specify hedonic price equations that take into account factors such as proximity to transportation, to city parks, to schools, etc.[8] Such amenities are translated into the value (reflected in the price) that the typical buyer puts on a specific parcel of land. In other words, this measures the land's "product." This product can alternatively be thought of as the dollar value of enjoyment that a representative person gets from the land. Because the supply is fixed, all of the factors that affect the price of land are reflected in the demand curve.

In Figure 2, the demand curve intersects the supply curve at the equilibrium price, P0. Now suppose the political jurisdiction implements a land-value tax. The tax results in a downward shift of the demand curve to D'. This downward shift reflects the fact that landowners now must transfer some of the land's product to the political jurisdiction. Because implementing the tax shifts the demand curve down to capture the lower after-tax value of the land, the equilibrium price falls to P1.

Figure 2 illustrates an important result: There is no deadweight loss when a tax is imposed on land. Imposing the tax still results in a transfer of purchasing power to the government (equal to the

rectangle P0EE'P1). But recall that we assumed that these tax receipts are used by the government to buy goods and services that are perfect substitutes for private consumption. Consequently, the taxes paid by landowners are returned to society in the form of public goods and services. More importantly, the tax on land is identical to a lump-sum tax in the sense that does not distort decisions by consumers.[9]

The burden of a land tax falls completely on the land owner at the time the tax is enacted. The difference between the pre-tax (P0) and after-tax (P1) equilibrium prices in Figure 2 is exactly equal to the present value of taxes paid on that land. The land's pre-tax value is the capitalized value of the land's (pre-tax) product. Similarly, the land's after-tax value is the capitalized value of the land's after-tax product. Hence, the difference between the land's pre-tax and after-tax values (prices) is the capitalized value of the tax.[10] This means that the entire tax incidence is borne by the property owner at the time the land-value tax is implemented. Because the land is not movable, there is no decision that the land owner can undertake to reduce the tax burden. Hence, no distortion is present.

Proponents of the land-value tax assert that such a tax, unlike most earnings taxes, is progressive. Insofar as wealthier people pay a larger fraction of their income on land, those with relatively greater means are more likely to pay a higher tax rate under a land-value tax. If policymakers desire a tax structure that is progressive, the land-value tax satisfies this objective without distorting the use of land from its highest-valued uses.

The foregoing is only a partial equilibrium analysis. All other prices and quantities are treated as fixed. That assumption makes the math easier, but it does not capture the many ways in which implementing a land-value tax could affect the economy. To analyze these other effects, a general equilibrium framework is needed.

In the partial equilibrium analysis, land values declined when a land-value tax was implemented (Figure 2). That analysis ignores the dynamic effects of eliminating the earnings tax. Without the distortions of the earnings tax, the city's economy is likely to grow and it is reasonable to expect that land will become more productive, and therefore more valuable. Indeed, it is likely that the post-tax output gains will result in land values higher than shown in Figure 2.

Two-Tier Taxes

Traditional property taxes can be viewed as a combination of a tax on land value and a tax on improvements. Some researchers argue that in the long-run the supply of physical capital, such as buildings and structures, is perfectly elastic from the perspective of any one municipality (i.e., the supply curve is horizontal). This elasticity stems from the fact that the market for capital is national. Therefore, imposing a tax on buildings and structures lowers the demand for such improvements. Because the supply is perfectly elastic, the equilibrium price is unchanged and the deadweight loss is maximized.

Nobel laureate William Vickery is quoted as saying, "The property tax... is a combination of the worst taxes—the

Land-value taxes have been implemented by nations around the world.

part that is assessed on real estate improvements—and one of the best taxes—the tax on land or site value. A tax on land, properly assessed... is virtually free of distortionary effects, while the tax on improvements imposes serious burdens on construction." (See England (2002) for the quote.) Thus, it makes economic sense to separate the two taxes, charging a higher rate on land and a lower rate on improvements. I will refer to such a tax as a "two-tier property tax."

Thus far, I have concentrated on theoretical efficiency concerns. When considering the merits of a land-value tax, there are also some practical considerations that need to be kept in mind.

Municipalities have significant borrowing constraints. This means that the city must try to match its spending plans with its revenues each year. An ideal city tax should provide enough revenues during business cycle fluctuations to maintain a steady stream of revenues for the city.[11] Because the city income tax is a fixed rate, it follows that municipal income tax revenues fluctuate by the same magnitude as income does. Though consumption spending tends to be smoother than income over time, fluctuations in sales tax revenue also coincide with business cycle fluctuations. One advantage of property taxes is that they tend not to fluctuate as much as income or sales taxes over the course of the business cycle. On this score, a two-tier property tax is probably better than an earnings tax.

One advantage of property taxes is that they tend not to fluctuate as much as income or sales taxes over the course of the business cycle.

A major downside to the land-value tax is that it is costly to administer. Businesses have accounting systems to keep track of wages and profits. That makes it fairly easy to collect an earnings tax. In contrast, property taxes and land-value taxes are costly to administer, largely due to the illiquidity of land. Because property can be in the same hands for decades, there are not always recent market transactions from which to determine the fair market value of land. As a result, government officials must perform regular assessments, a labor-intensive and often contentious process. Thus, in terms of ease of administration, the income tax is probably better than the land-value tax.

The two-tier land tax has obvious economic appeal on efficiency grounds, but it may be less attractive because it is costly to administer. Fortunately, we don't have to speculate about whether land taxes are feasible, because other jurisdictions have decades of experience with them.

LAND-VALUE TAXES IN PRACTICE

Economists have long recognized that land-value taxes are economically efficient. Interest in the subject, however, has waxed and waned over time.[12] Policymakers face a difficult choice. It is likely that replacing the earnings tax with a land-value tax would lead to more efficient land use and a larger city economy. However, the tax imposes large short-term costs on current landowners.

Land-value taxes have been implemented by nations around the world, including Estonia, Taiwan, Singapore and Hong Kong. Cities have implemented land-

Table 1

CITY	LAND TAX RATE	BUILDING TAX RATE	PCT OF PROPERTY TAX REVENUE FROM LAND TAX
Aliquippa Sch Dist	16.3%	1.1%	85.5%
Aliquippa	7.7%	0.09%	75.9%
Allentown	4.195%	0.893%	44.0%
Altoona	9.1764%	3.0784%	30.1%
Calirton	2.8%	.0122%	53.0%
Coatesville	1.016%	0.4%	33.9%
DuBois	9.5%	.045%	44.0%
Duquesne	1.6%	0.847%	34.0%
Ebensberg	4.0%	1.33%	40.0%
Harrisburg	2.4414%	0.4069%	46.0%
Lock Haven	5.214%	1.357%	61.8%
McKeesport	1.65%	0.46%	59.0%
New Castle	9.2459%	2.3337%	46.6%
Oil City	9.15%	2.71%	42.5%
Pittsburgh Imp. Dist	0.371%	n/a	100%
Scranton	0.0821%	0.0179%	66.0%
Steelton	0.649%	0.444%	35.0%
Titusville	5.916%	1.9%	31.0%
Washingtom	19.1216%	1.1%	74.4%

Source: Center for Study of Economics, Phipadelphia, PA

Because Pittsburgh's general revenues increased after the shift to land taxation, the city could afford more public goods and services, which attracted more residents.

value taxes too: Sydney and Canberra in Australia and Fairhope, Alabama, use a land-value tax. Pennsylvania has perhaps the most experience with land-value taxes. In 1913, the Pennsylvania Legislature passed Act 147, which permitted the cities of Pittsburgh and Scranton to reduce property taxes on buildings to a half-mill rate by 1923.[13] Between 1923 and 2000, Pittsburgh adopted a dual rate of 2 mills on land and 1 mill on buildings. Over time, the Pennsylvania Legislature permitted more cities and political jurisdictions to adopt the two-tier land tax, with different tax rates on land and buildings. Other states also have some experience with two-tier land taxes. In 1916, Maryland's Legislature passed Act 656, allowing cities to classify land separately for taxation purposes. Federal legislation was passed in 1974 permitting the City Council of the District of Columbia to set different tax rates on land and on improvements. Most recently, the State of New York passed legislation enabling Amsterdam, NY to adopt a two-tier property tax.

Pennsylvania offers a wealth of examples of two-tier taxes. Table 1 shows

Cities with greater reliance on land-value taxation are likely to realize faster economic growth.

the rates on land and on buildings for 19 cities, boroughs, and special taxing districts in Pennsylvania in 2003. The tax rates on land and on improvements vary widely. For instance, the Pittsburgh Improvement District does not tax buildings at all while in Aliquippa the tax rate on land is 85 times greater than the tax rate on buildings. Other cities, like Steelton and Duquesne, impose rates on land that are less than twice the rate on buildings.

Regression Analysis of the Effects of Two-Tier Taxes

Several researchers have used regression analysis to study the effects of two-tier property taxes. Most of these studies focus on Pennsylvania because it provides the most variation in tax rates. Some cities have implemented the two-rate property tax and others have not; rates have varied widely. This variation allows us to more accurately measure the effects of different land-value tax rates.

Mathis and Zech (1982) collect data on 27 Pennsylvania cities to test the idea that lowering the tax rate on improvements relative to the tax rate on land reduces distortion and induces people to increase improvements to land. Using construction activity as a proxy for increased spending on improvements, Mathis and Zech find no significant correlation between construction activity and the structure-to-land tax ratio. Tideman and Johnson (1995) extend the Mathis and Zech approach to data collected from 53 Pennsylvania cities over a 14-year period. They also find that lower tax rates on structures relative to tax rates on land do not generate significant increases in construction spending. Bourassa (1990) does an in-depth study of the relationship between tax rates and construction spending in three Pennsylvania cities. He seeks to determine how construction rates were affected by people's perceptions about whether the tax rates were permanent or temporary. Bourassa too finds no significant correlation between the different land tax rates and construction activity.

Several researchers have criticized the methods employed in these studies. Some have pointed out that school districts frequently overlap city boundaries. If school districts did not also reform their land tax rates, the incentive effects of the dual-rate tax would be diminished. Critics have also suggested that the existing capital stock could have been above its long-run level at the time Pennsylvania cities enacted tax reforms, causing people to let the existing capital stock depreciate until it returns to its long-run equilibrium level. Or construction activity could be a bad proxy for city economic growth.

Plassmann and Tideman (2000) deal with these potential concerns by developing a model that accounts for dynamic decisions. Specifically, they employ a statistical technique called a Markov chain to correct for instances in which small municipalities did not realize any new construction after tax reform. They compare 15 land-tax cities with 204 similar no-land-tax-reform Pennsylvania cities over a 22-year period. Plassmann and Tideman report that cities utilizing the two-tier land tax have higher average

construction levels than no-land-tax cities. They conclude that, properly estimated, there is a significant, positive correlation between the ratio of land tax rate to structure tax rate and the level of construction spending.

Oates and Schwab (1997) focus on the experience of Pittsburgh following a 1979 increase in the tax rate on land to five times the rate on structures. They collect evidence on 15 large Northeastern cities and Pittsburgh. For each city in this sample they collect data on the annual value of building permits issued for two decades: 1960-69 and 1980-89. Oates and Schwab use a statistical model to estimate the correlation between increased reliance on land taxation and economic growth. They find none. This is somewhat perplexing because Pittsburgh recorded a 70% increase in the number of building permits while the number declined by 16% for the 15 Northeastern cities over the same dates.

Despite the lack of a correlation, Oates and Schwab conclude that property tax structure had an impact on economic growth because it enabled Pittsburgh to avoid rate increases in other taxes that would impede economic development. The statistical analysis does not allow them to account directly for the positive effects of increased land tax revenues, but they argue that because Pittsburgh's general revenues increased after the shift to land taxation, the city could afford more public goods and services, which attracted more residents. They conclude that cities with greater reliance on land-value taxation are likely to realize faster economic growth.

Model Economies

The complexity of a city's economy makes regression analysis difficult. Researchers have tackled this problem by developing economic models that serve as a kind of controlled laboratory with which to quantify the likely effects of different tax policies. One such attempt is Tideman (1998) who uses a dynamic general equilibrium model to evaluate the effects of eliminating taxes on structures and replacing them with land value taxes. Tideman calibrates his model to match the long-run features of a typical U.S. city. In his model, the market value of goods and services produced within the city's boundaries (Gross City Product, or GCP) depends on the combination of land, capital and labor. Technological progress is explicitly accounted for in his model. There is also a tradeoff between consumption today and consumption in the future. Foregoing consumption today means more investment, which allows increased consumption tomorrow. That investment can be made either inside the city or outside of it.[14] The city is modeled as an open economy, in which capital can flow in and out of the city freely. Because basic arbitrage conditions dictate that returns from investing in structures in the city must equal those from investing elsewhere, this determines the return to capital in the city.

Tideman uses his model economy to simulate the economic effects of two tax policies. In the first case, the city levies a traditional property tax, with land and structures taxed at the same rate. In the second case, the tax on structures is eliminated and the tax on land is raised to compensate for the lost revenue. Tideman

People invest more in the city because they are no longer trying to avoid the tax.

Taxing labor income or taxing structures is more distortionary than taxing land.

finds that eliminating distortionary taxes increases investment expenditures by 130 percent in the long run. People invest more in the city because they are no longer trying to avoid the tax. More capital increases worker productivity, resulting in an increase of about $500 per year in output per worker. Compared to actual output per worker in the U.S., this amounts to an increase of about one percent.[15] Tideman thus finds that the economic impact from tax distortion is quantitatively significant in a general equilibrium model of a city economy.

The work of Nechyba (2001) considers a slightly different question. He compares the distorting effects of various state-level taxes to the effects of a tax on land value. Nechyba's model describes a production technology that combines land, labor and capital to produce consumption goods. Like Tideman, he assumes that the state is an open economy in which labor and capital are perfectly mobile. Therefore, wages and the return to capital are determined in the world labor and capital markets, respectively. Nechyba finds that the increase in land-value tax rates necessary to maintain tax revenues is smaller when eliminating the corporate income tax than when eliminating taxes on labor. Nechyba concludes that substantial "reductions in taxation of capital income to be replaced by higher taxes on land rents therefore seem feasible, while similar reductions in taxes on labor income seem out of reach unless elasticity assumptions in reality are substantially more favorable than what is assumed..." (24).

Nechyba computes the change in land tax rates necessary to offset the revenue lost from a 20 percent reduction in tax rates on capital and labor, respectively. The results are reproduced in Table 2. A 20 percent reduction in the tax rate on capital requires a 1.8 percent increase in the tax on land. In contrast, a 20 percent reduction in the tax rate on labor requires a 43 percent increase in the tax on land. A small decrease in the tax rate on capital results in a large gain in economic activity because capital taxes are highly distortionary. The economic gains are much smaller from a similar reduction in labor taxes. Table 2 also reports the necessary change in land tax rates given a 20 percent reduction in the income tax rate. Note that income taxes are applied against labor income and capital income. Personal income is a weighted combination of income from labor and capital.

Table 2

20% CUT IN TAX ON	PCT Δ IN LAND TAX	PCT Δ IN LAND TAX
CAPITAL	1.8	1.3
LABOR	42.8	-20.9
SALES	23.8	-11.1
PERSONAL INCOME	13.7	-6.3
CORPORATE INCOME	-0.2	0.4
PROPERTY	0.2	1.3

Source: Nechyba (2001), Table 5, p. 58.

Overall, Nechyba's evidence suggests that taxing labor is less distortionary than taxing structures. However, the key point is that taxing labor income or taxing structures is more distortionary than taxing land.

Nechyba finds that land tax rates would need to increase by 14 percent to offset a 20 percent reduction in the personal income tax rate. A 20 percent reduction in the sales tax rate requires a 24 percent increase in the tax rate on land to maintain tax revenues.

The evidence from Nechyba's model economy indicates that a large increase in the tax rate on land value is needed to reduce the rate on labor earnings by 20 percent and maintain city revenues. In 1979 Pittsburgh changed from a policy that taxed land at twice the rate applied to structures to a policy that taxed land at times the rate applied to structures. If the rate on structures remained constant, this implies that land-value tax rates increased by 150 percent. Nechyba reports that in order to totally eliminate the personal income tax the rate on land values must increase by 72 percent. Such an increase is large but not unprecedented.

Table 2 also reports Nechyba's findings of the effects of different tax cuts on land prices. Suppose a city government reduces the rate on a tax category by 20 percent and raises the land-value tax rate in order to achieve revenue neutrality. Column 3 in Table 2 reports the percentage change in land prices that occurs in Nechyba's model economy. Because taxes on capital are inefficient, land prices actually increase when tax rates on capital, corporate income and property are lowered. Land prices decline when a city reduces tax rates on labor, personal income and sales. For instance, if the government in his model economy lowers the tax rate on personal income by 20 percent, equilibrium land prices fall by 6.3 percent. His model suggests that the distortion associated with the personal income tax is relatively small. When the personal income tax is lowered and the revenue lost is offset by a higher land-value tax rate, land owners suffer from falling land prices.

Haughwout (2004) develops a general equilibrium model economy to predict the effects of tax rate changes in New York City. He adds an interesting twist by treating public goods as rivalrous. In Nechyba's model, the government buys pure public goods that an unlimited number of people can enjoy without diminishing their value. In Haughwout's model, on the other hand, the cost of providing public services increases with the city's population. Like Nechyba, Haughwout considers scenarios in which all or part of current tax revenues are replaced by a land value tax.

Haughwout considers a case in which New York City eliminates the sales tax, the tax on structures and the income tax, replacing the revenues with a land-value tax. In 1997, New York's sales tax rate was 4 percent, its tax on structures was 2.83 percent, and its income tax rate was 4.46 percent. Haughwout finds that the revenue-neutral land tax rate would be 21.7 percent. Haughwout's model suggests that replacing these taxes with a land tax would increase the city's population by 51 percent, its employment by 84 percent, and its economic output

The quantitative results obtained from experiments with these model economies suggest that the distortions produced by taxes on structures, income, and capital are particularly onerous.

by 91 percent. Moreover, after the tax on structures is eliminated, Haughwout finds that wages would increase by 4 percent and capital per unit of land would increase by 168 percent. With more people and constant government revenue, New York's per capita tax revenue would decline by 34 percent. With more employment, the city's poverty rate would decline by 34 percent. Land prices would fall by 28 percent due to the increased tax on land (see Figure 2).

The quantitative results obtained from experiments with these model economies suggest that the distortions produced by taxes on structures, income, and capital are particularly onerous. There is ample economic theory and quantitative evidence to support a shift in the tax burden from structures (and income) to land. The remainder of this report investigates the impact of eliminating the city earnings tax and moving to a land-value tax. Will such a change lead to more economic activity in the city? The next section proposes a model calibrated to match the Kansas City economy. This model economy is used to quantify the economic effects of eliminating the city earnings tax while holding city revenue constant.

There is ample economic theory and quantitative evidence to support a shift in the tax burden from structures (and income) to land.

AN ECONOMIC MODEL

The model economy is a controlled environment within which the economic impacts of changes in tax policy can be simulated. I wish to predict the effects of a two-tier property tax in which land is taxed at a higher rate than structures. In particular, I want to estimate what the tax rate on land would have to be in order to replace the revenues now generated by the earnings tax.

The state of the art model city economy is provided by Haughwout and Inman (2001) and Haughwout (2004). The results reported in this section are obtained by modifying their model to match certain long-run features of the Kansas City economy. The model assumes that labor and capital are perfectly mobile. In equilibrium, people's valuation of wages and the return to capital cannot be higher or lower than the reservation value of living outside the city. Otherwise, people who value life in the city less than life outside of the city would relocate. Because the city is small relative to the rest of the world, the wage and return to capital are balanced against people's valuation of living outside the city.

Households derive utility from land, housing capital, a composite consumption good (excluding housing services), and the local public good. Households are divided between resident workers and dependent households. One can think of dependent households as unemployed households that are either poor or headed by retired citizens. Firms operating in the city maximize profits employing land, capital, resident workers, and commuter labor. Finally, the city government produces a public good from public infrastructure, aid from the federal government, income from pre-existing city assets, and city taxes. The details of the model economy are presented in Appendix A.

The household's preference function is set up so that the elasticity of demand for the consumption good, for housing

structures and for residential land is equal to one with respect to their own price and with respect to income.[16] For firms, a version of the Cobb-Douglas production function is used to tell how combinations of labor, land, and physical capital are combined to produce units of the consumption good.[17] Lastly, the share of income paid to land is set at 5 percent.[18]

While this model economy is very good at examining the fiscal policy effects, the model departs from reality in some ways that are worth noting:

- Land enters both the production technology and the household's utility function. That means that an increase in land price will induce both firms and households to substitute away from land without frictions. So, in the model economy, the demand for land may be too sensitive to changes in tax rates.
- The model is a static representation of the city economy. It only predicts the equilibrium point that the economy will reach in the long run. It does not predict how fast changes will occur. Later, I will offer a modified approach that tries to mimic the dynamics of the model economy.
- There is potential for measurement errors in some of the parameters. The values for infrastructure levels and poverty rates are particularly uncertain due to the lack of real-world data from Kansas City for these parameters. Fortunately, sensitivity analysis suggests that changes in these parameters do not materially affect my results.
- The model economy dramatically simplifies the real world. It includes migrant workers, regular working households, and poor households. Kansas City's economy is obviously far more complex. It's difficult to predict how much these simplifications affect the accuracy of the model.

PHASING OUT THE EARNINGS TAX

Now I perform the analysis for Kansas City, calibrating the model with 2005 data. Kansas City's residential property tax rate was 1.1796 percent of assessed value.[19] The area of Kansas City is 313.5 square miles, of which 50 percent is assumed to be available for

Land owners do not bear the full burden of the land-value tax.

Table 3
Model Simulation Results for the Kansas City Economy

VARIABLE	MODEL ECONOMY	ACTUAL ECONOMY
EMPLOYMENT	289,098	284,358
REVENUE	265,548,748	332,464,522
• *Property*	68,810,281	73,916,389
• *Earnings*	132,313,986	136,608,635
• *Sales*	64,424,481	121,939,498

Source: United States Census Bureau, Bureau of Labor Statistics, and Comprehensive Annual Financial Report for the City of St. Louis, 2005.

Eliminating the earnings tax would help to attract new residents from the Kansas side of the Kansas City metropolitan area, thereby increasing state revenues.

residential and business use. The Kansas City earnings tax rate is 1 percent and the city's portion of the sales tax rate is 1.5 percent.

The baseline simulation results for Kansas City are found in Table 5. The model economy does a good job of matching the revenue and employment statistics.[20] The model economy measures the equilibrium tax revenues generated by a 1 percent tax on only wages. The model fails to capture the intensity of retails sales in Kansas City.

The Long-Run Simulation

I now simulate the replacement of the Kansas City earnings tax with a two-tier land value tax in order to find the land-value tax rate that keeps long-run city revenues constant.

Kansas City's area is 313.5 square miles. I assume that 50 percent of Kansas City's land area is subject to the land-value tax, meaning there are approximately 100,000 acres of taxable land available in Kansas City. Land in Kansas City is not used very intensively, leading to a relatively low value of $15,233 per acre. Hence, the total value of available land in Kansas City is slightly greater than $1.5 billion.

I begin with a partial equilibrium analysis, in which prices and quantities do not change. The city earnings tax generates $136 million for the Kansas City government. Using these figures, the land-value tax rate necessary to replace the lost revenues from the earnings tax is 8.7 percent.

Next, I use the model economy to incorporate the dynamic effects of eliminating the earnings tax. The results of the simulation are shown in Table 6.

Note that once general equilibrium effects are accounted for, the revenue-neutral land-value tax rate is just 6.8 percent. Employment increases by over 50 percent because the distortionary tax is eliminated. Property and sales tax revenues also increase.

A Phase-In Plan

In 2003, Philadelphia issued a public call for tax reform recommendations. Philadelphia is interesting because it has the highest earnings tax rate in the country: 4.54 percent. The Philadelphia Tax Reform Commission's final report

Table 4
Model Simulation Results for the Kansas City Economy
(Land-Value Tax Replaces Earnings Tax)

VARIABLE	MODEL ECONOMY	ACTUAL ECONOMY
EMPLOYMENT	289,098	284,358
REVENUE	265,548,748	332,464,522
• *Property*	68,810,281	73,916,389
• *Earnings*	132,313,986	136,608,635
• *Sales*	64,424,481	121,939,498

Source: United States Census Bureau, Bureau of Labor Statistics, and Comprehensive Annual Financial Report for the City of St. Louis, 2005.

recommended that the earnings tax rate be lowered to 3.25 percent by 2014, and that a land-value tax be phased in.[21]

The Philadelphia proposal provides a good model for Kansas City because the challenges the cities face are similar. The proposed reduction in Philadelphia's earnings tax rate, 1.29 percentage points, is very close to the 1 percentage point reduction necessary to phase out the Kansas City earnings tax. The proposal's 10-year timeline for the transition is also a good model for Kansas City.

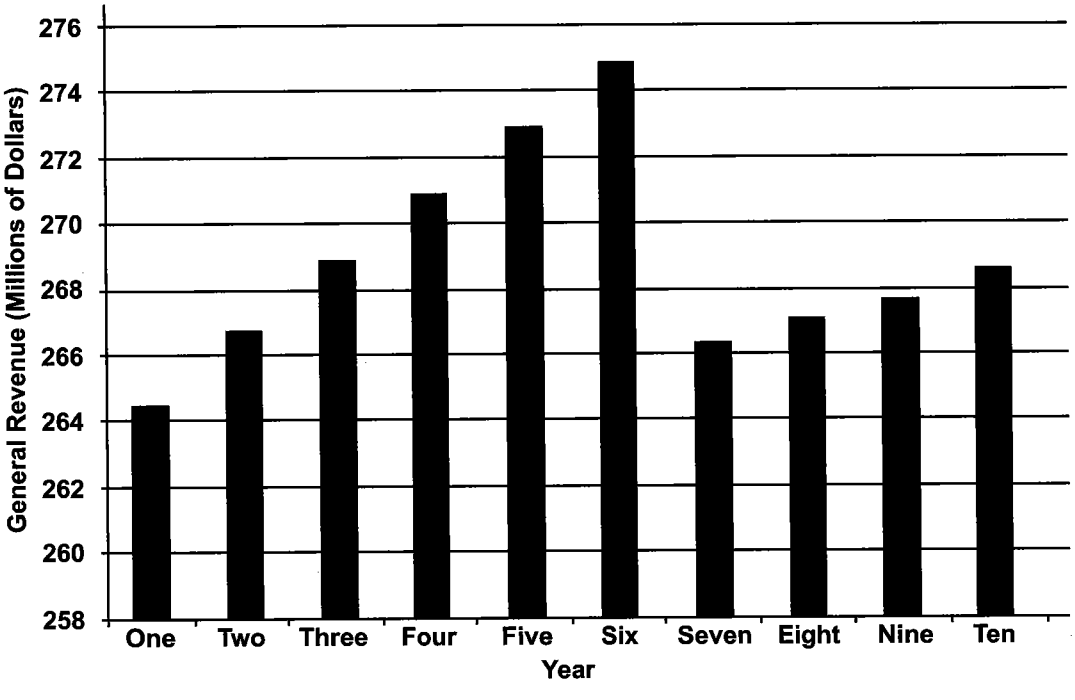
Because the earnings tax in Kansas City is 1 percent, I phase it out in the following three steps: I lower it to 0.5 percent in the first year, to 0.25 percent in year six, and to zero in year ten.

Figure 4 plots city revenues over the course of the 10-year transition period.[22] In 2005, revenues totaled $265.5 million, and the phase-in plan is structured so that annual revenues never drop below this figure. Figures 4 shows that as the city economy grows, the revenues exceed the $265.5 million yearly minimum.

I assume that the first year's earnings tax cut is unanticipated, so that general equilibrium effects do not kick in until the second year. The land-value tax rate necessary to generate the $66.2 million lost from the earnings tax cut is 4.3 percent.

Over time, incentives will begin to induce changes in the equilibrium prices and quantities. If the city were to permanently set the earnings tax rate at 0.5 percent and impose a land-value tax of 4.3 percent, long-run city revenues would rise by $58.2 million. Therefore, at a four percent convergence rate, city revenues would exceed current revenues

Figure 3
General Revenue for Kansas City: A Ten-Year Phase-in of the Land-Value Tax



Financial assistance from the state could ease the transition to a land-value tax, benefiting both Kansas City and the state as a whole.

I find that the broad-based land-value tax outlined previously is superior to these alternatives.

by $2.33 million in year two, by $4.56 million in year three, by $6.71 million in year four, by $8.77 million in year five, and by $10.75 million in year six.

In year six, the earnings tax rate would be reduced to 0.25 percent, resulting in a decline in city revenues of $33.1 million. With the return on U.S. Treasury securities at 5 percent, the city government's accumulated savings in years two through six would be equal to $37.24 million, allowing the city to delay an increase in the land-value tax rate until year seven. In year seven, the land-value tax rate would need to be raised to 5.7 percent in order to keep revenues constant. Over the long run, a 5.7 percent land-value tax combined with a 0.25 percent earnings tax rate would result in city revenues rising to $306.8 million. So at a four percent convergence rate, year seven revenues would be $20.8 million higher than what would be required to keep city revenues neutral in year seven. So at a four percent convergence rate, city revenues would increase compared to the status quo by $12.3 million, $24.1 million, and $35.4 million in years eight through ten, respectively.

In year ten, the city would set the earnings tax rate to zero. That would cause city revenues to fall by $33.1 million. However, the city would have $71.8 million accumulated from years eight through ten. As a result, there would be no need to raise the land-value tax rate until the twelfth year.[23] In year twelve, the land-value tax would need to be raised to 6.7 percent. The final land-value tax rate is very close to the long-run equilibrium rate established earlier.

It is important to note that the equilibrium assessed value of land in Kansas City falls to $14,807 after the land tax is completely phased in, a 2.8 percent decline. Though lower, it is important to note that one would predict a change in the price that is equal to the capitalized value of the stream of tax payments on the land, which, holding everything else constant, is much larger than 2.8 percent. The general equilibrium effects result in changes in land price that reflect the capitalized value of the land value tax and other market factors. Kansas City's market factors result in price movements that partially offset the effect that the land-value tax alone has on the land price. In short, land owners do not bear the full burden of the land-value tax.

Additional Revenue Sources

Although phasing out the earnings tax is clearly in the city's long-term interests, it may require considerable courage for the city to adopt a land tax rate above 6 percent. Fortunately, there are likely to be other revenue sources that could reduce the bite of the land-value tax.

One possibility would be for the state government to partner with the city government. Eliminating the earnings tax would help to attract new residents from the Kansas side of the Kansas City metropolitan area, thereby increasing state revenues. It would therefore be in the interest of the state government to help the city eliminate the tax. Financial assistance from the state could ease the transition to a land-value tax, benefiting

both Kansas City and the state as a whole.

There are undoubtedly other revenue sources available to the Kansas City government that could partially offset the lost earnings tax revenue, allowing the final land-value tax rate to be lower than 6.7 percent. Suppose that the Kansas City government coordinated with local jurisdictions so that the city needed to replace only $100 million in lost revenues. Then the land-value tax could be as low as 4.3 percent in the first year and 5.7 percent in year seven, with no need to raise property taxes further thereafter. A 5.7-percent land-value tax rate would actually result in city revenues increasing by $15 million per year in the long run.

THE BURDEN ON REPRESENTATIVE HOUSEHOLDS

Generally speaking, the model suggests that replacing the earnings tax with a land-value tax would be a good thing for city development. Employment, gross city product, and retail sales would increase. But how would individual taxpayers fare?

The burden of the land-value tax would not fall equally on all taxpayers. People with large incomes and no real property would benefit from the switch to a land-value tax. Conversely, people with low incomes and large property holdings would see their tax bills increase. Here I show how my proposal would affect three hypothetical households.

For the purposes of these illustrations, I treat each household as a static enterprise. I compute the change in its tax bill based on its income and the assessed value of its land holdings, holding all other decisions constant. Household spending on consumer items that are subject to the city sales tax, for example, will not change. In short, the tax bill for each individual household is computed as if the city-wide effects did not influence the household's resulting real wealth or income.

Household A

Household A has income subject to the earnings tax of $200,000 and land with an assessed value of $15,000. Household A would see its earnings tax bill fall by $2,000 and its land-value tax bill increase by $855,[24] for a net decline of $1,145.

Household B

Household B has no income subject to the earnings tax and has land with assessed value of $6,000. This household would see no change in its earnings tax bill—it is zero in any case—and its land-value tax bill would increase by $342. Household B would bear a larger burden under my proposal.

Household C

Household C is an intermediate case. This household has income subject to the earnings tax of $50,000 and land with an assessed value of $12,000. Household C's earnings tax bill would decrease by $500, and its land-value tax bill would increase by $516 in years one through six and to $684 in years seven through twelve. In year twelve, the land-value tax bill would rise to $804.

In general, households with small incomes and large property holdings will

A sales tax is not a viable alternative to the earnings tax.

see their total tax bills increase. Because these conditions most closely correspond to retired persons living in their own homes, the two-tier property tax may need to be phased in. On the other hand, it is important to keep in mind an offsetting effect: eliminating the distortionary earnings tax induces people to move back into the city, thereby increasing the demand for city property and raising property values. Hence, higher property tax bills are likely to be offset somewhat by increases in home equity.

ALTERNATIVE PROPOSALS

In this section, I consider and reject two alternatives to the phase-out plan discussed above. First, I explore the possibility of exempting some taxpayers from the land tax via abatements. Second, I ask whether the sales tax would be a better choice for generating revenue lost from the earnings tax. I find that the broad-based land value tax outlined previously is superior to these alternatives.

Eliminating the earnings tax would result in a larger city economy, as more workers and residents flock to the city, more capital goods are purchased, and more retail sales are made.

Reduction in Taxable Land

City officials might be tempted to exempt certain classes of taxpayers from the land-value tax, but there is a simple economic argument against doing so: such an abatement is a subsidy that distorts decisions. Abatements would retard the resurgence in the city economy because landowners would seek the subsidy instead of putting land to its most highly valued use.

To illustrate this point, consider a case in which there are no abatements. The land price reflects the capitalized value of the land tax and the effects that changes in other market factors have on the land price. Recall that the equilibrium assessed value does not respond by the full amount of the land-value tax rate. If, for example, abatements are implemented along with the land-value tax, the incentives to use the land efficiently are affected. It is the inefficient use of land that negatively affects the city economy. Even though the abatements benefit some land owners, the city economy is adversely affected and other land owners may suffer sharper declines in their land values.

The Sales Tax Option

Some have suggested an alternative method for phasing out the earnings tax: instituting a broad-based sales tax. The term "broad-based" often means extending the tax to include services such as doctor visits, legal services, and accounting services. Proponents note that sales taxes capture revenues from individuals who live outside the city limits. An efficient tax satisfies the following condition:

$$\frac{t_x}{t_y} = \frac{\varepsilon_y}{\varepsilon_x} \quad (7.1)$$

where tx and ty are the tax rates on goods X and Y, respectively; εx and εy are their respective elasticities. Equation (7.1) states that the tax rates that minimize the total deadweight loss are those inversely proportional to the elasticities. Equation (7.1), known as the Ramsey Rule, equates the percentage change in value of good X and good Y when there is a one-percentage point change in the tax rate.[25] The result is a general equilibrium counterpart to the notion of deadweight

loss discussed in Section 2. Tax rates should be set so that the percentage change in the values is equal across goods.

Equation (7.1) is a useful guide when evaluating different tax structures if the objective is to minimize deadweight loss. Consider applying a broad-based sales tax at the city level. The chief problem with such a proposal is that sales in a city are very elastic. Stated differently, if retailers face a sufficiently higher sales tax rate in the city relative to the suburbs, businesses may opt to locate outside the city to avoid the tax. If a city faces stiff competition from suburban business—if the city's market size is small relative to the region, for example—then the demand for the goods sold by city businesses is more elastic.[26]

In terms of equation (7.1), a sales tax on a good that is very elastically demanded can easily be avoided: just drive outside the city limits and buy the same good at the lower tax rate. To illustrate, suppose retail sales in the city are good X in equation (7.1). Take the tax rate and elasticity on a composite set of goods, collectively call them good Y, as given. If the denominator in equation (7.1) is getting larger—that is, more elastic—because transportation costs are getting smaller, an increase in the sales tax rate simply adds to the tax burden.

The Ramsey Rule dictates that implementing a broad-based sales tax on items sold inside the city limits is not the best policy in an environment when declining transportation and transaction costs are increasing the elasticity of demand for the products being taxed. One piece of evidence that such costs are declining is increased Internet sales, which are not yet subject to state and local sales taxes. The United States' Commerce Department estimates that e-commerce sales increased from 0.6 percent of retail sales in the fourth quarter of 1999 to 2.5 percent of retail sales in the third quarter of 2005.

What if Kansas City applied a broad-based sales tax or raised the rate on the existing set of taxable items? The model economy is used to illustrate this effect.[27] Suppose the earnings tax is eliminated and in order to hold city government revenues constant the city increases the sales tax rate. Because the sales tax is applied against all consumption in the model economy, it is by definition a broad-based sales tax. Using the model economy the sales tax rate would have to rise to 20 percent to keep city government revenues constant. Moreover, it would be replacing one distortionary tax with another. The sales tax is also highly regressive as low-income households, on average, spend a larger fraction of their income on consumer purchases than high-income households. Thus, as a fraction of income, the sales tax imposes a larger burden on low-income households than an income tax.

In short, a sales tax is not a viable alternative to the earnings tax. Sales taxes are highly distortionary, and the extremely high tax rates required would devastate the retail sector in Kansas City.

CONCLUSION

The purpose of this report is to propose a tax structure that eliminates the earnings tax in Kansas City. In order

The two-tier property tax is a slam dunk from the perspective of city economic development.

The phase-in plan permits constituents to avoid the land-value tax bill if they so desire.

to make up for the forgone earnings tax revenue, I propose that the city adopt a two-tier property tax schedule that taxes land at a higher rate than structures.

Using a sophisticated economic model, I have shown that Kansas City can phase out its earnings tax by replacing it with a two-tier property tax. The tax rate on land would have to be around 6 percent. This modest increase is made possible thanks to the beneficial economic incentives that are created by the shift from the distortionary earnings tax to the non-distortionary land-value tax. Eliminating the earnings tax would result in a larger city economy, as more workers and residents flock to the city, more capital goods are purchased, and more retail sales are made.

On the surface, therefore, the two-tier property tax is a slam dunk from the perspective of city economic development. A small increase in the property tax rate applied to the value of land permits the city to eliminate the earnings tax. The difficulty with implementing this plan, however, goes with the uneven distribution of the tax burden. Inevitably, some city dwellers will face higher taxes. Most likely, they will be retired people who own property but do not receive income that is subject to the earnings tax. However, city leaders should avoid land-value abatements. Rather, the land-value tax should be phased in gradually to spread the burden of the higher tax over time. The phase-in plan permits constituents to avoid the land-value tax bill if they so desire.

I also suggest that other revenue sources may be available to help offset the revenues lost by eliminating the earnings tax. That would allow the land-value tax to be even lower. A $30 million reduction in costs or alternative revenues results in a one percentage point reduction in the land-value tax rate.

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NOTES

[1] The responsiveness of labor supply to changes in the wage rate—the elasticity of the labor supply curve—is an unresolved empirical issue. In this illustration, the labor supply curve is drawn to be slightly inelastic. In addition, to be correct the wage rate used in Figure 1 is the real wage rate.

[2] The change in relative prices also changes the total quantity of resources that the worker can purchase. A reduction in the wage changes the relative price between leisure and consumption, which causes the substitution effect. In addition, lower wages also reduce the total amount of goods that can be purchased, which causes the income effect. Since leisure is a normal good, the income effect results in more work effort. The compensated supply curve removes the income effect by showing how much labor the worker would supply if he could afford the same amount of leisure as before the tax change. Thus, only the substitution effect remains.

[3] WF is the market-determined pre-tax wage after the tax is implemented. WL is the after-tax wage received by the worker. I omitted a full diagram of all the curves in order to keep the figure as simple as possible.

[4] Note that as the definition of the market shrinks, the labor supply curve is more elastic. There are more substitute activities as the definition of the market shrinks.

[5] Consider the lump sum tax as a tax on living. The supply of living is independent of the price. In other words, life is inelastically supplied. Therefore, a lax on life is paid without distorting anyone's decisions. This idea of inelastic supply will be revisited below.

[6] Henry George, the 19th century economist and social reformer, was an early proponent of the land tax. His arguments, however, had more to do with redistributing wealth. (See George 1879) Still, the land tax has been championed by many modern economists, including Nobel Prize Laureates Milton Friedman and William Vickery.

[7] Land here does not include improvements to the land, such as buildings.

[8] To apply the hedonic pricing equation, the definition of parcel of land must be large enough to permit variation in the price and in the amenities that affect land's price. As such, the city is an appropriate size jurisdiction because there is generally sufficient variation in both measurements.

[9] This of course is a partial effect; that is, it does not take into account the possible effects in other markets.

[10] The pre-tax price captured the capitalized product of the land. After the tax, the buyer is purchasing the product of the land and a tax liability. Asset pricing tells us that the after-tax price will incorporate the land's after-tax product. In this way, future buyers do not bear the burden of the tax since the purchase price takes the tax liability into account.

[11] Of course, if cities can anticipate business cycle downturns, there is always the option to save revenues during expansions to use when the local economy is contracting. Political pressures likely bear on city spending during business cycle expansions, preventing the city from saving.

[12] See, for example, Netzer (1966), Feldstein (1977), Bentnick (1979), Mills (1981), Wildasin (1982), and Nechyba (2001).

[13] A mill is 0.1 cent.

[14] Tideman assumes that the city economy is populated by a large number of representative households. Each household has the same momentary utility function. The household lives infinitely long. Thus, the decision to consume today is tied directly to the decision to consume in the future. Capital accumulation is the means by which the household saves for future consumption. In other words, foregoing consumption today adds to the city's capital stock. The return from this investment today is consumption in the future.

[15] See Penn World Table 6.1 for output per worker in the United States.

[16] See Rosen (1979) and Gyorko and Voith (2000) for justification for the specification.

[17] Parameter values are taken from Krusell, Ohanian, Rios-Rull and Violante (2000).

[18] This is the same as specified in Mieskowski (1972), Arnott and MacKinnon, and Sullivan (1985).

[19] In my calculations, the personal property tax rate is divided among municipal purposes, county purposes, hospital purposes, public health purposes, recreation purposes and Interest in Public Debt. The 1.1796 percent rate is the sum of general, health and museum rates. These uses correspond to the rates that are consistent with the rates in the city's model economy. I also ran the model economy with the total personal property rate set at 1.3196 percent. The results are not materially different. See http://www.kcmo.org/finance/cafr05/46propertytaxrates.pdf for details on the city property tax rate.

[20] See the following reference for year 2003-04: http://www.kcmo.org/manager/bdgt06/budgetsummaries.pdf . Note that the earnings tax numbers comprise the sum of withholdings and declarations by wage earners.

[21] Recommendation 25 on p.10 of the report recommends that the city earnings tax rate be lowered over a 10-year period to 3.25 percent. In the same Report, Recommendation 8 states that the land-value tax should be phased-in over the same 10-year period.

[22] Revenue figures in this section include only revenues from the earnings tax, property taxes on structures, sales taxes, and land-value taxes. Kansas City gets a small amount of revenue from other sources, (such as federal transfers and user fees) but these do not affect

our analysis and are omitted for the sake of simplicity.

[23] **Year eleven would also be covered by the additional revenues from the transition.**

[24] **Because the equilibrium assessed value in Kansas City is $14,114, this payer would have about one acre of land.**

[25] **Notice that the retailer might not pass the tax on to the final consumer. Indeed, if the price does not respond to the tax because of competitive forces, the same incentive is operating because the retailers' return will be lowered by the sales tax rate.**

[26] **Differences in relative sales tax rates explain why some cities have sales tax amnesty days during the year.**

[27] **The numerical results are available on request.**

APPENDIX A

The Model Economy

I present the formal version of the model economy that is used to quantify the effects of tax reform for Kansas City. I follow Haughwout (2004).

T.1 Households

The city residents are divided are into two groups: resident workers and dependent households. Let n denote the number of resident workers. The number of resident workers is determined within the model economy. Resident workers live, work, and consume in the city. They receive a wage, W, for each unit of time working.

Dependent households do not work. Instead, they receive transfer income, denoted $\overline{Y}$. I assume that the number of dependent households is set exogenously. Because dependent households do not work, one can interpret dependents as families that receive government assistance or retirees.

City households are identical in terms of their preferences. Formally, let the utility function be characterized by, $U=U(x,h,l,G)$ where x is the quantity of perishable units of a single consumption good, h is flow of housing capital services, l stands for the quantity of land services, and G is the quantity of local public goods.[29] I normalize the flow of housing capital services and the consumption good so that the price is set at one.

Each household faces a budget constraint. For resident workers, the constraint is given by:

$$(1+\tau_s)x+(r+\tau_p)h+(r+\tau_p)(R/r)l_r = (1-\tau_w)W \quad (A.1)$$

where τ_i denotes the local tax rate on sales $(i = s)$, property $(i = p)$, or income $(i = W)$, R is the price of land (measured in units of the consumption good), and r is the household's discount factor.

For dependent households, the left-hand-side of equation (A.1) is set equal to the transfer payment, $\overline{Y}$.

T.2 Firms

Firms combine land, resident labor, commuter labor, and capital to produce output. I assume the production technology exhibits constant-returns-to scale. Here, the quantity of local public goods acts as a Hicks-neutral scale variable in the production function. Formally,

$$X = Gl_l^{\alpha} n^{\beta} m^{\delta} k^{\eta} \quad (A.2)$$

where G represents the quantity of government goods, l_l^{α} is the quantity of land used in producing output, X, m is the number of commuter workers, and k is the quantity of capital.

Firms choose factors so as to minimize gross-of-tax unit costs, subject to equation (A.2). Costs are formally represented as follows:

$$C = (1+\tau_p)(R/r)l_r + Wn(1+\tau_p/r)k+(1+\tau_m)m \quad (A.3)$$

T.3 Government

City government produces the public good, G from the pre-existing public infrastructure, aid from the federal government, income from pre-existing assets, and tax revenues. Let G_0 denote the city's infrastructure, Z the payments received by the city from the federal government, A the stock of city assets, and T the total value of locally generated city taxes receipts.

Suppose further that the city government bears some share of the transfer payments made to dependent households. In addition, depreciation and remaining interest costs on the city infrastructure are included in city spending. The city's budget constraint, therefore, is represented by

$$G = \frac{[T+Z+A-\Psi\overline{Y}]/(r+\theta) + [(r-r^{\circ})/(r+\theta)]G_0}{C} \quad (A.4)$$

where Ψ is the city's fraction of transfer payments, r^0 is the rate at which the city pays interest on the existing infrastructure, and θ is the depreciation rate on city infrastructure. Note that $T = \sum_i \tau_i B_i$ where $i=X, s, p, W, m$.

T.4 Equilibrium

Equilibrium is defined as residents households choose consumption, housing services, capital, and land to maximize utility, firms choose land, resident labor, and commuter labor to minimize costs subject to the technology constraint, markets for land, labor, capital and the consumption good clear, and the government budget constraint is satisfied.

In Houghwout, the number of commuter workers is fixed. Resident workers, however, are perfectly mobile. They have a reservation utility level. Residents' schedule for land prices and work effort reflects their evaluations of living in the city or in the rest of the world. In other words, the demand for land and the supply of labor reflects the resident's alternative outcome, which is to live in the rest of the world. The reservation utility level creates an arbitrage opportunity and thus, this is the welfare level enjoyed by resident workers. In other words, the city must offer at least the reservation utility level, or the resident moves. If the welfare achieved in the city exceeded the reservation level, workers would move into the city. With declining marginal utility, the resident worker's welfare is determined by this reservation level. In contrast, welfare by dependent households is endogenously determined.

Firms choose whether to locate in the city just like resident workers. Maximizing profits is the objective of firms. In equilibrium, the firm is indifferent between locating in the city or locating outside of it.

It is useful to consider how prices affect the location decisions by resident workers and firms. Suppose a resident worker's wage increases. Other things being equal, the higher wage is traded against the price of land. As wages increase, the rents from working in the city must be offset by higher land prices. Similarly, for the firm, wages and land rents are costs that adversely affect profits. Suppose the firm's profits are held fixed—that is, one can draw an iso-profit schedule—as wages increases, the firm uses less land. There is a combination of wages and land prices that keeps the firm's profits constant. The equilibrium is where wages and land prices are such that resident workers and firms are indifferent between locating in the city or outside the city.

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