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HOW TO REPLACE THE EARNINGS TAX IN SAINT LOUIS

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 Saint Louis 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 10.04 percent. The model predicts that in the long run, the number of people working in Saint Louis would double.

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 Saint Louis 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 10.04 percent.

Model simulations indicate that Saint Louis 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.

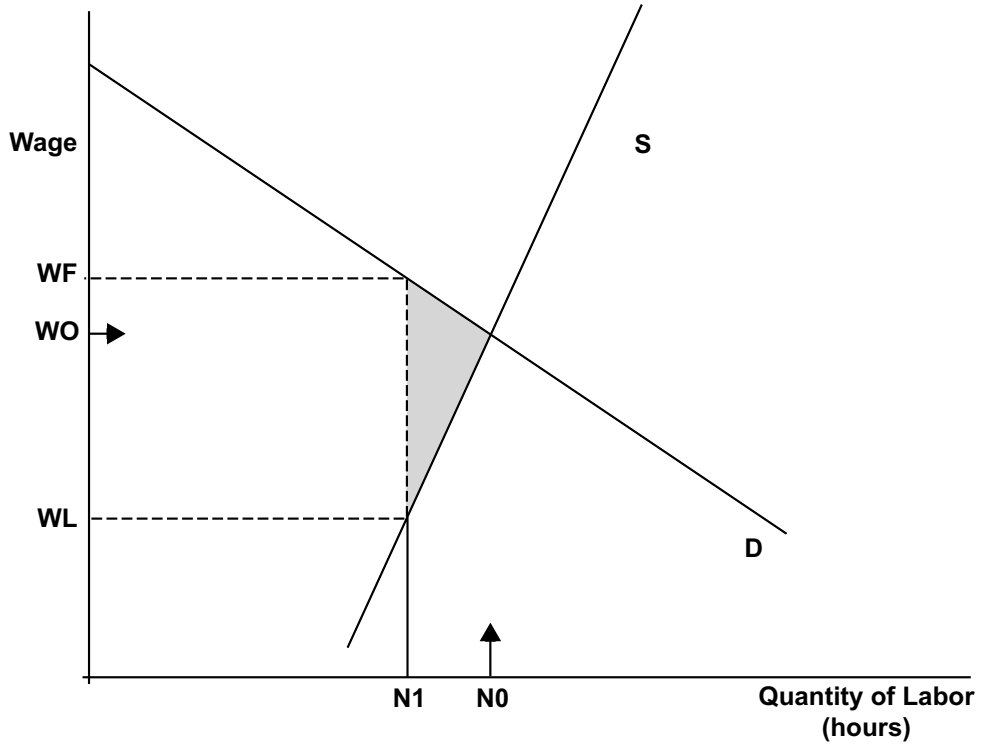
The substitution effect is economically wasteful, because tax avoidance reduces consumer welfare without increasing government revenues. An efficient tax is one that minimizes the substitution effect. A tax is efficient to the extent that people cannot avoid it by changing their behavior. It's good public 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 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,

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.

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]

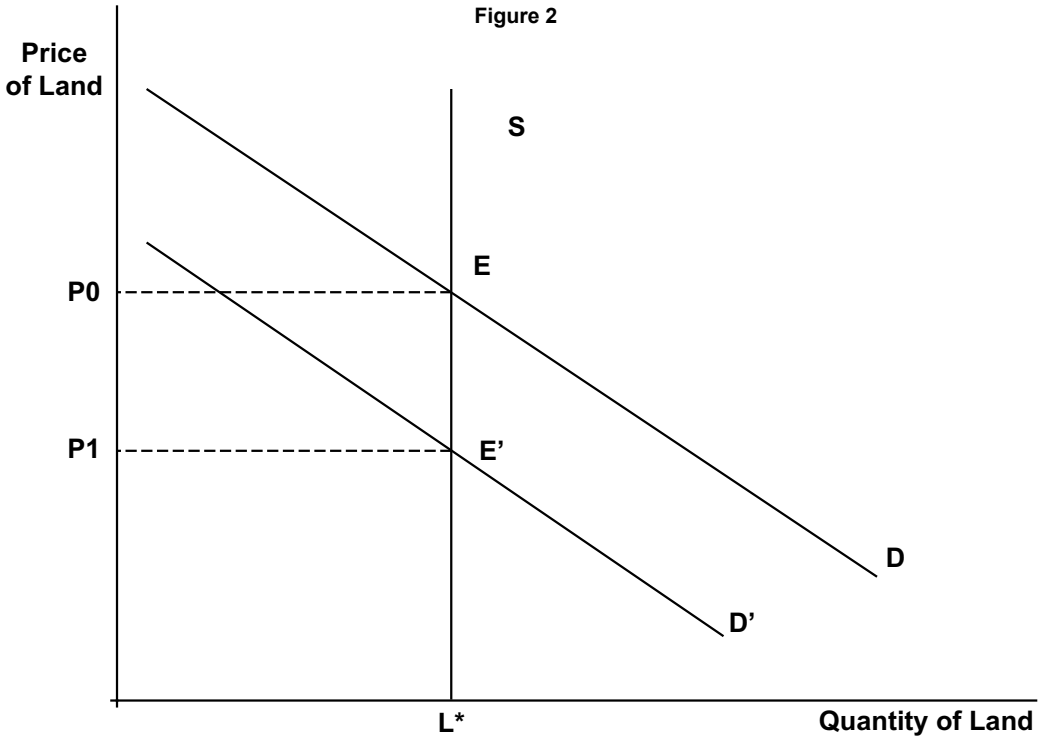
Figure 2 depicts the compensated supply and demand curves describing the market for land. The compensated demand curve for municipal land (pre-tax) is represented by the curve labeled D and the compensated supply of land by the curve labeled S.[7]

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

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

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.

Figure 2



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 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

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

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 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.

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-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,

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

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 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.

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.

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

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 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

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.

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.

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

Table 2

20% CUT IN TAX ON	PCT Δ IN LAND TAX	PCT Δ IN LAND PRICE
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.

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 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

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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 Saint Louis economy. This model economy is used to quantify the economic effects of eliminating the city earnings tax while holding city revenue constant.

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 Saint Louis 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 Saint Louis 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. Saint Louis' 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

I simulate the model economy for Saint Louis as it was in 2005. The Saint Louis City residential property tax rate was 1.4402 percent of assessed value.[19] The area of Saint Louis is 61.9 square miles, of which 75 percent is assumed to be available for residential or business use subject to the property tax.[20] The city earnings tax rate is 1.5 percent, and the city portion of the sales tax is 1.775 percent. Table 3 reports the results of the baseline simulation. Note that the revenue reported for the actual economy is the sum of the three main categories: property, earnings, and, sales. I exclude other sources of city revenue, such as licenses and permits, municipal charges for using parks, and court fines. This should have little effect on the results of the model because these revenue sources are a small fraction of the city budget.

Here, the model economy does a good job of capturing the key features of the Saint Louis economy. The model economy measures gross city product to be $13.7 billion. The average wage is $35,132 and the price of land is $36,888 per acre. In the baseline simulation, both property and sales tax revenues are a little low, reflecting the fact that the model economy does not have enough detail to capture the size of the retail industry in Saint Louis City. The fit is better along the critical dimensions of employment and

Table 3
Model Simulation Results for the Saint Louis Economy

VARIABLE	MODEL ECONOMY	ACTUAL ECONOMY
EMPLOYMENT	260,432	245,494
REVENUE	271,954,873	297,003,000
• *Property*	83,913,022	96,459,000
• *Earnings*	156,257,822,	154,530,000
• *Sales*	31,784,029	46,014,000

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

As after-tax wages increase, there is an incentive to supply more labor.

Capital investment increases thanks to the shift to a less distortionary tax.

earnings tax revenue. It is crucial for the model to accurately assess the impact that changes in marginal earnings tax rates will have on these two components. As Table 3 indicates, the fit is very good, suggesting that the model will accurately predict changes in these quantities as the city tax structure is changed.

Having established the initial values of our variables, the next step is to change the policy parameters and compute the effect of those changes on the equilibrium prices and quantities. The model permits us to observe the operation of incentives. I begin with economic primitives—technologies and preferences—and compute the long-run equilibrium in order to quantify the impact of policy changes on employment, revenues and other prices and quantities.

The Long Run

It's important to emphasize that the model is designed to show only how tax rates affect long-run equilibrium prices and quantities. The model does not predict how quickly the city economy will move from one equilibrium to another. I will incorporate those dynamic considerations into my analysis later in this report.

Suppose that the city eliminates the earnings tax and replaces it with a two-tier property tax: the earnings tax rate goes from 1.5 percent to zero while the tax rate on structures is held constant at 1.4402 percent of assessed value. What would the rate on land value have to be in order to keep city revenues constant?

Let us first answer the question using a static analysis in which all prices and quantities are held constant. The equilibrium assessed land price in the model economy is $36,888 per acre. With 29,712 acres of land available, the total value of available land in Saint Louis City is $1,096,016,256.[21] It follows that the tax rate on land would have to be 14.25 percent in order to replace the $156 million of city revenues that would be foregone if the earnings tax were eliminated.

Now, I run the same policy experiment using the model economy, which takes into account the dynamic effects of the incentives created by reducing the earnings tax. The model predicts that the land-value tax rate would have to be only 10.1 percent. Results for employment and city revenues are reported in Table 4.

As Table 4 shows, employment changes dramatically in the model economy when the earnings tax is eliminated. Part of the explanation for this is quite intuitive: as after-tax wages increase, there is an incentive to supply more labor. The supply of labor shifts to the right in response to the elimination of the earnings tax, causing the equilibrium quantity of labor to increase. But that is not the only factor. The model economy also takes other dynamic effects into account. One important general equilibrium effect arises because a more distortionary tax is eliminated in favor of a less distortionary tax. Because the distortionary earnings tax has been eliminated, businesses accumulate more structures, machines, and other physical capital. The additional investment induces businesses to hire more workers. These forces combine to bring about large employment gains.

Note that the revenue-neutral land-value tax rate under a dynamic analysis

(10.1 percent) is substantially lower than the revenue-neutral rate using less sophisticated static assumptions (14.25 percent). As Table 4 shows, city property tax revenues from structures are 21 percent higher as a result of the lower earnings tax. That's because capital investment increases thanks to the shift to a less distortionary tax. All that extra capital and employment translates into a larger gross city product. As GCP increases, consumption spending rises, which is reflected in higher city sales tax revenues. So, with property taxes and sales tax revenues increasing because of the general equilibrium effects, the required land-value tax rate is not nearly as large as was predicted by a naive partial equilibrium analysis.

Two key prices are worth mentioning. First, pre-tax wages are 8 percent higher in the economy with the land-value tax than in the economy with the earnings tax. If we limited ourselves to partial equilibrium analyses, we would expect wages to increase by 1.5 percent, the same as the rate of the earnings tax that was eliminated. With expanding physical capital, however, workers become more productive and the wage that clears the market for city labor rises by 8 percent.

Second, land prices decline in this experiment by 7.1 percent. 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, would cause a much larger drop than 7.1 percent.[22] The model economy is set up so that people's decisions are permitted to change in response to the new tax structure. The model predicts that the use of land by commercial and industrial activities would increase from 54 percent of the city's available land with the earnings tax in place to 58 percent with no earnings tax. In the processes, businesses would bid up the price of land, benefiting existing property owners in the city.

Although the model economy is quite useful as a way to quantitatively assess the economic impacts of the proposed policy changes, the model also has important limitations. In particular, the model economy does not give us

Pre-tax wages are 8 percent higher in the economy with the land-value tax than in the economy with the earnings tax.

Table 4
The Long-Run Effects on the Saint Louis City Economy
(Land-Value Tax Replaces Earnings Tax)

VARIABLE	BASELINE MODEL ECONOMY	TWO-TIER PROPERTY ECONOMY LAND-VALUE TAX EXPERIMENT	DIFFERENCE (TWO-TIER LESS BASELINE) DIFFERENCE FROM BASELINE
EMPLOYMENT	260,432	521,283	260,851
REVENUE	270,954,873	267,335,324	-3,619,549
• *Property*	82,913,022	100,632,859	17,719,837
• *Earnings*	156,257,822	0	-156,257,822
• *Land-Value*	0	102,877,265	102,877,265
• *Sales*	31,784,029	63,825,200	32,041,171

Total city revenues would actually increase in the years following each earnings tax cut from the level they would have reached without the cuts.

information about the transition from the current equilibrium to the new long-run equilibrium.[23] Next, I present a proposal to phase out the earnings tax over 10 years, and I modify my model to quantify the required tax rates during the transition process.

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 recommended that the earnings tax rate be lowered to 3.25 percent by 2014, and that a land-value tax be phased in.[24]

The Philadelphia proposal provides a good model for Saint Louis 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 1.5 percentage point reduction necessary to phase out the Saint Louis earnings tax. The proposal's 10-year timeline for the transition is also a good model for Saint Louis.

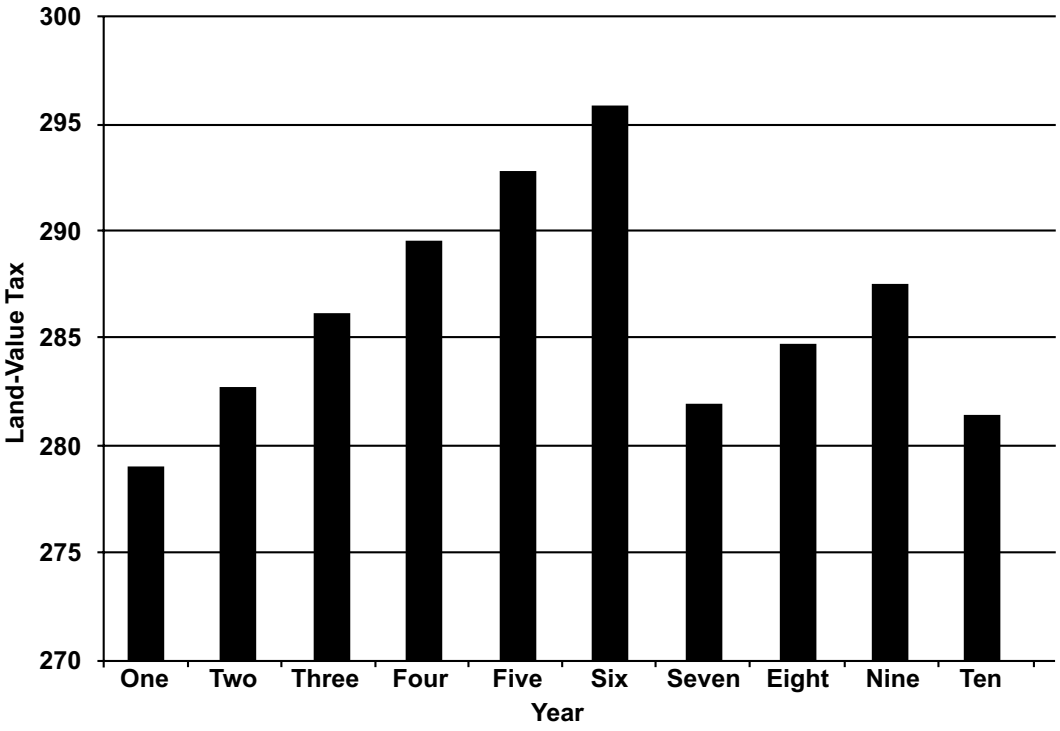
Thus, I propose the following timeline for phasing out the Saint Louis earnings tax. The city would cut the earnings tax in three one-half percentage point increments: from 1.5 percent to 1 percent in the first year, from 1 percent to 0.5 percent in year six, and from 0.5 percent to zero in year ten. At each step, the city would simultaneously increase the tax rate on assessed land value enough to offset the expected revenue losses from the earnings tax reductions. It's important to note that because of the general equilibrium effects, total city revenues would actually increase in the years following each earnings tax cut from the level they would have reached without the cuts.

In order to model the transition, I need to specify the rate of convergence, the speed at which the city economy adjusts over time to its new long-run equilibrium. In the previous analysis, I assumed that the convergence rate was 100 percent. That is, I assumed that the city economy "jumped" to its new equilibrium immediately after the policy change was implemented. Obviously, that doesn't happen in the real world. The evidence suggests that for industrialized countries like the United States, the convergence rate is about four percent.[25] In other words, about four percent of the difference between the original long-run equilibrium and the new long-run equilibrium is realized from one year to the next. City economies could shift faster because capital inflows play such an important role in city development, but I use four percent as a conservative estimate.

Figure 3 plots the portions of general revenues that come from the earnings tax, property taxes on structures, sales taxes, and land-value taxes during the ten-year phase-in plan. In 2005, general revenue contributions from these four sources totaled $272 million. As Figure 3 shows, the phase-in plan is structured so the sum of revenues from the earnings tax, property taxes on structures, sales taxes and land-value taxes is never less than $272 million in any year. Figure 3 shows that as the city economy grows, the revenues exceed the $272 million yearly minimum.

Consider the first year of the phase-in period. The city government lowers

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



the earnings tax rate from 1.5 percent to 1 percent. I assume that the change is unanticipated, so that equilibrium prices and quantities do not change significantly during the first year. Based on the model economy's equilibrium value of available city land, the land-value tax rate would have to be set at 4.75 percent to offset the $52.1 million in lost earnings tax revenues.

Beginning in the second year, the elimination of the earnings tax would begin to induce changes in equilibrium prices and quantities. If the city permanently set the earnings tax rate at 1 percent and imposed a land-value tax set at 4.75 percent, the model predicts that city revenues would rise by $92.9 million. With a four percent convergence rate, that implies that city revenues would exceed current revenues by $3.7 million in year two, $7.3 million in year three, $10.7 million in year four, $14 million in year five, and $17.2 million in year six.

These increased revenues could be saved to partially offset the revenues that would be lost when the city cut the earnings tax again in year six. With the return on U.S. Treasury securities at five percent, the city government's accumulated savings in years two through six would total $59.4 million. The half percentage point cut in the earnings tax rate in year six would cause a decline in city revenues of $52 million. Hence, the accumulated savings would be sufficient to offset the revenues that would be lost to the city in year six when it lowered the earnings tax rate from 1 percent to 0.5 percent. This would allow the city to delay the next increase in the land-value tax rate until the seventh year.

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

Cutting the earnings tax would benefit everyone in the long run.

In year seven, the city would again have to raise the land value tax, to 7.58 percent. As the city economy adjusts in the eighth and ninth years, the city could accumulate the "excess" revenues and apply them toward the change in the land-value tax rate in year ten. The process would culminate in the tenth year with the earnings tax eliminated and the land-value tax rate set to 10.04 percent.

Describing the transition path more explicitly confirms that a long-term land value tax rate of just over 10 percent meets the important criterion of revenue neutrality. Indeed, there is a small savings compared to the result obtained from the long-run equilibrium analysis owing to the ability to accumulate excess revenues during the years between changes in the earnings tax rate.

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 10 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 Illinois side of the Saint Louis 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 the city of Saint Louis and the state as a whole. Saint Louis City could also take advantage of opportunities to coordinate with Saint Louis County. For example, water, fire and some protection services could be coordinated in ways that would generate revenues or savings, which would partially offset the lost earnings tax revenue.

Suppose, for instance, that with these other revenue sources, the city only needed to replace $80 million of the foregone earnings tax revenues. In that case, a land tax rate of just 4.65 percent would be sufficient to generate the required revenue indefinitely. Moreover, the economic model shows that land prices would increase by 11 percent if the land-value tax were set to 4.65 percent and the earnings tax were eliminated. The increased demand for city land would more than offset the effect of the tax in the model economy. In short, cutting the earnings tax would benefit everyone 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. After the phase-in, Household A would see its earnings tax bill decline by $2,000 and its land-value tax bill increase by $1515,[26] for a net decline of $485 per year.

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 $602. Household B would bear a larger burden under my proposal.

It is worth examining how this burden would change during the phase-in period. Household B would pay $285 in land-value taxes in years one through six. The land-value tax bill would rise to $455 in years seven through ten and then rise to $602 thereafter.

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. This household would see its earnings tax bill decrease by $500 while the land tax bill would rise by $570 in years one through six, to $910 in years seven through ten, and to $1205 after year ten.

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

Replacing the earnings tax with a land-value tax would be a good thing for city development.

Eliminating the distortionary earnings tax induces people to move back into the city.

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. 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.[27] 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.[28]

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 the City of Saint Louis 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.[29] 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 Saint Louis 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 Saint Louis.

Conclusion

The purpose of this report is to propose a tax structure that eliminates the earnings tax in Saint Louis. In order 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 Saint Louis 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 10 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

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.

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

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. An $80 million reduction in revenue needs would lower the land-value tax rate to 5.5 percent.

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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. See http://stlouis.missouri.org/government/proptax/2005taxrate.html for details on the city property tax rate.

[20] Available land is not measured or recorded in city documents. Streets and sidewalks, for example, use up land that could otherwise be used for commercial purposes. In Saint Louis, Forest Park is another piece of land that is withheld from commercial development.

[21] Note that I am assuming that the market value equals the assessed value for land.

[22] Note that the land-value tax rate, if placed on the actual land value, cannot exceed the discount rate. The tax rate here is applied to the assessed land value. The distinction between assessed and market is important. Typically, assessed value is a fraction of the market value. So, in fact, the land-value tax rates proposed here satisfy this technical condition.

[23] The key problem lies with the way in which physical capital is accumulated in the city economy. The city economy is a small, open economy with capital inflows and outflows. Without an explicit modeling of this aspect of the economy, it is difficult to quantify the transition to the new long-run equilibrium.

[24] 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.

[25] See, for example, Section 3.2 in Jones (2002).

[26] With the equilibrium assessed value of one acre of land in Saint Louis at $34,282, this would amount to the landowner holding roughly 1⁄2 acre of land. Note that I also applied the one percent earnings tax rate paid directly by the person in my calculation of the earnings tax reduction.

[27] 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.

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

[29] The numerical results are available on requeSaint

[30] One can alternatively think of the consumption good as a composite good consisting of all the different items, except housing services, that the households enjoys.

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 Saint Louis. 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.[33] 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:

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

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,

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

where *G* represents the quantity of government goods, l_f^{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:

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

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

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

where Ψ is the city's fraction of transfer payments, r° 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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