

**Growth and Infrastructure in Alachua County:
Does Conventional Development Pay Its Share of Public Costs?**

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Executive Summary

Academic studies conducted in recent years have been unable to reach a consensus regarding the desirability or long run fiscal impact of alternate development patterns (the current U.S. development pattern versus more compact development). However, if each type of development paid its incremental cost, we could simply leave it to consumer sovereignty to choose which type of development pattern offered the highest net benefits. Thus, this study asks a simpler question – does the current development pattern in Alachua County generate enough tax revenue to cover its associated incremental public costs?

Employing a transparent approach that accounts for indirect impacts and impacts over time and treats development on a community-wide basis, we examine whether or not new residents in Alachua County pay their share of infrastructure costs. We estimate that there was \$25,113 of state and local government infrastructure per household in Alachua County in 2000. Bond issues to be paid by new residents and existing residents finance some of the needed infrastructure. New residents share in the repayment of past debts incurred to provide infrastructure for existing residents and share in the provision of infrastructure for later growth. New residents also make other purely growth related tax payments - such as sales taxes on the building materials for their new homes, offices, and stores; property taxes on vacant “model” homes; documentary stamp taxes; and the current value of any taxes paid on parcels while they are under development but before they are occupied. In order to cover their proportionate share of infrastructure costs, each

new household must generate enough taxes and fees to pay the portion of the \$25,113 infrastructure cost that is not bond financed.

We estimate that the typical new household pays *more* than its share of infrastructure costs by \$3,114. Therefore, we find no reason for Alachua County to implement substantial impact fees based on the argument that new conventional growth does not pay its associated public costs. There may, of course, be other reasons to levy moderate impact fees, for instance pollution or congestion of favorite natural recreational locations that represent social costs not internalized by new residents (or existing residents for that matter). Charging new residents development taxes and fees that are substantially in excess of the associated costs of providing public infrastructure and services would entail negative economic consequences for the citizens of Alachua County. The two that seem most likely are a misallocation of scarce resources and seriously and unduly delayed development accompanied by a general economic slowdown. Therefore, significant impact fees are clearly not warranted in Alachua County if the main argument in favor of them is that conventional development does not pay its share of public costs.

1. Introduction

From 1960 to 2000, Florida grew at a higher average annual rate, 3.5%, than every other state except much smaller Arizona and Nevada. One of the very basic causes of this phenomenon is that many people (not just retirees) find Florida a desirable location in terms of its winter weather and recreational opportunities. In the early years of the twentieth century, long miserable summers and a lack of economic opportunities balanced these desirable characteristics. In the latter part of the twentieth century, however, the advent of air-conditioning made summers much easier to bear and the economic performance of the South caught up to the rest of the nation. Coupling these developments with the abundance of affordable land, Florida's rapid growth is not surprising. Further, since we still have a lot of relatively affordable land, there is no reason to expect rapid population growth to end any time in the near future. This presents communities in Florida with unique problems and opportunities related to the following two questions. First, what kind of community do we want to be (today, next year, and fifty years from now)? Second, how do we pay for it? This report deals with one small part of the second question for Alachua County – does incremental conventional growth generate enough tax revenue to pay for the cost of maintaining the same level of public services as enjoyed by typical existing residents and, if there is any deficit or surplus, what is its extent?

Many studies related to the cost of growth ask “Is there a development pattern that would lead to incremental costs for public services less than those associated with the conventional growth?” A large literature on “the cost of sprawl” addresses this issue, which is but one aspect of the first question posed above regarding what type of community we want to be, and which is distinct from the issue addressed here. While, as such, it is mostly beyond the scope of this

report, a few words are called for in the interest of avoiding confusion later on, since it can at times be easy to confuse the questions.

Early studies in the “cost of sprawl” literature, particularly *The Costs of Sprawl* (Real Estate Research Corporation (RERC), 1974) found that hypothetical compact development leads to lower capital and operating costs than conventional development (sprawl) by a large margin, only to be found fatally flawed by later academic analysis.¹ Unfortunately, many people seem to have taken these studies at face value and further to have made the jump from these initial findings to the view that 1) sprawl should be discouraged and 2) conventional development does not pay its own way. However, even if we take findings that sprawl is more expensive than compact development at face value, *neither* of these conclusions necessarily follows. First of all, if sprawl entailed higher operating public costs, it would remain to be shown that sprawling development does not generate enough public revenue to pay those costs. Second, lower costs do not necessarily imply higher net benefits – people presumably like their current lifestyle choices, and if they like them enough, the benefits may more than outweigh even substantial extra costs. Again, however, these findings cannot be taken at face value and more recent and better-done studies have failed to reach a strong consensus regarding the degree of any net ill effects from conventional development. *The Costs of Sprawl – Revisited* (Burchell et. al., 1998) provides a thorough review of the literature on this question.

¹ As noted below, Chapters 2 and 3 of *The Costs of Sprawl – Revisited* (Burchell et. al., 1998) provide a thorough overview of the difficulties in reaching an academic consensus in this regard. Altshuler (1977) and Windsor (1979) are widely cited critiques of the original *The Costs of Sprawl*. The exchange between Gordon and Richardson (1997) and Ewing (1997) in *Journal of the American Planning Association* provides an illuminating and non-technical look at why a more or less definitive conclusion has not been reached in the academic literature regarding the relative costs and benefits of conventional and more compact development patterns.

While it is difficult to say for certain what type of development offers the higher net benefits in the long run, there is a better way to get future development right – charge each type of new development its marginal cost. The ability to price at marginal cost is in fact one of the theoretical justifications for imposing impact fees, although local governments have been hesitant to levy different fees on different residents depending on where they choose to live within the jurisdiction (Nicholaus, Nelson, and Juergensmeyer, 1991 and Frank, 1989). If an increment of conventional development does not pay its incremental share of public costs, there might well be too much conventional development. But, if conventional development already pays its associated incremental costs, large impact fees are not justified and will in fact cause socially undesirable and inefficient outcomes. One such undesirable consequence is simply the waste of scarce resources over the long run caused by skewing their allocation toward less valuable or more costly uses. Another, negative consequence, which is potentially much more serious in the short run and intermediate run, would be the economic slowdown and transition costs that would accompany any severe and undue delay in development in Alachua County. Over charging new development to a small degree would probably not lead to this problem. However, the fact that potential new households and businesses have a wide variety of locations to choose from in Florida that are on fairly equal footing with Alachua County means that a moderate to large degree of overcharging relative to other counties might well have exactly this effect.

Our analytic approach is more sophisticated than “arithmetic” fiscal impact models but less complex than “econometric simulation” fiscal impact models. The advantage of this approach is that it accounts for indirect impacts and impacts over time and treats development from a community-wide perspective while avoiding complications that might make the results difficult

to interpret or unstable. In order to cover their proportionate share of infrastructure costs, each new household must generate enough taxes and fees to pay the portion of the \$25,113 infrastructure cost incurred per household that is not bond financed. We estimate that the typical new household in Alachua County pays \$3,114 *more* than its share of infrastructure costs. Therefore, we find no reason for Alachua County to implement substantial impact fees based on the argument that new conventional growth does not pay its associated public costs. Doing so would result in a misallocation of scarce resources and might seriously and unduly delay development, leading to a general economic slowdown. There may, of course, be other reasons to levy moderate impact fees, for instance pollution or congestion of favorite natural recreational locations that represent social costs not internalized by new residents (or existing residents for that matter), but these are separate from the question of whether or not new growth generates enough tax revenues to pay associated incremental public costs.

The remainder of the report is organized as follows. Section 2 lays out our analytical approach, discussing the assumptions used and deriving the formulas that serve as the basis for our empirical results. Section 3 details the data used to implement our analytical approach empirically and presents our findings. Section 4 discusses the implications of the report's empirical findings, including not only what can be inferred from the report, but also some things that cannot. Finally, section 5 concludes.

2. Analytic Approach

How do we calculate how much new residents should be charged to cover their share of infrastructure costs? One simple approach would be to subtract current indebtedness for infrastructure from the current value of existing infrastructure and then charge new residents up

front for an equal per capita share of the existing infrastructure. They would then share equally in the repayment of the existing debt and in expenditures for future infrastructure increases. Of course, in calculating the charge, credit should be given for any tax payments made in the process of development that were made before the state or municipal governments incurred operating costs associated with the new resident – although calculating the magnitude of such credits can be quite difficult. (Nicholas, Nelson, and Juergensmeyer, 1991) This assumes that the new residents will generate enough revenues to cover associated operating costs over the course of their lives, but no significant excess, and that new residents do not significantly alter the marginal cost of providing the current level of infrastructure. We consider these possibilities in more detail below. Since the new residents reduce the infrastructure stock per person, concurrency requires that new infrastructure be funded before the commencement of new development. It turns out that to satisfy concurrency while also making sure that new residents pay, in present value terms, the full incremental public costs associated with their taking up residence, something very similar to the approach described above must be implemented.

According to the historical overview in *The Costs of Sprawl - Revisited* (Burchell et. al. 1998, page 13), most fiscal impact analyses have found conventional residential development to be generally fiscally negative, open space or undeveloped land to be break-even, and nonresidential development to produce positive fiscal impacts. Yet, in evaluating whether or not new development pays its own way, the approach taken by these analyses is logically very problematic. It is impossible to think about continual growth in non-residential uses without accompanying growth in residential uses or to think about continuing growth in only high revenue yielding types of residential uses. For instance, if only affluent professionals moved into

a community and no new stores or office complexes were built, the new residents would have no one to provide them with consumer goods, nowhere to buy them, and nowhere to work.

In order to answer the general question of whether new development pays for itself, we must consider all of the cost and revenue impacts of the new development. This means that, when a new resident comes into the area, we must look at the taxes paid and costs incurred not only where they live, but also where they work and shop. In order to make it feasible to include all of these direct and indirect impacts, and to be able to answer the question of whether new growth as a whole “pays for itself”, we look at increments of new residents that reflect the overall composition of the community. However, this approach sweeps some of the marginal cost pricing question under the rug. If we find that the “typical” new resident pays his way, it could still be the case that the resident who moves into a mobile home or low cost housing does not pay their way while the resident who moves into high cost housing more than pays their way. This possibility might lead to a very regressive impact fee schedule, and, to keep this initial analysis simple, we ignore it.

In the analysis that follows, we assume that development of vacant parcels to house new residents, collection of any taxes and fees associated with development, and increases in infrastructure to accommodate the new residents all take place over the period before the new resident arrives. This is consistent with the spirit of concurrency requirements that new building permits cannot be issued until new infrastructure, or at least the mechanism to finance it, is in place. The term “new residents” refers to the additional population that will take up residence at the end of the current period or beginning of the next period. Beginning in the period they take up residence, but not before, the government will incur operating and depreciation expenses

associated with these “new residents.” Altering the timing slightly does not change the framework in any meaningful way.

We divide the revenues associated with new development into two types; recurring tax payments that commence upon taking up residence, and taxes targeted specifically at the growth process itself that are paid more or less simultaneously with taking up residence but do not recur thereafter. Recurring taxes consist mainly of property and sales taxes. Taxes targeted at the growth process would include impact fees, but also include things such as taxes on vacant or partially developed lots while they are being developed, sales taxes on the materials for new homes and businesses, documentary stamp taxes, property taxes on unoccupied “model” homes, and sales taxes on purchases made by new residents while in the area making arrangements for their new home or job.

New residents clearly pay more than their share of recurring taxes in present value terms. Regressing the natural log of taxable value on the effective date of improvement (controlling for use category) for 53,218 residential, commercial and industrial properties for which the effective improvement date was after 1950 (essentially all improved private properties in Alachua County with the major improvements made after 1950), we find that every year prior to 2000 that the property was improved, taxable value falls by 3.27% (the t-statistic is an impressive 106.13). This means that in 2001, the typical single family home built in 2000 will pay approximately 216% as much in property taxes as the typical home built in 1976 (the median effective year in the 2000 tax roll). Similarly, from 1995 to 2000 gross sales per capita in Alachua County rose at an average annual rate of 3.34%, while the average annual rate of inflation was less than 2% over

the same period.² Since today's new homes are tomorrow's old homes, there will come a time when homes built in 2000 pay less than an equal per capita share of recurring property taxes. However, since new development pays more than its share up front, only receiving a break relatively far into the future, in present value terms new residents will pay considerably more than existing residents in recurring taxes.

The costs imposed by a new resident are the initial cost of providing the needed infrastructure, the present value of future investment needed to replace depreciation of that infrastructure, and the present value of all future operating costs associated with the new resident. One might at first think the findings that "sprawl" is more expensive to serve would mean that new residents are more expensive to serve than existing residents – that is marginal costs are considerably above average costs. However, this would be the case only if sprawl is more expensive (the degree to which this is the case being an unsettled issue, as discussed elsewhere) *and* new development is more "sprawling" than previous development. The portion of Alachua County's population residing in the incorporated area of Gainesville was 46.85% in 1990 and 46.04% in 2000 – so new development in Alachua County would not appear to be much more "sprawling" than old development.

There are other reasons marginal and average costs can diverge. Probably the largest force working to push marginal costs above average costs is increased population pressure on land prices, which in turn drives up the costs of public roads and other facilities (to the extent that growth is directed to areas where land is cheaper, this is somewhat offset). On the other hand, additional population allows additional spreading of fixed costs and may give rise to other

² Authors' calculations based on gross sales data from the Florida Department of Revenue's website, population data from the Bureau of Economic and Business Research at the University of Florida, and inflation data from the United States Bureau of Economic Analysis website.

economies (say due to greater purchasing power or increased opportunities to employ expensive technologies that are cost saving but only at a sufficiently large scale), which push average costs above marginal costs.

To make the analysis simple, we assume that in any given period, new residents bear a per capita share of recurring tax payments equal to existing residents, and cause the community to incur costs equal to existing residents on a per capita basis. Since new residents pay more in revenues, increased spreading of fixed costs may offset increasing marginal costs, and more conventional development is no more “sprawling” than past conventional development, this simplification may either over or under estimate any fiscal burden created by new growth. Of course, costs may rise over time as the community wide level of service is increased, but that increase in costs would have nothing to do with growth – we are asking if growth generates enough revenue to cover provision of the current level of services and infrastructure. If infrastructure per capita is to be increased, existing residents must bring the community up to the new standard before imposing higher standards for new residents. This is the usual standard in calculating impact fees. (Nicholaus, Nelson, and Juergensmeyer, 1991)

Since a large amount of infrastructure is bond financed, we must find a way to factor indebtedness into the analysis. We assume that government financial managers maintain a constant level of indebtedness relative to the stock of infrastructure, thus locking in that component of the current finance structure over time. Together with the assumptions described above, this allows us to devise a very simple formula for any deficit or surplus associated with new development. Although simple, this formulation involves a dynamic setting with ongoing community-wide growth (into the indefinite future), something beyond the scope of the typical “arithmetic” fiscal impact analysis. It requires fewer assumptions than “econometric simulation”

fiscal impact models, presents fewer opportunities for mistakes and allows us to reasonably judge the sources of potential inaccuracies.

In any particular period, tax revenues consist of recurring tax revenues and revenues which I have referred to as growth specific revenues (including taxes paid by the businesses where the existing residents work and shop), and must cover operating expenses, depreciation (if the existing capital stock, and thus level of service, is to be maintained), debt service, and the portion of infrastructure to accommodate growth that is not debt financed. That is:

Expenditures = Operating Expenses
 + Depreciation Charges
 + Debt Service
 + # of New Residents x Non-Bonded Infrastructure Per Capita, and

Tax Collections = Recurring Taxes on Residents (Property, Sales, etc.)
 + Growth Specific Taxes & Fees

Since expenditures cannot exceed tax collections and we assume no one wants tax collections to exceed expenditures, tax collections must equal expenditures on average. Because we are concerned with whether new growth generates enough revenue to maintain the current community standard, not increase it, we impose that all new infrastructure investment is related to providing for growth (additional infrastructure improvements should be financed by the whole community). Expressed on a per capita basis, having adjusting all terms (including the municipal interest rate) for inflation, this gives:

$$\begin{aligned}
\text{Recurring Taxes Per Capita} &= \text{Operating Expenses Per Capita} \\
&+ \text{Depreciation Rate} \times \text{Per Capita Infrastructure} \\
&+ \text{Municipal Interest Rate} \times \text{Bonded Per Capita Infrastructure} \\
&+ \text{Population Growth Rate} \times (\text{Non-Bonded Per Capita} \\
&\quad \text{Infrastructure} - \text{Growth Specific Taxes \& Fees Per New} \\
&\quad \text{Resident}).
\end{aligned}$$

The present value of the tax bill paid by a typical new resident (who actually takes up residence at the beginning of the next period) is equal to the present value of the annual stream of recurring tax payments per capita plus the per new resident amount of growth specific taxes and fees. The cost is equal to the initial infrastructure expense plus the present value of depreciation and operating expenses. Subtracting the present value of tax bill from this cost gives the amount by which new growth does not pay its own way, or the difference between incremental cost and incremental revenue from conventional development, which we refer to as an incremental subsidy. That is:

$$\begin{aligned}
\text{Incremental Subsidy} &= [1 - (\text{Population Growth Rate}/\text{Real Interest Rate})] \\
&\quad \times \\
&\quad (\text{Non-Bonded Per Capita Infrastructure} - \text{Growth Specific Taxes} \\
&\quad \text{\& Fees Per New Resident}).
\end{aligned}$$

This formula shows the degree to which the typical new resident does not pay their share of public costs. Since all residents face the same millage rates and sales tax rates, the recurring taxes paid by new residents must cover associated operating expenses. If all infrastructure investment beyond that paid for by growth specific taxes was bonded, there would not be any incremental subsidy. Further, to the more infrastructure that is bonded the lower the subsidy will

be. This is because, while existing residents help pay debt service on new capital, new residents help to pay debt service on old capital. To the extent that non-bonded capital is not covered by growth specific taxes, new residents initially create a deficit equal to the amount of non-bonded infrastructure per capita less the portion paid for by growth specific taxes and fees. However, the subsidy is less than that burden because, in subsequent periods, tomorrow's new residents will place a similar burden on today's. Therefore, paradoxically, the subsidy is smaller if the population growth rate is larger, all else equal.

The present value of the burden of future growth borne by today's new residents must be subtracted from the initial burden created by the new resident to arrive at the incremental subsidy. Since the present value of a future flow is subtracted, the incremental subsidy will be lower the lower is the real interest rate (not the municipal rate, but rather the typical resident's rate of time preference). Unless the interest rate is as low as the growth rate, however, the subsidy will not be eliminated in this approximation unless growth specific taxes are equal to non-bonded per capita infrastructure investment.

Similar calculations determine the incremental excess tax burden to the community this year from one more new resident or one year's worth of new residents, which we refer to as the deficit per new resident and the deficit, respectively. We also calculate the present value of the excess tax burden from all future new residents, which we refer to as the Growth Burden. These are given by:

$$\text{Deficit Per New Resident} = (\text{Non-Bonded Per Capita Infrastructure} - \text{Growth Specific Taxes} \\ \text{\& Fees Per New Resident}),$$

$$\text{Deficit} = \text{Population Growth Rate} \times \# \text{ Current Residents} \\ \times \\ \text{Deficit Per New Resident, and}$$

$$\text{Growth Burden} = [1 + (1/\text{Real Interest Rate})] \times \text{Population Growth Rate} \\ \times \\ \# \text{ Current Residents} \times \text{Deficit Per New Resident.}$$

Since ongoing growth may place a burden on the new residents, the deficit per new resident is larger in absolute value than the incremental subsidy per new resident. While the incremental subsidy decreases with the growth rate, as discussed above, the deficit and growth burden increase with the growth rate, as the current residents must pay some share of the per capita infrastructure costs for a larger number of residents. Thus, we have the additional paradox that, if non-bonded infrastructure per capita is more than growth specific taxes, as the growth rate increases the subsidy shrinks (new residents come closer to paying their share), but the deficit and growth burden grow (current residents pay increasingly more than their share). We now turn to describing our data and applying these formulas to produce our empirical results for Alachua County.

3. Data and Results

To implement the approach outlined above, we need estimates of the per-capita stock of state and local capital, the fraction of that stock that is debt financed, and growth specific taxes. Using data from the U.S. Department of Commerce's Bureau of Economic Analysis (BEA), we first apply the average annual growth rate of the national per capita state and local government capital stock from 1995 to 1999 to the 1999 national per capita state and local capital stock to produce

an estimate of the 2000 national per capita state and local capital stock.³ Holtz-Eakin (1991) provides estimates of the 1988 per-capita level of state and local infrastructure for each of the 50 states and the District of Columbia. We use his work to estimate the ratio of Florida's per capita state and local capital stock to the national average state and local capital stock per capita. We then apply this ratio to the 2000 national per capita state and local capital stock estimate to estimate Florida's per capita state and local capital stock in 2000. Since infrastructure such as roads and school buildings are not transportable and involve significant land costs, the cost of constructing a given amount of infrastructure will vary considerably across counties. Therefore, we multiply the state average per capita state and local infrastructure by the house construction cost component of the Florida Price Level Index (produced by the Bureau of Economic and Business Research at the University of Florida and the Florida Department of Education) to arrive at an estimate of the per capita stock of state and local capital in Alachua County in 2000. This gives an estimate of \$10,464 for Alachua County's 2000 stock of state and local capital per capita (or \$25,113 per household). These figures are contained in Table 1.

³ Katz and Herman (1997) and Fraumeni (1997) describe the methodology underlying the BEA capital stock estimates.

Table 1: State and Local Infrastructure Per Capita	
1999 U.S. State and Local Government Capital Stock Per Capita (BEA)	\$ 14,648
Average Annual Rate of Increase In US State and Local Capital Stock, 1995-1999 (BEA)	4.47%
Estimated 2000 U.S. State and Local Government Capital Stock Per Capita	\$ 15,302
1988 Ratio of Florida's Per Capita State and Local Government Capital Stock to the National Average (Holtz- Eakin, 1991)	83.24%
2000 Florida State and Local Government Capital Stock Per Capita	\$ 12,737
Alachua Housing Cost Index - Florida Average=100 (From 2000 FPLI Study)	82.15
2000 Alachua County State an Local Government Capital Stock Per Capita	\$ 10,464

From the 1997 Census of Governments (U.S. Department of Commerce, 1997), we obtain Florida's state long-term indebtedness per capita, Florida's average state and local indebtedness per capita, and Alachua's countywide state and local indebtedness per capita (including the county government, school board, and all municipal governments). We adjust Alachua County's indebtedness by the state average ratio of local government bond funds and offsets to local debt to get an estimate of per capita indebtedness for existing infrastructure. We estimate the 1997 Alachua County per capita state and local capital stock by deflating the 2000 estimate by three years using the national average rate of increase. This allows us to calculate the ratio of indebtedness to infrastructure stock for Alachua County at 40.81%. These figures are given in Table 2.

Table 2: State and Local Infrastructure Debt Per Capita	
1997 Florida State Long Term Debt Less Bond Funds and Bond Offsets Per Capita	\$ 741
1997 Florida Local Government Long Term Debt Less Bond Funds and Bond Offsets Per Capita	\$ 2,178
1997 Ratio of Florida Local Government Bond Funds and Bond Offsets to Long Term Debt	42.26%
1997 Alachua Long Term Per Capita Debt (County, School Board, & All Municipalities)	\$ 5,204
1997 Alachua Local Government Long Term Debt Less Bond Funds and Bond Offsets Per Capita	\$ 3,005
1997 Alachua State and Local Long Term Debt Less Bond Funds and Bond Offsets Per Capita	\$ 3,746
Infrastructure Debt to Asset Ratio - Alachua County	40.81%

Table 3 lists additional parameters of interest. These include: population, average household size, and per capita income for Alachua County in 2000 (from BEBR); the average rate of population growth from 1990 to 2000 (from BEBR); the countywide average millage rate (from the Florida Department of Revenue); the ratio of just value to sales prices and the ratio of land value to just value for Alachua County (authors' calculations based on 2000 tax roll); the share of material costs in structure costs (authors' calculations based on construction cost indexes for Florida cities from R.S. Means Inc.); the average annual rate of inflation from 1990 to 2000 (from the BEA website); the current prevailing interest rates as of July 6, 2001 on 30 year mortgages and state and local bonds (from the Federal Reserve website); and the inflation adjusted interest rate and municipal interest rate (the nominal rates less the inflation rate).

Table 3: Other Data and Parameters	
2000 Alachua Population	217,955
Alachua Average Household Size	2.4
Alachua Average Annual Population Growth Rate (1990 to 2000)	1.84%
Alachua 2000 Per Capita Income	\$ 27,208
Alachua County Wide 2000 Average Millage Rate	26.40
Alachua Just Value to Sales Value Ratio	82.47%
Alachua Land Share in Just Value	20.18%
Materials Share in Structure Cost	51.55%
Average Rate of Inflation (1990 - 2000)	2.36%
Nominal Interest Rate	7.11%
Real Rate of Time Preference	4.75%
Nominal Municipal Interest Rate	5.21%
Real Interest Rate on Municipal Bonds	2.85%

The final piece of data needed to calculate the difference between incremental public costs and revenues associated with growth is an estimate of growth specific tax revenues. Not surprisingly, this is the most difficult piece of information to acquire. Property taxes on parcels under development are a source of growth specific property tax revenue, and sales taxes on the materials used in new construction are a source of growth specific sales tax revenue. To provide an estimate of these tax collections, we calculate the number of various types of parcels per household in 2000 based on data reported in *Florida Property Valuations and Tax Data*. (Florida Department of Revenue, 2000) Using over 50,000 observations from the 2000 tax roll, we calculate the average land value and just value for each type of parcel over all parcels improved after 1996. Using the just value to sales price ratio from Table 3, we estimate the average market value of these parcels. Finally, we subtract land value from just value, adjust by the just value to

sales price ratio, and multiply by the share of materials in structure costs from Table 3 to arrive at an estimate of the average materials for these parcels. These figures are shown in Table 4.

Table 4: 2000 Alachua County Parcel Count and Average Value Data By Parcel Type							
Parcel Type	Single Family Residential	Mobile Homes	Condo-miniums	Multi Family (Less Than 10 Units)	Multi Family (10 or More Units)	Improved Commercial	Improved Industrial
Number of Parcels	46,067	5,319	3,090	1,760	382	2,839	568
Number of Parcels Per Household	0.5073	0.0586	0.0340	0.0194	0.0042	0.0313	0.0063
Land Value Per Parcel Improved After 1996	\$ 26,458	\$ 15,094	\$ 18,021	\$ 11,556	\$ 557,040	\$ 181,370	\$ 59,766
Just Value Per Parcel Improved After 1996	\$ 139,496	\$ 49,983	\$ 89,300	\$ 107,656	\$ 5,380,680	\$ 596,731	\$ 420,613
Market Value Per Parcel Improved After 1996	\$ 169,147	\$ 60,607	\$ 108,282	\$ 130,539	\$ 6,524,409	\$ 723,573	\$ 510,020
Materials Cost Estimate Per Parcel Improved After 1996	\$ 70,657	\$ 21,808	\$ 44,555	\$ 60,070	\$ 3,015,141	\$ 259,632	\$ 225,557

Using data on over 50,000 parcels in Alachua County from the 1997 and 2000 tax rolls, we construct a rough estimate of the average length of time that a parcel under development is taxed as a vacant residential, commercial, or industrial lot - approximately 2.5 years. Assuming that the typical new resident causes new development of different types of parcels on a per capita basis equal to existing 2000 development (for example .5073 single family parcels per household), we calculate property taxes on lots under development by applying the countywide average millage rate to the average land value for each type of parcel, multiplying by the number of parcels per household, summing across types of households, and multiplying by 2.5 years. This gives an estimate of \$1,553 of property tax revenue on lots under development per new household. To

estimate sales taxes on building materials, we simply multiply the materials cost estimates for each parcel type by the number of each type of parcel per household, sum, and apply the 6% sales tax rate. This gives an estimate of \$3,721 of sales tax revenue on building materials per new household. These estimates are shown in Table 5.

We can also use the data from Table 4 to produce a rough lower bound measure of documentary stamp tax revenue from new development. To do so, we apply the tax rate of .7% on the value shown on recorded deed to the market values in Table 4, multiply by the number of each type of parcel per household, and sum. To estimate the documentary stamp revenue from recorded mortgages, we assume that 80% of the market value of the development per new resident is mortgaged and apply the tax rates of .35%. The 80% mortgage figure is based purely on the assumption of the standard residential mortgage. As we have not yet performed any independent calculations to arrive at a potentially more accurate estimate, the actual figure might be a bit higher or a bit lower. However, since our estimate of documentary stamp revenues is small relative to our other estimates of growth specific taxes, and since mortgage stamp revenues account for less than one third of growth specific documentary stamp tax revenues, moderate or even sizeable changes to this percentage would result in insignificant changes in the final subsidy and deficit estimates. These calculations result in the estimate of \$1,458 of documentary stamp tax revenue per new household shown in Table 5. In all likelihood the actual documentary stamp revenues attributable to new growth are higher than this estimate for two reasons. First, each parcel associated with new development may change hands more than one time in the development process. Second, some new residents purchase houses from current residents, who in turn purchase new houses, again increasing the number of deeds recorded as part of the new development process.

Table 5: Property Taxes on Lots Under Development, Sales Taxes on Materials, and Documentary Stamp Taxes	
Sales Taxes on Building Materials Per New Household	\$ 3,721
Property Taxes on Vacant Lots Under Development Per New Household	\$ 1,553
Documentary Stamp Taxes Per New Household	\$ 1,458

The calculations described above ignore a great many potential sources of growth specific tax revenues - property taxes on model homes and sales taxes on durable equipment purchased when starting new businesses to name just two. In order to arrive at an estimate of property and sales tax revenues due to new growth that captures most direct and indirect impacts, we turn to statistical analysis of county-by-county property values and sales tax collections in Florida. For the 67 counties of Florida from 1995 to 1999, we obtain data on aggregate just values from *Florida Property Valuations and Tax Data*. (Florida Department of Revenue, 1995-2000) We also obtain data on housing starts and personal income (total and per capita) from the *Florida Long-Term Economic Forecast 2000 Data Appendix*. (Bureau of Economic and Business Research, 2000). The underlying idea is that recurring property tax revenues are basically determined by total property value, which is basically determined by total personal income in the county – more people of a given per capita income mean more homes and businesses, while richer people demand more expensive homes to live in, offices to work in, and stores to shop in, and both effects are captured by total personal income. To the extent that growth stimulates additional non-recurring property tax revenues from model homes or more residential, commercial, or industrial property cleared and under development but not yet occupied, etc.,

changes in the number of new households (multiplied by per capita income to account for growing wealth over time) should be associated with measurable changes in just values which can be identified by regressing aggregate just value for each county on total personal income and housing starts multiplied by per capita income (to control for changes in wealth and thus the value of new development over time).

Some counties may have higher just values than would be indicated by total income for reasons other than growth that are none the less correlated with growth. For instance, counties with beautiful beaches may be attractive to both tourists and potential new residents. To avoid confusing these effects, we control for county specific effects by including county dummy variables. We also interact the county dummy variables with total personal income. We thus rely on variation within counties in the product of per capita income and housing starts around its county mean to identify the effect of growth itself on property tax revenues (as opposed to the new household once new residents are living in it). The results of this regression are recorded in Table 6. The coefficient on the product of per capita income and housing starts was 9.2999. Applying the countywide millage rate and 2000 per capita income from Table 3, this translates to \$6,680 in growth specific property tax revenues per housing start in addition to the recurring property tax revenues that come as a result of a higher permanent population. This estimate is quite precise – the low standard error (1.7278) implies there is only a 10% chance that the revenue effect is less than \$5,089. This is our best estimate of non-recurring growth specific property tax revenues.

Table 6: Just Value and Taxable Sales Regressions			
Dependent Variable	Just Value	Taxable Sales	Taxable Sales
Income Coefficient Varies With Period	No	No	Yes
Coefficient (Housing Starts * Per Capita Income)	9.2999	10.5225	7.2330
Standard Error	1.7278	0.5720	0.5869
Observations	335	335	335
R-Squared	99.98	99.84	99.95
Tax Revenue Per Housing Start	\$ 6,680	\$ 17,178	\$ 11,808
Lower Bound (10%)	\$ 5,089	\$ 15,981	\$ 10,579

We apply a similar approach to estimate non-recurring sales tax revenue from growth. To do so, we obtain data on taxable sales, housing starts, and personal income (total and per capita) from the *Florida Long-Term Economic Forecast 2000 Data Appendix* (Bureau of Economic and Business Research, 2000) the 67 counties of Florida from 1975 to 1999. Caution must be exercised in two respects, however, in conducting the analysis. First, as in the property tax regression, some counties may have higher taxable sales and higher growth rates for some other basic permanently underlying reason. Therefore, we include county specific effects to control for such underlying variables. We also interact the county dummy variables with total personal income so as to allow the effect of total personal income to vary across counties. Second, cyclical impacts which boost taxable sales in general may also boost housing starts, but, again, we do not want to confuse cyclical spending on other goods and services with the impact of growth. (This was not a potential issue with the just value regression since it was focused entirely on property valuations and thus could not pick up spending on other goods due to cyclical effects. County specific effects, however, cannot control for these cyclical effects.) Total personal income will control for some of the cyclical variation. However, since the BEA series

income data is somewhat noisy at the county level, the control will not be perfect. Even if the income measure were not noisy, it would not control for cyclical fluctuations in the portion of income spent on goods and services. To solve this problem, we divide the data into five five-year periods and average each variable over each five-year period. This should remove any county level cyclical effects.

The results of this regression are given in the second column of Table 6. The coefficient of 10.5225 on the product of total personal income and housing starts translates to \$17,178 of growth related sales tax revenue *in addition to ongoing sales tax revenues related to the increase in population*. The small standard error (.5720) implies that the effect is very precisely estimated. However, another potential is that, over such a long time period, relationships between underlying variables might be slightly different in different time periods. If any of the errors thus introduced are correlated with housing starts, our initial regression might confound the effects. To address this problem, we conduct a separate regression in which we allow the coefficient to differ in each period by interacting total personal income with time period dummy variables. The results of this regression are shown in the third column of Table 6. The coefficient of 7.2330 on the product of total personal income and housing starts translates to \$11,808 of growth related sales tax revenue *in addition to ongoing sales tax revenues related to the increase in population*. The small standard error (.5869) implies that the effect is very precisely estimated; there is only a 10% chance the effect is less than \$10,579. We adopt this as our favored estimate of non-recurring growth related sales tax revenues.

With the data in Tables 1-6, we can apply the formula developed above to estimate the incremental subsidy, deficit per new household, and growth burden associated with new conventional development in Alachua County. These estimates are contained in Table 7. Using

our best estimates of growth specific taxes from our regression approach listed in Table 6 along with our estimates of growth related documentary stamp tax revenues from Table 5, we estimate that the incremental subsidy is a negative \$3,144. That is, the typical new household pays *more* than its share by \$3,144. This subsidy corresponds to a deficit per new household of a negative \$5,083 and a growth burden of a negative \$449,507,917. That is, the typical new household, along with its accompanying commercial and industrial development, creates a fiscal surplus of \$5,083, and the present value of this surplus from all future growth is estimated at nearly 450 million dollars.

Table 7: Difference Between the Cost and Revenues Per New Household And Fiscal Remedies (Present Value, Maintaining Current Level of Service)		
Estimate of Growth Specific Taxes	Regression	Arithmetic
Incremental Subsidy (Tax)	\$ (3,114)	\$ 4,982
Deficit Per New Household (Surplus)	\$ (5,083)	\$ 8,132
Growth Burden	\$ (449,507,917)	\$ 719,152,839
Change Growth Targeted Taxes Per New Household to Eliminate Deficit, No Change In Infrastructure Debt to Asset Ratio	\$ (5,083)	\$ 8,132
Corresponding Change in Average Household's Recurring Tax Bill	\$ 94	\$ (150)
Change in Indebtedness to Eliminate Deficit, No Additional Growth Targeted Taxes	-49.59%	79.34%
Corresponding Change in Average Household's Tax Bill	\$ (51)	\$ 82

While our best estimate indicates that growth more than pays its share of public costs, we also prepare an estimate of the incremental subsidy based on our lower bound estimates of

growth specific taxes from Table 5. These estimates (which are in the last column of Table 7) represent an upper bound on the incremental subsidy, deficit per new household, and debt burden. The figures indicate that the incremental subsidy is at most \$4,982. Thus, even using these overly conservative estimates of growth targeted taxes, the incremental subsidy per new household is of only moderate size.

Any deficit or surplus can be eliminated either by changing growth targeted taxes (say impact fees targeting the group paying less than their share) *or* by changing the level of indebtedness, *or* some combination thereof. Simple increases in property taxes *cannot* equate the marginal costs and revenues associated with new development while maintaining a balanced budget since they apply equally to those paying more than their share and those paying less than their share. Any increase in indebtedness, however, must be accompanied in the long run by an increase in per capita recurring taxes to pay the additional interest. Similarly, any increase in growth specific taxes must be accompanied by a reduction in per capita recurring taxes in the long run. For each of the three estimates of growth specific taxes, Table 7 shows the average impact fee or change in indebtedness required to balance marginal costs and marginal revenues associated with conventional development, along with the corresponding long run changes in per capita recurring taxes.

4. Implications and Discussion

What can be made of these findings? Impact fees in Alachua County cannot be justified on the grounds that conventional development does not pay its own way. There may, of course, be other, valid, reasons to impose impact fees – for example, costs due to increased pollution or congestion of favorite natural recreational sites that are not internalized by new residents. Absent

some other such factor, imposition of any substantial impact fee would only result in the misallocation of valuable scarce resources to higher cost or lower valued uses. Imposition of moderate or large impact fees might well have substantially worse consequences. Households and businesses considering locating in Alachua County have many locations to choose from, many of which are in Florida and would be quite good substitutes for locating here. Therefore, overcharging new development by a moderate or large amount relative to other similar counties in the state would be likely to severely and unduly delay further development activity in the county. This might well create a substantial drag on the area's overall economy. Given the high desirability of locations in Florida, economic activity in general and development activity in particular would eventually recover, unless the impact fee imposed was exceedingly high. However, the costs of making that adjustment to the citizens of Alachua County, and particularly to those employed by businesses closely associated with development, could easily be quite large. Exactly how large would depend upon the elasticity of demand for locations in Alachua County and also upon the speed of adjustment of land prices and local wages.

While we find that new development in Alachua County does pay its share of public costs, this does not mean that all development in Florida does so. For example, Miami-Dade County has slightly lower per capita personal income than Alachua County, so we would estimate slightly lower growth specific sales and property tax revenues. At the same time, since land is so much more expensive in Miami-Dade County, our method of estimating the capital stock would imply that infrastructure costs are about 39% higher. Therefore, about \$5,000 of growth specific fees in addition to growth specific sales and property taxes would be needed in Miami-Dade County in order for new development to pay its share of public costs in that county.

While, on balance, new development in Alachua County more than pays its way, we have not broken the costs and revenues down into state, county, and municipal components. It could be the case that some levels of government receive a share of the growth specific revenue that is too low given their share of infrastructure costs. While accounting at that detailed a level is beyond the scope of this report, we note that if this occurs to a significant degree, it represents a mismatching in Florida's system of public finance, rather than a failure of new development to cover incremental public costs.

Our method of estimating the per capita infrastructure cost is obviously crucial. Some readers might worry that old capital costs less than new capital or is of a different quality. However, staff economists at the Bureau of Economic Analysis have done extensive research aimed at sharpening their estimates to control for these factors. All historical investment data are carefully depreciated, quality adjusted, and valued at today's prices to arrive at a fully standardized estimate of the capital stock. While the BEA methodology might not be perfect, it does represent the best and most comprehensive capital stock benchmark available. *The Search for Efficient Growth Patterns* (Duncan et al., 1989) estimates that the average infrastructure cost per dwelling unit in Florida under conventional development was \$15,941 in 1990 dollars. This figure is cited in many, if not most, comprehensive works on the infrastructure costs of conventional versus compact development and methods of paying for growth.⁴ As one rough check on the reasonableness of our figure, we apply the nominal rate of increase in the U.S. per capita stock of state and local infrastructure from 1995 to 1999 from Table 1 to this figure over 10 years, then multiply by the housing cost index to adjust for the relatively affordable land and structure costs

⁴ Burchell et al. (1997) note the tendency of studies in this area to recycle or update data from previous studies, given the difficulty of obtaining new data.

in Alachua County, arriving at an estimate of \$20,279 for the 2000 Alachua infrastructure cost per new household. While \$5,000 less than our estimate, it is at least in the same ballpark.

Readers might also worry that marginal costs rise with growth because land prices go up. While there is merit to this argument, spreading of fixed costs and economies of density offset it at least partially and might even outweigh it. Further, if we allow marginal costs to diverge from average costs, we should also allow marginal recurring revenues to diverge from average recurring revenues. As we discussed in section 3, there is substantial evidence that new development pays considerably more than its share of ongoing property tax revenue. Thus, allowing for non-constant per unit costs and revenues would quite likely increase the degree to which new development in Alachua County more than pays its way.

Some readers might be confused by the fact that we fully standardize the capital requirement when new capital is often more productive than old capital, in the sense that it provides a larger or higher quality flow of future services than old capital. After all, the new capital expenditures will in fact cost more because of this. However, this is exactly the reason to standardize the capital stock and treat it on an equal per capita basis across the community. The benefits of this higher quality new capital will flow throughout the community, and forcing new development to shoulder the extra costs is therefore deemed inappropriate. Further, the courts have generally deemed holding new development to a higher standard than currently met by the rest of the community to be illegal. (Nicholas, Nelson, and Juergensmeyer, 1991)

There are at least four other potential sources of significant growth specific revenues that are completely ignored in this paper because obtaining a reasonable estimate is beyond the scope of our initial analysis. Two relate to the lack of a perfect and disaggregated capital stock estimate and the other two relate to a lack of sufficiently detailed and easily assessable data on tax

collections other than property and sales taxes for the counties of Florida. First, developers often build local roads within subdivisions and then turn them over to the county. If the value of these roads goes into the capital stock measure, their value should also be added to the growth specific revenues. Since we are uncertain how to determine easily how much of the value of these roads are reflected in the capital stock measure, we ignore this and accordingly either underestimate growth specific revenues or overestimate the public infrastructure cost. Second, Gainesville Regional Utilities (GRU) collects significant facilities charges for every new hook-up (\$1,600). To the degree that the state and local capital stock estimates include utility infrastructure of the type provided by GRU (or other municipal utilities in Alachua County that levy charges upon initial hook-up), any utility hook-up fees should be included. Again, we do not know how much of the value such infrastructure is reflected in the capital stock measure, so we ignore this factor and accordingly overestimate infrastructure costs or underestimate growth specific revenues. Third, growth specific revenues should reflect the extent to which an increment of new development increases corporate income taxes or other corporate taxes paid by developers. Since we lack data that would allow us to rigorously estimate the magnitude of such tax collections, we have ignored them. Finally, based on county specific analysis, the National Association of Home Builders (NAHB) feels that every new household probably generates considerably more revenue from building permits and similar fees in Alachua County than it costs to carry out required permitting and inspections.⁵ To the extent that such fees do generate positive net revenues, they should be included in our estimate of growth specific revenues. However, we lack the ability to construct a rigorous estimate, again causing us to underestimate growth specific revenues in Alachua County.

⁵ Personal communication from David Crowe, Senior Staff Vice President, Housing and Finance Policy, NAHB, and Elliot Eisenberg, NAHB.

On whole, the factors considered in this section of the report might well add over \$1,000 to our estimate of the extent to which conventional development more than pays its way. At the very least, when taken together with our arithmetic calculation of growth specific sales and property tax revenues (which serve as a highly conservative lower bound), these considerations strongly suggest that conventional development in Alachua County does not create a significant fiscal deficit. While different analysts using slightly different methodologies might of course reach slightly different results, the odds of any rigorous, self-consistent, and clear cut community wide modeling approach generating an incremental subsidy estimate of more than a few thousand dollars per new household (five thousand at the very outside) seem quite remote.

5. Conclusion

In this report we examined the extent to which new conventional development in Alachua County fails to pay its share of public costs, particularly infrastructure costs, under the current system of state and local finance. Our best estimate implies that the typical new household under conventional development generates \$3,114 more in tax revenue than its incremental cost in present value terms. While additional work remains to be done before anyone can claim to have reached a fully definitive resolution of this issue, these finding clearly indicate that great care should be taken in the imposition of impact fees in Alachua County. Since significantly overcharging new development would result in negative economic consequences for the citizens of Alachua County, and since our best estimate implies that growth pays more than its share, there is no justification for large impact fees based on the argument that conventional growth does not pay for the infrastructure needed to support it. There may, of course, be other arguments for impact fees centering on social costs that are not internalized by new residents (pollution,

crowding of favorite local lakes, etc...), but these do not relate directly to the cost of public services.

More detailed analysis of some of the points simplified away above might prove enlightening, but any resulting changes could go in either direction and would not likely be large. For example, sorting out the degree to which the combination of higher property tax revenues from new development, potentially rising marginal costs, and the spreading of fixed costs combine to make additional conventional development more or less fiscally desirable could quite obviously go in either direction, and the individual components might well partially cancel each other. It would also be useful to undertake a more precise updating of the state specific capital stock estimates of Holz-Eakin and to extend this method directly to Alachua County's capital stock estimate in a more direct way than was possible given the scope of this initial study. Still, this analysis clearly shows that there is no reason to think that conventional growth in Alachua County falls short of paying for its associated public costs.

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