



## Housing appreciation (depreciation) and owners' welfare

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### ABSTRACT

This paper extends Frank's (2006) very simple model to analyze the welfare effects of appreciation and depreciation in a world with borrowing, property taxes, and moving costs. It is shown that appreciation can make homeowners worse off but that even when there is a property tax depreciation can not make homeowners who intend to stay in their house worse off. Our model provides a simple framework that can be used discuss the rationale for alternative policies to aid homeowners during periods of both appreciation and depreciation.

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### 1. Introduction

From the late 1990s through 2005 low interest rates, new exotic mortgage instruments and real estate speculation led to increased residential appreciation. The rise in market values led to increased residential property tax assessments and widespread citizen protests. In response many states adopted government programs that gave property tax breaks to homeowners whose parcels had appreciated especially rapidly (see Dye et al., 2006; Haveman and Sexton, 2008). Beginning in mid-2006 a rapid and widespread decline in housing prices occurred and there was considerable discussion about appropriate government programs to protect housing equity. Appreciation provoked the greatest controversy in areas where the market value of homes rose despite the fact that perceived structure and neighborhood quality were unchanged. Thus, we can view the change as a pure increase in user cost.

Frank's (2006) wonderfully simple model shows that, starting from a fixed bundle of housing and a composite good, either an increase (appreciation) or a decrease (depreciation) in the price of housing makes an owner better off (pp. 166–167).<sup>2</sup> The appreciation result is intuitive but the case with depreciation is not. This result may seem paradoxical but the intuition behind it is that, once purchased, housing and the composite good become

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<sup>2</sup> Alternative conceptualizations of appreciation are possible but we do not think they are as interesting or relevant to the public policy debate. In competitive markets with no maintenance costs or property taxes the value ( $V$ ) of an infinitely-lived residential structure is  $V = (\text{rent} \cdot \text{hs}/i)$  where rent equals the value of a services delivered by a unit of housing in a year,  $hs$  equals the number of units of housing services embedded in the structure and  $i$  is the interest rate. Frank's (2006) treatment assumes an increase in the rent per unit of housing services. Alternatively, one could think of appreciation as being an increase in the units of housing service embodied in a structure with no change in the rent per unit of housing service. In this alternative case, a resident living in an appreciating unit obtains more housing services, and more utility, from the same structure after appreciation—thus, the purchase price of the structure rises but the user cost (cost per unit of housing services) is unchanged. This alternative approach would yield very different welfare implications than our (and Frank's (2006)) treatment—in particular, owners of depreciating units would be worse off.

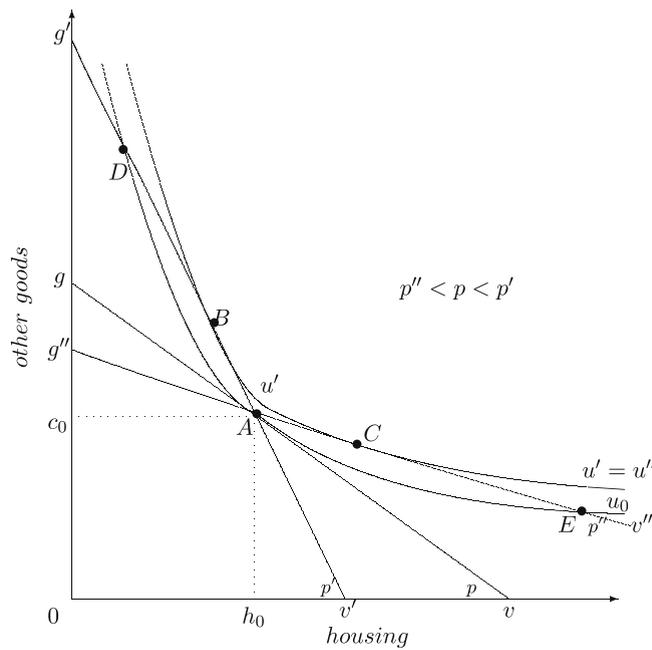


Fig. 1. The Frank's (2006) example.

endowments that can be costlessly maintained even when relative prices change. Frank's logic exercise is an amusing and useful teaching tool but also raises an important and timely question: under what conditions are real world consumers made better (or worse) off by changes in housing prices? This short paper provides some additional intuition about this question by adding three real world complexities—borrowing, moving costs and property taxes—to Frank's model.

The rest of the paper is organized as follows: Section 2 recapitulates Frank's (2006) model, Section 3 revises the model to add borrowing and moving costs, and property taxes are considered in Section 4. Application to some issues raised in recent literature is discussed in Section 5. Some potential extensions are considered in Section 6 and concluding remarks are discussed in Section 7.

## 2. Frank's model

Frank's (2006) model can be described graphically as follows (see Fig. 1). The consumer has lifetime wealth ( $w$ ) which she expends on lifetime consumption of  $h_0$  unit of housing (purchased at price  $p$ ) and  $c_0 = w - p \cdot h_0$  units of the composite good purchased at a price normalized (without loss of generality) to equal one. The bundle  $(c_0, h_0)$  at point A maximizes lifetime utility on indifference curve  $u_0$ .

Suppose housing appreciates after the consumer selects her bundle, then the budget constraint rotates, around the original consumption bundle, to  $g'v'$  and intersects  $u_0$  twice. Since the original consumption bundle remains in the opportunity set, the consumer can be no worse off, and will be better off as long as an indifference curve above  $u_0$  is tangent to the new budget constraint along line seg-

ment AD. In order to adjust the consumption bundle the consumer sells the old house and purchases another one with the proceeds—at the higher price.

Now suppose housing depreciates, then the budget constraint rotates, around the original consumption bundle, to  $g''v''$  and intersects  $u_0$  twice.<sup>3</sup> Once again the original consumption bundle remains in the opportunity set so the consumer can be no worse off, and will be better off as long as an indifference curve above  $u_0$  is tangent to the new budget constraint along line segment AE. Once again, the consumer sells the old house and purchases another one with the proceeds—at the lower price. This simple analysis justifies Frank's (2006) counter-intuitive conclusion that after-the fact changes in prices always increase consumers' well-being in static models. Of course, this surprising result has nothing to do with labeling one axis housing but comes about from the fundamental logic of the model.

The basic model can be illustrated mathematically by assuming that homeowners have a Cobb–Douglas utility function in housing and other goods. As shown in the Appendix, in this case the percentage change in well-being is a function only of the percentage change in price and the share of the budget optimally devoted to housing. Fig. 2 illustrates the potential gain in well-being from a range of appreciation and depreciation for this case.

The figure shows that, for example, a 40% increase in housing prices leads to an increase in well-being of about 1%. While this may seem trivial it is important to remember that, in this static model, the effect is a lifetime increase in well-being (which is proportional to lifetime

<sup>3</sup> To simplify Fig. 1 we assume that  $u' = u''$  are tangent to  $(g'v'$  and  $g''v''$ ) at B and C, respectively.

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