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Greening the Property Tax

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GREENING THE PROPERTY TAX

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ABSTRACT

This paper reviews the literature and policy discussions about the role of the property tax for land use. Various externalities of the development of land, such as new infrastructure needs, the loss of open space or air pollution due to longer commutes as people locate far from city centres, are not internalised fully by property taxes or other policy instruments and this is often thought to contribute to excessive land use and urban sprawl. The impact of property taxes on land use intensity and sprawl is ambiguous in theory, however, and it depends on tax design, as well as land use regulation policies and other taxes that can influence municipalities' incentives to convert land for development. Yet, there is some evidence suggesting that higher property taxes can limit urban sprawl, in particular when the tax on land is higher than on structures, although effects are small given relatively given a limited price elasticity of land use. Various property tax design options are discussed that may help to better internalise land use related externalities.

Key Words: Property tax, land use, urban sprawl, fiscal zoning

JEL codes: R14, R38, R51, R52

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GREENING THE PROPERTY TAX

Introduction

All OECD countries levy recurrent taxes on immobile property. Usually this is a combined tax on land and improvements, the latter referring to structures, buildings, irrigation systems and other man-made features. In most countries the property tax is levied at the sub-central level, often municipalities, to finance local public goods. Since property tax revenues are generated at the local level, property taxes are often seen as a particularly good way of financing local public goods, as there is a correspondence between the benefits that are taxed (building or land services) and the funding of public services (Slack, 2011). Property taxes are difficult to evade, as immovable property can hardly be hidden, and they have been found to have a milder negative effect on economic growth than other taxes (OECD, 2010).

This paper focuses on the environmental impact of property taxes. While no government has ever introduced property taxation as an environmental policy instrument, the property tax can influence land use, by changing the costs and incentives to build or leave land undeveloped. This will often depend on the type of land or its location, as rates or value assessments may differ depending on these characteristics. Property taxes, in their current design, usually cover neither the full cost of infrastructure needs arising from new housing or business property development, nor the costs of externalities, such as loss of open space, congestion and air pollution, as people locate in suburbs or rural areas, thus lengthening commutes. The failure to internalise these externalities is often thought to contribute to excessive land use and urban sprawl – an expansion of urban development characterised by low density, segregated land use and limited infrastructure provision in more sparsely developed areas. In a number of countries there is a discussion about property tax reform to improve environmental impacts. More recently, some local governments, in particular in the United States, have started to use the property tax as an environmental policy instrument to promote investments in energy efficiency or renewable energy through property tax rebates.

Property taxes have to be viewed in the context of other policy instruments that influence land use, such as land use planning, energy taxes on transport fuel and road user charges that can also help to internalise externalities related to urban sprawl. The effects of property taxes can only be understood in the context of countries' land use planning systems, as they determine the supply of land for different uses. Ideally, land use planning systems, property and environmental taxes together would help ensure that there is sufficient supply of land to provide for affordable housing, in particular in areas that are well connected to public transport and other infrastructure, while internalising the externalities associated with urban sprawl and excessive land use, such as too much loss of open space, congestion and air pollution. While property taxes can have an impact on incentives to develop land, it is often low, owing to relatively low tax rates in most countries and a limited price elasticity of land use. Also, it is too rough an instrument to generate many desirable outcomes, such as preserving certain areas from development altogether or ensuring that there is enough open space in urban areas. Therefore, land use planning is needed as a complementary policy tool. Finally, some externalities related to urban sprawl, such as increased emissions and congestion from transport, might best be addressed with other instruments, such as energy taxes on transport fuels, road user charges and construction of public transport infrastructure.

This paper is organised as follows:

- The next section analyses the land use effects of taxes on immobile property and corresponding transactions. It starts by discussing a pure land tax that taxes only the value of land associated with its most profitable, rather than its actual use. This “ideal” tax is then compared to property taxes, as they are more commonly observed in OECD countries, typically taxing both land and

infrastructure or buildings and often differentiating rates or value assessments across different land uses.

- Section three discusses different reform proposals and ideas to better internalise externalities associated with new development with various tax instruments. This includes taxes on land area, rather than on land value, taxes with differentiated rates in line with the environmental impact of different land uses, development charges to internalise the externalities associated with the need for new infrastructure or the environmental effects of making soil impermeable as a result of construction, and windfall taxes on the gains associated with land use planning changes. There is very limited or sometimes no empirical evidence or practical experience with a number of these instruments, so drawing firm conclusions is difficult. The section also discusses instruments to ensure that there are no perverse incentives for municipalities to favour excessive development with a view to increasing property tax revenues.
- Section four discusses the interaction of land use planning and property taxes for land use, but also housing prices, along with the impact that property taxes can have on municipalities' incentive to encourage development and instruments to limit negative environmental effects.
- Section five discusses the use of property tax rebates and other policy tools associated with the property tax to promote green investment. Again, although this has become popular recently, in particular in the United States, empirical research on the effectiveness of such instruments is scarce.
- The final section concludes and suggests further work.

The impact of property and land taxes on the environment

Taxes on land or buildings can help internalise externalities associated with land use to some extent

Urban sprawl is thought to come with a number of undesirable effects. It can cause an underuse of existing infrastructure in urban areas and an excessive loss of open space, which has recreational and aesthetic value for people and is important as a habitat for plants and animals. The loss of these habitats and their fragmentation threatens biodiversity. Buildings and infrastructure often make the soil impermeable impairing its ability to perform key functions for the environment, such as controlling floods and replenishing groundwater, by absorbing rainwater, and providing habitats. As people live farther away from work, their commutes become longer and the car use tends to increase, as public transport infrastructure is often not available in these areas. This increases air pollution and contributes to climate change. Denser cities could reduce urban sprawl and relieve some of these problems.

Although denser cities would address many of these problems, as this would limit land use changes, contribute to shorter commutes and make it easier to organise public transport, it is important to remember that there are limits to making cities denser. There is a point where congestion costs in very dense cities would outweigh the costs of further land use changes outside the centre. Moreover, open and green spaces are needed in cities, as well, for recreational purposes, biodiversity and water management, hence there are limits to dense development in cities.

That said, it is important to understand how property taxes influence land use patterns. In most cases, land and improvements, referring to structures, buildings, irrigation systems and other man-made features constructed on land (Bird and Slack, 2005), are taxed at the same rate. However, tax rates or value assessments often differ across different land uses in practice. In particular, there is usually a lighter tax burden on farmland or forests, with the aim of limiting the impact on farmers' income and slowing down

the development of open space, or both. Revenues collected through property taxes differ widely, but are relatively small as a share of overall tax revenues in most countries, although they often contribute significantly to local tax revenues. In addition, many countries levy taxes on property transactions. This, as well, can have an effect on land use, in particular by creating incentives to purchase undeveloped land to build a new house rather than an existing building in more central areas to lower the tax burden.

Property taxes can be designed to internalise some of the externalities associated with land use changes, but there are other instruments, which may sometimes be better suited. New development often comes with considerable needs to build new infrastructure, such as new roads, water and electricity infrastructure or new schools. Property taxes can be thought of as recovering some of those costs, yet this means that owners of existing homes will co-finance infrastructure needs that were generated by new developments. In North America, municipalities increasingly levy development cost charges to recover infrastructure costs for new developments, often as a one-off fee. This is better targeted at those who have generated new infrastructure needs. New development will also lead to a loss of open space, with consequences for leisure activities and biodiversity. Since property taxes are generally not designed to take into account the extent or existence of social costs due to open space loss, they can at best be viewed as a very approximate instrument to internalise such externalities. Finally, new development that is associated with urban sprawl will increase traffic, and thus also associated air pollution and congestion. The most direct instruments to internalise these externalities are congestion charges and taxes on emissions, but property taxes can play a role, if they can be designed to encourage land use in areas that are well connected to infrastructure rather than excessive or widely dispersed settlement in urban fringes or rural areas.

The role pure taxes on land value and of conventional property taxes for land use

It is useful to distinguish between taxes on land and on buildings, as their characteristics and effects on land use are different. The Nobel prize winning economist William Vickrey went as far as to claim that a property tax “is economically speaking, a combination of one of the worst taxes—the part that is assessed on real estate improvements ...—and one of the best taxes—the tax on land site value” (Vickrey, 1999).

The economic case for a pure land tax is compelling (see Mirrlees et al., 2011) and there is a long history of economists and politicians arguing in favour of it. It is a tax on rents, so it does not discourage desirable economic activities, such as work and investment. Land is essentially fixed in supply, and cannot be affected by the introduction of a land tax. A land tax should therefore be expected to be capitalised in land prices, which would fall in response to the introduction to a land tax, but the after tax price of land should not change, and neither should resource allocation. Land rents are largely determined by public action, such as zoning and infrastructure developments, rather than the landowner’s effort. Therefore, it would seem fair to tax these rents and use the revenues to finance the provision of public goods, as already argued by the political economist Henry George in the mid-19th century (George, 1879) or by Winston Churchill in the House of Commons early in the 20th century (see citation in Mirrlees et al., 2011). The assessment that land is completely inelastic needs to be qualified a bit, though, since land supply for development or other specific purposes is influenced by land use planning. Taxes on land value could reduce the incentive for land owners to apply for permission to develop land, given that agricultural land is generally a lot less valuable than nearby land where development is allowed, and thus taxes on agricultural land would also be lower. However, given the size of potential gains from development permission, this effect is unlikely to be large. A tax on land value has the potential to limit housing price bubbles, as the share of the tax in imputed rents and incomes would rise when land prices rise faster than imputed rents (Muellbauer, 2005).

Land taxes are largely neutral with respect to investment and land use, although as they increase the cost of holding land, incentives to put land to its most valuable use are strengthened. Thus, keeping housing vacant or undeveloped becomes less attractive (Muellbauer, 2005), in particular in areas where land values are higher, such as around existing infrastructure, which will often be desirable from an environmental and fiscal perspective, or near attractive landscapes, which will often not be desirable. Incentives to develop land that is distant from existing infrastructure are weaker. This is because land values, and thus also the tax burden, are lower. As a result, the need to recover the tax cost by increasing the return on land through development is also weaker (Cho et al., 2010). However, it is still the case, even in areas with lower land values, that land taxes strengthen incentives to put land to its most valuable use, which will often be development for residential or commercial purposes. Therefore, a land tax by itself does not necessarily limit urban sprawl, or the conversion of land for construction or agriculture, compared to a situation without taxes, although incentives to develop higher value land will increase, which may favour development in inner cities. However, such pure land taxes exist only in very few places, so that there is not enough empirical evidence to draw any firm conclusions.

Note that a land tax is not expected to change the after tax-price of land, given that land supply is largely inelastic. Thus the tax cost would lower the price of land, leaving the after-tax land value unaffected. The biggest practical challenge is that a land value tax would require valuation of land separate from structures built on it. That may be difficult in the absence of a liquid market for undeveloped land. It is sometimes argued that the optimal tax base for land should be its highest-value potential use, rather than actual use, to create minimal distortions (Oates and Schwab, 1997), although this may complicate value assessment even further. Yet, a land value tax that is independent of actual land use would come with the additional benefit of reducing incentives for municipalities to convert land to a development area to obtain higher property taxes (Löhr, 2010).

A property tax levied on the value of buildings and structures in addition to land is generally thought to have less favourable effects. It reduces incentives to develop land, renovate buildings or extend them, as this would increase the tax burden. This effect would be particularly high in urban areas, where house prices are high. For this reason, property taxes that tax the value of buildings along with the value of land have sometimes been thought to contribute to the decay of inner cities in the United States (Land, 1967; Carey, 1976; Wyatt, 1994) and to urban sprawl.

Property taxes that tax both land and structures have different, countervailing effects on the density of urban development and which effect dominates is an empirical question. On the one hand, incentives to build and renovate are weakened, reducing the capital-land ratio, and – with fixed dwelling and population size – the number of housing units per unit of land area and thereby population density. By reducing the intensity of land development, the property tax would promote urban sprawl. This effect would promote the spatial expansion of cities. On the other hand, house prices might increase, if the tax burden can be partly shifted on consumers, leading to a demand for smaller housing units. This would tend to increase the density of urban development (Brueckner and Kim, 2003).

The empirical evidence on the effect of property taxes, levied on both land and structures, on land use and urban density suggests that land use reacts only little to the property tax, but the tax still tends to contribute to denser cities. In their empirical studies on this issue, both Meng and Zhang (2011) and Polyakov and Zhang (2008) exploit the fact that land categories for different uses, such as forests, pasture or developed land, are subject to different property tax burdens in the United States. Their empirical results suggest that a higher property tax on a specific land use decreases the probability that land is converted to this particular use, as the land owner would face a higher tax burden as a result, but the effect is relatively small. This suggests that increasing property taxes on developed land would slow development, although only to a limited extent. Song and Zenou (2006), using cross section data on urbanised areas from the United States, find that higher property taxes reduce city size, as measured by the extension of urbanised

land area. A 1% increase in the property tax would decrease city size by 0.4% according to their results, *ceteris paribus*.

A number of studies have examined the effects of a pure tax on land or a two-tier tax, with a higher tax rate on land than on buildings. Some studies find that such a tax with a lower rate on improvements can lead to increased development activity. Pollock and Shoup (1977) estimate the effect of a move to such a two-tier tax system on the capital-intensity of land with data for thirty large hotel resorts built in Hawaii between 1965 and 1973. They conclude that the elimination of the tax on improvements would increase the long-run equilibrium investment in improvements by up to 25%. Bourassa's (1987) econometric results based on building permits in Pittsburgh, where a two-tier tax was introduced in the early 1980s, suggests that the decrease in the property tax on buildings and structures did lead to increased development, although there seems to have been no significant separate impact of the increase in the land component of the property tax by itself. Oates and Schwab (1997) also examine the Pittsburgh experience using several econometric techniques that control for general economic conditions and those prevailing in the local real estate market, by comparing with other cities. They conclude that following the tax regime change, Pittsburgh experienced a remarkable building boom, in particular for commercial property, while residential property construction increased only slightly. Plassmann and Tideman (1999) use econometric analysis to compare Pennsylvanian municipalities with a two-tier tax with municipalities that tax land and improvements at the same rate. They conclude that taxing land at a higher rate than improvements increases construction significantly.

To sum up, most of the available empirical evidence suggests that a lower tax on improvements does stimulate development, but it should be noted that this says nothing about the effect on urban density or sprawl. As explained above, demand for larger housing units by consumers resulting from lower house prices, which may follow from a reduction of taxes on buildings, might well dominate the stimulating effect on the intensity of land development. To explore this issue, Banzhaf and Lavery (2010), apply a technique to Pennsylvanian data that allows them to distinguish between the "density effect" that would lead to a larger number of housing units per unit of land as a result of a lower relative tax on improvements, and the dwelling size effect, that would induce consumers to demand larger dwellings in response to cheaper housing, as some of the tax decrease is passed on to them. Their results indicate that the density effect dominates, suggesting that two-tier taxes might help to increase the density of cities. They also find that the development of high-density housing structures is significantly higher in municipalities with two-tier property tax systems.

Another form of taxing property with effects on land use and its efficiency is a tax on property transactions, such as property sales taxes or stamp duties, which are common in many countries. Such a tax may hinder a re-allocation of land and structures to more profitable uses, as it discourages transactions. Leigh's (2009) estimates suggest that transactions may go down by 4-5% in response to an increase of stamp duties by 10%. Taxes on property transactions also discourage mobility of homeowners (O'Sullivan et al., 1995), which can hinder an efficient allocation of labour. They increase incentives to buy cheap land, which is generally farther away from city centres and transport infrastructure. They also encourage the purchase of undeveloped land to build new houses, as purchasing developed land, for example to renovate an existing house, would generate higher transaction taxes (Jörissen and Coenen, 2007). It is therefore often argued that the property sales tax should be abolished (Australian Treasury, 2009; Jörissen and Coenen, 2007), perhaps to be replaced by taxes or charges that better internalise some of the externalities associated with land use changes.

Property tax design is often used to achieve desired land use goals. In many countries, there are lower rates or a preferential value assessment for farmland, forests or open space. In the United States preferential assessment is implemented by assessing the value of land based on its actual use rather than on the market value related to the most profitable potential use, which will be housing development in most

cases. The rationale for this policy is usually to slow the conversion of farmland to housing development and preserve open space. The effectiveness of this instrument is questionable, however. Generally, the land use changes are rather inelastic to taxes (Polyakov and Zheng, 2008; Meng and Zhang, 2011) and the tax rebates provided by preferential value assessments have rarely matched the profits from subdivision and development (Malme, 1993). Results of empirical studies on the effectiveness of preferential use value assessment are not uniform, but overall they suggest that preferential assessment can only slow conversion of farmland, at best. Parks and Quimio (1996), studying the impact of use-value programmes on farmland conversion in New Jersey, find only a very small impact on the preservation of farmland. Ferguson and Spinelli (1998) find no impact of the adoption of use value taxation on the rates of conversion of farmland in four Virginian jurisdictions. Morris (1998), in turn, studies the effect of the existence and duration of use-value programmes on the proportion of farmland in 3 000 counties during the period 1957–1987 and concludes that preferential assessment delays conversion of farmland.

It is also important to ensure that preferred tax treatment of farmland and other types of open space does not have an undesired impact on other land use goals. Polyakov and Zhang (2008) simulate the effects of abandoning use valuation in Louisiana based on empirical estimates of the determinants of land conversion, including the property tax burden. They find that while use valuation slows the development of farmland, it has an even stronger impact in terms of preventing the conversion of agricultural land to forestry uses. However, this runs counter to Louisiana's efforts to reduce erosion and excess agricultural production by promoting conversion of cropland to long term, resource-conserving covers, such as grass or forests, through a policy instrument known as Conservation Reserve Programmes.

Overall, these results suggest that the different effects and costs of tax rebates to slow development of open space need to be carefully assessed and compared to other policy options. Tax relief through preferred assessment is likely to be less transparent than a classified property tax system that applies different rates to different categories of land. In the latter case, it is easier to evaluate the cost of the programme. Given the limited impact of property taxes on land use conversion, tax instruments alone are unlikely to achieve the desired land use goals, unless they are linked to strong planning instruments. Exclusive zoning or farmland preservation plans, such as those in Wisconsin or California, would be examples (Malme, 1993). Purchase of development rights and conversation easements would be other policy instruments to slow or prevent development of open space (Malme, 1993; Anderson, 2003), which should be compared to tax rebates in terms of their effectiveness and costs.

Reform proposals to better internalise development externalities through land taxation

In addition to traditional property taxes or taxes on land value, various other instruments are discussed in OECD countries to contain urban sprawl and internalise the externalities associated with excessive land use. These include different taxes or charges, some of which would target the externalities associated with land use changes much more directly than traditional property taxes or taxes on the value of land.

A tax on land area would be a more direct incentive to make efficient use of land than a tax on land value (Jörissen and Coenen, 2007). Based on a closed urban land market model, Colwell and Turnbull (2003) show that a revenue-neutral shift from a land value tax to a land area tax would decrease city size. Their model also suggests that while a frontage tax, that would tax the street-side length of building plots, would lead to a larger developed area than an area tax. Yet, in their framework, an area tax leads to a city that is too small from a welfare perspective with too much investment in infrastructure. An advantage of both a land area tax and a frontage taxes would be that they are very easy to administer, as they do not require complicated value assessments that necessitate frequent updates. On the other hand, the tax base would erode over time, because the tax base is not linked to prices. Based on the argument that a land value tax would be better able to promote housing development in urban areas, while the land area tax would provide a more direct incentive to use land efficiently, in particular in areas with lower land values,

a proposal to combine a land value tax with a land area tax has been discussed in Germany (Apel et al., 2000).

Another proposal brought forward in the German discussion on property tax reform is a land use tax, which would differentiate land taxes depending on the land use. In such a scheme, tax rates on land would be higher for environmentally more harmful uses. As an example, taxes on open space would be lower than on land that is made impermeable through paving and buildings (sometimes referred to as soil sealing), and intensively used farmland could be taxed more than farmland where practices are organic (Bizer, 1998). The proposal is to categorise land and apply tax rates that differ depending on the environmental impact of land use (Bizer and Lang, 2000). The proponents simulate the effect of a revenue-neutral move from the existing property tax to such a land use tax in the German context and conclude that the tax gives developers an incentive to choose denser projects that use land more efficiently. There would also be an incentive to remove existing structures sealing the soil and revert land to uses that have a better environmental impact. However, in order to achieve significant effects on the environment, the overall tax burden would have to increase, according to this study, at least in the German context, where property taxes are rather low. This proposal has been criticised on the grounds that it might tempt municipalities to convert land to more harmful uses. One solution could be to combine this model with incentives for municipalities to limit land conversions, such as tradable land planning permits (Fuest and Thöne, 2005). Another issue is that a land use tax with land area as a tax base would erode over time, unless tax rates were regularly increased. An alternative solution would be to combine a land use tax with a land value tax (Rodi, 2002), for example by taxing land value, while applying different rates depending on the environmental impact of different land use categories (Fuest and Thöne, 2005).

A tax on the welfare loss associated with the loss of open space due to housing developments (Korthals Alte, 2009; Brueckner, 2000, 2001) has been discussed in the Netherlands and the United States. Such a tax would target externalities associated with new development directly. The difficulty would be to estimate the social value of open space (for an overview of methods see, Blomquist and Whitehead, 1995; for a meta-study see Brander and Koetse, 2011). While there have been some attempts to estimate welfare associated with open space, through contingent valuation and hedonic price methods, those estimates are not very precise. Moreover, results often do not include the social cost of habitat loss due to new development, but only the direct welfare effect of open space loss for human beings. An alternative would be to guess the value of the welfare loss and calibrate a tax on new housing developments in line with the desired effect on land use changes.

Given that changes in land value that are driven by changes in land use planning are essentially windfall gains or losses, it has sometimes been argued that such gains should be taxed (e.g. Barker, 2004). This would seem fair, as the resulting gains are not due to landowners' efforts, but to public action, and there are no distortions to be expected, precisely because it would seem that landowners, who are the subjects of the tax, cannot influence the tax base through their own actions. The new Swiss land planning law foresees a tax on planning-induced value increases, as well as a compensation for planning-induced value losses. In the United Kingdom, on the other hand, several attempts to implement such taxes had to be abandoned eventually. The problem was a lack of credibility in the sustainability of such a tax (Mirrlees, 2011). Essentially, landowners can wait for a new government to abandon the tax and this might hold back land supply and drive up house prices. Perhaps for this reason, a more recent proposal to implement a planning gain supplement was eventually dropped in favour of a less formal system of planning charges (Mirrlees, 2011).

Development impact fees to cover the costs of infrastructure needs generated by new housing developments are relatively common in North America. Usually they are levied as a one-time fee per dwelling or developed land area. Brueckner (2000) argues that these fees are better able to ensure that developers internalise infrastructure cost of new development than more common financing schemes. In

such schemes all citizens of a municipality share the costs by jointly servicing the debt that serves to finance new infrastructure with their tax payments. Development impact fees are thus expected to slow land conversion and urban sprawl (Brueckner, 2000). Results obtained with a mono-centric city model (Brueckner, 1997), where the city has a single center, suggest that moving from cost sharing among all citizens to impact fee based infrastructure financing can reduce the city size to its optimum. Based on analytical and numerical general equilibrium models, Bento et al. (2006) show that urban growth boundaries and development taxes are the most effective instruments to limit urban sprawl, while gasoline and property taxes would preserve substantially less land. Walls et al.'s (2011) results based on a model that allows for varying house and land lot size, along with integrated housing and land markets, suggest that a development impact fee would decrease building and lot sizes. This is the main reason why development impact fees would reduce the total area of developed land in this model. On the other hand, there would not be less development *per se*. Land prices would also decrease, as consumers demand smaller lots. The effect on house prices has been estimated to be small. In the German context, estimates suggest that a tax of EUR 25 per m² of newly developed land (EUR 25 per m² newly sealed land) could reduce land conversion for development purposes by 16 ha per day in Germany, from around 80 ha per day in 2011 (Umweltbundesamt, 2003). Skidmore and Peddle's (1998) econometric estimates suggest that the introduction of development impact fees slows the growth of new housing developments.

Development impact fees and other charges to integrate the externalities associated with new housing developments can also help to revive decaying city centres according to one study. Brueckner and Helsley (2011) find that fiscal instruments which can limit inefficient urban sprawl, such as development impact fees and taxes that are equivalent to the welfare loss due to open space loss, would also reduce urban blight. This term refers to underinvestment in city centres. The investigated fees could increase central city re-investment to its efficient level.

A number of studies have explored the impact of development impact fees on house and land prices. The authors of earlier studies conjectured that development impact fees would either be paid by developers or consumers, depending on relative price elasticities of supply and demand. In the long run, land prices would decrease, as developers demand less land. Prices of existing homes would also increase, as some demand is shifted to the existing home market. These studies tend to find that both the prices of new and existing homes rise in response to an introduction of a development impact fee (Delaney and Smith, 1988a, 1988b; Singell and Lillydahl, 1990). Ihlanfeldt and Shaugnessy (2004) find that existing and new home prices rise in tandem by more than the impact fee. This can happen if the services of infrastructure that are financed by the fee along with reductions in property taxes, that might accompany the introduction of fees, are capitalised in house prices. These authors also find a fall in the price of land. This contrasts with Skaburski and Quadeer's (1992) empirical study, which suggests that land prices increased after the introduction of development impact fees in Toronto.

Overall, there is a host of reform proposals and ideas to better internalise the externalities of land use changes through property taxes. Few of these reforms have actually been implemented anywhere, so far, so empirical evidence for further analysis would be hard, if not impossible to obtain. However, it would still be interesting to investigate in some more detail the wider impact of some of these reform proposals as well as potential winners and losers.

The interaction of property and land taxes with land use planning

Land use planning and taxes – complements or alternatives?

The instrument that is most commonly used to influence land use is land use planning. In some countries, it is explicitly used as an instrument to contain urban sprawl, for example through urban growth boundaries, which exist in some cities in the United States. This has led some researchers to compare the

impact of land use planning to tax instruments to contain urban sprawl. Cheshire and Sheppard (2003) use a micro-simulation model, calibrated to fit the structure of demand for land and other house and neighbourhood attributes in Reading, England, to compare taxes to land use planning as instruments to contain urban sprawl. They find that both the taxation of transport and the taxation of land, as alternative instruments, can achieve the same level of urban land use as urban growth boundaries, but transport taxes would have to be very high to achieve the same result. Using land taxes rather than urban growth boundaries, in contrast, would increase welfare, because in this model revenues would be redistributed to citizens. Achieving the same effects on urban land use with a land tax as with an urban growth boundary would require significant increases in land taxation from a British perspective, but land taxes would remain modest by the standards of many North American communities.

The design of land use planning will critically determine its impact on land use and house prices. Cheshire and Sheppard (2005) argue that the UK planning system puts serious constraints on land supply, driving up house prices and increasing price volatility, with consequences for access to affordable housing that are probably not outweighed by the limits to urban sprawl that the system achieves. Another issue in the UK is that municipalities have very weak incentives to develop land, as most of the resulting tax revenues benefit the central government, while the local government bears much of the cost. However, planning systems in other countries are explicitly designed to provide for a sufficient supply of land for housing (Cheshire, 2008) and the impact on both house prices and land use may therefore be quite different. The authors propose modifying land use planning in the United Kingdom in a way so that it would take price signals into account (Cheshire and Sheppard, 2005). If the price differential between adjacent parcels of land exceeds a certain threshold, this would trigger the release of land for housing development, unless the price differential is exceeded by the social or amenity value of land that would be released in its current use.

While planning policies to limit urban sprawl and taxes can achieve similar results, these policy instruments are better viewed as complements rather than alternatives. While taxes can – at least in theory – be designed to achieve economically efficient land use and internalise certain externalities, such as the loss of open space or the emergence of new infrastructure needs, the aims pursued with land use planning are often more detailed and complex. Reaching a desirable degree of urban density is important, but there also needs to be sufficient green space in central areas and a tax will not be enough to ensure this. Some forms of development outside city centres are more desirable than others, such as development in areas with good connection to existing infrastructure as opposed to development in rural areas, which are less well connected. An important role of land use planning is to distinguish these different forms of development in order to achieve desired results, although tax instruments can be very useful to internalise transport externalities, for example through congestion charges or taxes on emissions.

In fact, comprehensive land use planning is sometimes used as an alternative to development charges to internalise the externalities of housing developments. Some countries use larger-scale land use plans that integrate the development of infrastructure, natural resources and recreational facilities. This approach has been applied with some success in the Netherlands (Korthals Alte, 2009) and in Hong Kong (Tse, 2001). This way, developers can be required to contribute to the preservation of open space or infrastructure development by integrating these aspects in their development projects. This can be a necessary complement or even an alternative to taxation, not least because given their small effect due to limited price elasticity of land use taxes have to be rather high to achieve sizeable effects on urban development and its location (Polyakov and Zhang, 2008; Meng and Zang, 2011, Needham, 2000).

In conclusion, land taxes cannot replace land use planning as an instrument to internalise the externalities of land use changes, in particular housing development. The impact of taxes is too weak to limit urban sprawl sufficiently and it cannot be targeted to achieve more specific results, such as sufficient green space in urban areas. However, the effects of property taxes can sometimes run counter to land use

goals that are pursued with other policy instruments, including land use planning. It is therefore important to understand the impact of taxes on land use to avoid such undesired effects.

Land use planning and taxes from the viewpoint of municipalities

To attract tax revenues, local governments may release more land for development than would be socially optimal. In particular, municipalities have an incentive to convert land to attract businesses, when these pay some local taxes, such as local sales taxes in the United States, or to allow the building of detached family homes that consume a considerable amount of land to attract inhabitants that pay a significant amount of property taxes, or in some cases, local income taxes. Wassmer (2003) provides some evidence for this phenomenon in the United States. He finds that municipalities' reliance on local sales taxes in particular, but also on some other local taxes, has led to stronger non-central retail activity in the Western United States over 1977-1997. However, there is no significant effect of the property tax according to his results.

Several solutions have been discussed to ensure that local governments take into account the impact of their planning decisions on urban sprawl and land use changes.

- One solution would be to avoid that municipalities benefit directly from their planning decisions through higher tax revenues, by allocating these revenues to a higher government level. It could then be re-distributed based on criteria that are not directly related to land use changes, for example on a per capita basis (Löhr, 2010).
- Another instrument would be tradable planning permits that could be useful in countries with a quantitative target for limiting land use changes, such as Germany (Henger and Bizer, 2010). Localised systems of transferable development rights have been used in the United States to achieve environmental targets (Johnston and Madison, 1997; Kaplovitz et al., 2008). The main objection against a country-wide system of tradable planning permits is that the environmental impact of development can differ quite significantly depending on local characteristics. One solution which has been used with regard to heterogeneous air pollutants would be to establish different trading zones delineated based on environmental, social, functional or regional criteria and allow for trading only within those zones (Nuisserl and Schroeter-Schlaack, 2009), although this would probably complicate implementation of the system. There could be trading across zones subject to different "exchange rates".
- An alternative would be to impose a charge on municipalities for converting land to development area. Again, the revenues could be redistributed by a higher government level to all municipalities in the region (Krumm, 2002). This would also reduce land conversion incentives for municipalities, but reaching a precise quantitative target with this instrument would require a trial and error process.

Property taxes as an environmental policy instrument to promote green investment

There is a long tradition of granting property tax exemptions to people or activities that are viewed as vulnerable or to promote desirable activities. Educational, religious and charitable institutions are exempted from property taxes in many countries. Veterans, widows, the blind and the aged have benefitted from property tax relief in some US states. Property tax relief has been used to promote urban renewal in the United States as far back as the 1960s (Land, 1967).

More recently, property tax exemptions to promote green investment have become popular. The United States Department of Energy counts 81 property tax incentives for renewable energy in the United

States on a webpage that serves as a database for such incentives (www.dsireusa.org/summarytables/finre.cfm). It also counts 9 property tax incentives for energy efficiency, usually providing tax relief for buildings that meet certain energy efficiency standards or exempting building value increases that are due to energy efficiency investment, from property taxation for some time. Between 2005 and 2009, federal expenditure on residential energy efficiency programmes was 2.2 billion USD in 2009 prices (Aliaire and Brown, 2011), and in fiscal year 2013 federal tax expenditures targeting energy efficiency improvements in existing and new homes reached almost 4 billion USD (Dinan, 2013). The Czech Republic, Italy and Spain are further examples of countries that provide property tax relief for renewable energy installations (Clement et al., 2005, Cansino et al., 2010).

The efficiency and effectiveness of these property tax rebates would have to be weighed against their direct costs and against more indirect effects related to the narrowing of the property tax base, that can result for example when building value increases that result from energy efficiency or renewables investments are exempted from the property tax. However, studies assessing the efficiency of property tax relief to promote investments in energy efficiency and renewable sources of energy are not available. In general, the evidence regarding the effectiveness of tax incentives and government subsidies to promote energy efficiency investment is mixed. Dubin and Henson (1988) and Walsh (1989) find no effect, while Hassett and Metcalf (1995) find a significant impact of tax relief on residential conservation investment, once they control for individual fixed effects. Even though this study concerns income tax rather than property tax reductions, results indicate that tax incentives can in principle be effective in promoting energy efficiency investments. Other studies suggest, however, suggest that free-riding effects may be large (Alberini et al., 2013) for subsidies and tax rebates to promote energy efficiency investments in private households.

Another policy tool to facilitate the financing of energy efficiency and investment in renewable energy via property tax assessments has been developed in the United States. In the case of the Property Assessed Clean Energy (PACE) instrument municipalities provide private households and businesses with a loan to finance investments in energy efficiency and renewable energy. The credit is secured via municipal bond issuance. It is repaid by property owners via higher property tax payments over 20 years. There has been controversy, however, regarding involuntary subordination to PACE loans which follows from the fact that property tax payments are superior to all other obligations, including mortgages. Since PACE financing is made after a mortgage is taken out, this can amount to involuntary subordination. For this reason, the Federal Housing Finance Agency has issued guidance that has stopped PACE financing in most locations. Changes that have made PACE loans secondary to mortgage loans have made them available in thirteen states, but the financing is pending in most other states. PACE financing for commercial property is, however, unaffected.

The United Kingdom has recently introduced a similar scheme, although it is not linked to property tax assessments, but to electricity bills. Credits provided to households investing in energy efficiency would be repaid via household's electricity bill. The government has set up a Green Deal Financing Company with GBP 200 million seed capital and a range of private sector members. It hopes that the private sector will invest a further GBP 14 billion to ensure the financing of the Green Deal. Both PACE and Green Deal loans are transferred to buyers when the property that has benefitted from the investment is sold. They are, however, at an early stage of implementation and studies regarding their effectiveness have yet to be conducted.

Conclusions and directions for further work

Property and land taxes influence location and land use decisions and it is important to understand the various effects to ensure a coherent and environmentally friendly land use policies. While empirical work on the land use effects of property taxes is scarce some conclusions can be drawn:

- By taxing a rent, a pure land tax would be largely neutral with respect to investment and land use, with somewhat stronger incentives to develop land with a higher value, such as in central areas that are well connected to infrastructure. However, value assessments of land independent of constructions that are built on it would be complicated, in particular if the aim was to assess the value associated with the hypothetical highest value use. Perhaps for this reason and also because the distributional consequences of moving from other forms of property taxes to a pure land tax would raise complicated political issues, a pure land tax has rarely been introduced, despite its theoretical appeal.
- Comparing a pure land tax to more commonly observed property taxes, that also tax buildings, the main finding is that taxing buildings weakens incentives to develop land, but the effects on urban sprawl or the density and size of cities are theoretically ambiguous. Empirical work, although very scarce, suggests that property taxes seem to limit city size, with somewhat stronger effects when the tax rate on buildings is lower than on land. Differentiating property taxes across different uses to limit the conversion of farmland is effective to some extent, slowing the conversion somewhat, and it can have undesirable side effects.
- Taxing property transactions favours location decisions that promote urban sprawl, while potentially inhibiting worker mobility and transactions that would favour putting land to its most valuable use.
- When local governments have wide-ranging autonomy regarding land use policies, while benefitting from tax revenues that arise following land use changes, an additional dimension arises, as there may be incentives to convert more land for development than what would be desirable from a social welfare and environmental perspective.

The exact impact of property taxes will depend on their size, the relation between the tax rate on land, on the one hand, and improvements, on the other, differences in rates or value assessments across different land use categories and on exemptions. It would be interesting to assess these issues in different country-specific contexts.

There is a wide range of proposals in different countries to reform the property tax to achieve better environmental outcomes. While some variants of current reform proposals have been tested, such as development impact charges, others have not, for example a classified tax system that would tax environmentally more harmful land uses at a higher rate. Further research regarding these proposals can therefore only rely on a very narrow empirical basis, but it would be possible to assess who might lose and who might gain from a reform, providing a basis for considerations regarding the political economy of reforms. Also, more in-depth analysis on the wider impact of some of the reform proposals would be interesting.

Finally, property tax exemptions and rebates have been used to promote investments in energy efficiency and renewable sources of energy. Again, research regarding the effectiveness and efficiency of such policy approaches is scarce. Another, more recent policy approach is to use property tax assessments to finance investment in energy efficiency and in renewable energy in the residential sector in an effort to overcome credit constraints, although with only limited practical experience up to date.

The analysis of the environmental impact of the property tax and possible reforms to improve these effects could be pursued further in a number of ways. The fiscal network could

- collect more detailed information about the nature of property taxes in OECD countries to better analyse their impact on land use.

- envisage empirical work on the impact of different types of property taxes and their size on the rate of land use changes and/or indicators of urban sprawl.
- analyse in more detail the potential impact of different reform options on land use, in particular by identifying winners and losers to better understand the political economy of these reform options.
- pursue a more in-depth analysis for a few volunteer countries regarding the environmental impact of their property tax systems and possible reforms, as case studies.
- analyse property tax rebates and property tax assessments as policy tools to promote green investment in the residential sector.

Delegates are invited to discuss these options and decide on the future direction of work.

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