Equity Finance of Residential Real Estate: A Potential Market Transformation Program

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ABSTRACT

Purchasing a home is one of the worst investments that can be made. Real estate is usually too large a fraction of wealth to justify on portfolio grounds and too complex for the average consumer to make informed judgments about value, durability and operating expenses. Energy efficiency market transformation programs, to date, have focused on educating the consumers so that they can make more informed decisions. This has not met with much success.

Equity finance, through a partnership with a non-resident investor, adds both reliable information, through the property specification in the partnership agreement, and an expert consumer, the non-resident investor, whose incentives are perfectly aligned with the resident homebuyer. These perfectly aligned incentives come from the form of the partnership, pre-arranged shares of both the purchase and sales price with additional contract terms about improvements and expenses.

Equity partnerships are much more effective than consumer education, since the equity partners are involved in many transactions and their incentives are so perfectly aligned. Real estate becomes more like a restaurant meal, frequently purchased, frequently criticized, and very responsive to sophisticated customer demands.

This potential energy efficiency market transformation program can have changes on the energy efficiency and quality residential real estate through many different mechanisms. This paper explores: the benefits to the financial community; how equity finance will work under several behavioral assumptions about homebuyers; changes in training and incentives of builder and their employees; and the minimum requirements that will ensure a vibrant secondary market in home equity.

Introduction

Energy efficiency market transformation programs generally come in two flavors, information programs and subsidy programs. These two flavors are supported by the barriers taxonomy that was codified by Eto, Prahl and Schlegel in their scoping study (Eto, 1996). The problems of energy efficiency in residential real estate can easily fit into this taxonomy. There are search costs, split incentives, hidden costs, bounded rationality, etc. – the whole sea of barriers in this one market.

There are two problems with the barriers taxonomy. First, they are so broadly defined and include so many different concepts that declaring that a market has search costs or bounded rationality in the decision making is about as informative as declaring that human beings contain proteins, a true, but useless fact. Given the great generality expressed by each of the market barriers, it is no surprise that the remedies to these problems are the most

general remedies possible: cash subsides and information. More specific remedies require a much more specific diagnosis of the problem than the barriers model alone can accomplish.

Second, the taxonomy conceptually slices reality in a way that makes it difficult to conceive of some kinds of market interventions. In the barriers model, you can evaluate the early term effectiveness of the program by noting the effect of the program on the barriers. The benefits of some programs can not be easily expressed as barrier reductions and, because it is difficult to express these benefits, it is also difficult to conceive of these kinds of programs. The language of barriers is itself a barrier to some kinds of energy efficiency market transformation programs.

Given these two distinct difficulties with the barrier taxonomy, it comes as no surprise that equity finance, a program proposed to solve other problems in the residential real estate market (Caplan, 1997), is difficult to conceive of as a remedy to energy efficiency problems. Equity finance focuses on characteristics inside a single barrier and is difficult to conceive of as a solution since it does not remove barriers.

Through all these difficulties, equity finance of residential real estate arises as a potentially powerful program. By adding an equity partner on real estate transactions, the rules of the system, the incentives, punishments, and constraints are changed. Those kinds of changes are, in general, much more permanent and effective than changing the numbers in a system, as a subsidy-style program would do.[1] This kind of remedy requires a much deeper, more theory-based, assessment of the residential real estate market than the barriers model can accomplish.

The remainder of this paper will be a theory-based evaluation of an equity finance program that will define and explore several behavioral assumptions about the residential real estate market and their relationship to both brokers and builders. These behavioral models will then be used to evaluate the effects of the program and to identify crucial uncertainties that need to be resolved before a program can be implemented.

How Housing Finance and Purchase Institutions Are Not Optimal from a Portfolio Point of View

It's not that buying a house is a bad idea; it's a very good idea. Renters pay more for their housing because owners anticipate bad renters. Renters don't have the same freedom to make changes in the property that owners do. This doesn't mean that buying a house, even the house that you currently rent, is a good idea.[2] If you look at that house as just another asset in your portfolio, it probably won't look like a good investment.

For most people, owning a house is similar to having their entire portfolio composed of their employers' stock. All their eggs are in one basket; there is no diversification. If their employers' business starts to flag, the value of their stock holdings falls at the same time they become unemployed.

The same thing happens with houses. Broad downturns in the local economy and depressed real estate prices happen at exactly the same times. Real estate prices are likely to go down just when people are most likely to be laid off. Portfolio theory suggests that

[1] For an enlightening discussion of see Meadows, Donella (1997) Places to Intervene in a System, Whole Earth, Winter, p.78-84

[2] Tax incentives serve to reduce the effective interest rate on debt. This does not detract from the fact that most home purchases are highly leveraged.

holding assists with correlated returns is a bad idea, unless there are other uncorrelated assets to reduce the risk. The problem is exacerbated if equity in a home is a large part of their financial portfolio When you think about a house like it is part of a stock portfolio, highly correlated with income and a very large part of total asset holdings, home ownership seems crazy.

Asset allocation is just the beginning of the problems associated with purchasing and owning real estate. The typical homebuyer is not a sophisticated former construction worker or a real estate professional. He depend on the expertise of inspectors, real estate agents, and mortgage brokers to help make the purchase and offer decisions. While these helper agents are a fine source of information, their hearts are where their wallets are. That puts them at odds with the needs of the homebuyer.

Consider the typical buyer's agent.[3] The agreement usually states that the agent represents the buyer in the transaction, but the agent is still paid a fraction of the sales price. That means that their desire to help out the buyer with good advice will always be tempered by the loss they suffer with every drop in the price.

While the next few steps in the purchase process are of some help to the homebuyer, there is still a lot of room for gaming. Appraisal, done mostly for the mortgage lender, is far from exact. Appraisers have an incentive to "hit the number" and appraise the house at or above the purchase price. This extra incentive arises because sales agents, who have a strong incentive to see that the sale goes through, often choose appraisers. Appraisers that don't "hit the number" will find few sales agents willing to hire them. This effect may be minor compared to how appraisals are conducted.

The most common appraisal method is the "comp" method where prices of similar houses in the same area are collected and used as the pricing basis for the house being appraised. There is significant latitude in deciding which houses are comparable and how far back to look for comparable houses. The key observation is that the closer the match, the fewer comparable houses. Finding houses with similar school districts, vintage, or square footage is hard enough. Finding houses with similar energy efficiency characteristics would make the job even more difficult and make valuation even more imprecise.

It is clear that, in spite of a series of safeguards and expert agents, homebuyers are on their own if they wish to consider energy efficiently when valuing and pricing a home. What remains to be seen is why consumers don't seem to value the energy efficient characteristics and improvements.

Theories of Why Efficient Housing Is Not Valued as Much as a Neo-Classical Model would Suggest

There are many theories about why homebuyers don't seem to value energy efficient houses as highly as neo-classical theory would suggest. The standard, highly abstract, economic theory predicts that houses with relatively low operating expenses will have those advantages capitalized into the price of the house. This seems to make a lot of sense. It is a highly rational response to a very abstract problem. That's part of the problem; it's too abstract to explain consumer behavior.

[3] The form of the relationship varies from state to state. Some states explicitly state that the buyer's agent is supposed to look after the buyer's interest, others use the traditional relationship where both the buyer's and seller's represent the seller's interest.

Most people cannot have their behavior adequately modeled by a fully rational agent with access to godlike reasoning powers and an infinite amount of information. Breaking down these kinds of assumptions and replacing them with something more descriptive may yield a theory with greater descriptive and predictive power.

It isn't necessary to find "the" theory, but it is important to find a set of the most reasonable theories. Each will apply to some people some of the time. The idea is to set out the ideas that seem to be the most likely explanations for the phenomena and decide that the other options, the ones not included, are unlikely to be true. In this case, there are five models that explain why people don't, or don't seem to, value energy-efficient features as highly as in the neo-classical models. The shorthand names for these five theories are:

- The swamping theory
- The spanning theory
- The proxy theory
- The binding theory
- The innocence theory

These are only partial theories, because they don't explain all the behavior of all the agents, but they do describe enough of the behavior to explain the differences between the highly abstract, economic theory, and what we observe in the marketplace. Many of these theories represent different aspects of what is called "bounded rationality", one of the frequently cited barriers. The diversity encompassed in these models should demonstrate how broad the "bounded rationality" description truly is.

The swamping theory.[4] The swamping theory is just a consequence of being an animal; we can only handle so many events at one time. Every moment of our lives there are a huge number of events happening all around us. Fortunately for us, there is a specialized part of our brain that picks out some events for the other parts of our brain to focus on.

Houses are a huge collection of events and attributes that need to be evaluated. We only consider the most important things because we are limited in what we can consider at one time. When we are shopping for a house, we are making notes on what has to be repaired, how much yard work is involved, where our existing furniture will go, and where to put the oil painting of great-grandmother Edna.

Energy efficiency does not show up in the valuation because it is one small attribute in a very large number of attributes. School district, number of bedrooms, and tile show up, but we don't notice energy efficiency the same way we don't notice the bushes on the side of the house. Efficiency is just too small a detail to be concerned about.

The spanning theory.[5] The spanning theory takes the swamping theory's observation that houses are incredibly complex bundles of characteristics and comes to the conclusion that people are unlikely to find the perfect house but that they may find an approximation of that perfect house. The problem is that if you start listing the characteristics that you see in houses, e.g. type of construction, type of floors, school quality, commute distance, you mathematically eliminate the possibility of the perfect home relatively quickly. There just

[4] The statistical motivation for this theory comes from the common econometric practice of interpreting the error term as consisting of many unincluded variables. Energy efficiency is then just one of these unincluded variables.

are not enough homes to supply the right mix of characteristics for everyone that wants to buy a home.

The consequence of this problem is that things we do like and are willing to pay for, like energy efficiency, seem to be valued less because they are combined with other things that we don't like as much.[6] You can see some of this in both children's behavior and asset pricing in economies that lack some insurance or futures markets

My children can't have dessert until they have finished dinner. Dessert isn't even offered unless they do some special chores. Their willingness to do chores for dessert, given that they have to eat dinner, is less than it would be if I made the desert offer without requiring them to eat dinner. So while they really enjoy desert, their apparent behavior doesn't show how much they enjoy desert since they loathe my cooking.

The proxy theory.[7] The proxy theory, like the spanning theory, looks at houses as a bundle of characteristics. Also like the spanning theory, groups of characteristics tend to show up together in houses. Unlike spanning theory, some characteristics are hard to discern, and the easiest way to detect them is to look for one of the easier to detect characteristics in the same group.

For example, energy efficiency, as a characteristic, may be grouped with the age characteristic. A quick gauge of the efficiency of a house is its age, and age is very easy to discern. If you are interested in energy efficiency, you buy a newer home. The consequence of this behavioral relationship is that the increases in the price of a house, which are partially due to increased efficiency, are statistically almost fully explained by the other easier-to-observe characteristics. The valuation of energy efficiency is hiding in, and being covered up by, the other characteristics.

This argument also explains why energy efficient remodels and retrofits are not fully capitalized into the price of a house. People can't tell how efficient the houses are, and they again use the age as the proxy for energy efficiency.

The Binding Theory. The next theory is not as dependent on the description of houses as bundles of characteristics but rather on the behavior of the financial institutions that surround the purchase of a house.

Mortgage lenders have two ratios that they keep foremost in mind, the loan-to-value ratio and the debt-service-to-income ratios. The loan-to-value ratio is just the fraction of the total price that the mortgage is funding. Low loan-to-value ratios mean that the homebuyers are less likely to default on the loan and that, if they do default, the sale price of the home is greater than the outstanding loan amount. The debt-service-to-income ratio gives the lender

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[5] The economic motivation for this theory is found in the literature on asset pricing with incomplete markets. Magill, Michael & Quinzii, Martine (1996) is an excellent reference on the topic. The main insight is that asset prices are different than they would be under complete markets, the apparent price of some attributes is greater than or less than what would be observed in complete markets.

[6] The author's previous residence was an efficient home in a new subdivision and while I personally calculated the value of the tighter envelope and ducts, these benefits were veiled by the lack of large trees and extremely wide roads, two characteristics that I abhor.

[7] The statistical motivation of this theory is the difficulty in identifying individual parameter values in hedonic pricing models when some attributes are correlated. These models have the additional unknown biases when the design matrix, housing characteristics, does not sufficiently cover the characteristic space.

an idea of how likely the applicant will be to make loan payments when there are unexpected changes in income or expenses.[8]

Both of the ratios form constraints; if loan-to-value or debt-service ratios are too high, either the loan will not be financed or it will be financed at a higher interest rate. There are some rather large benefits to backing away from these constraints. The easiest way to back away from a constraint is to move some of the things that are measured in the constraints into things that aren't. Operating expenditures, energy use in particular, is one of those items. By choosing a house with higher operating expenditures, the perfect rationality model predicts that the price of the house will be lower. Homebuyers are then trading higher overall costs, price plus operating expenses, against purchase price in an attempt to manipulate the ratios under the constraint.

Once again, people do value energy efficiency, but there are other aspects of the market that encourage a move away from energy efficiency.

The innocence theory. The most commonly espoused theory about why people don't seem to value energy-efficient housing is because they just don't understand how important it is or how to evaluate a home for energy efficiency. This idea is at the heart of most information programs and inspection programs.

Its clear from the other theories that just injecting more information into the system won't necessarily get the market to produce more efficient homes. Only the innocence theory would react to that kind of stimulus. The remainder of this paper will start with an outline of a possible solution to this problem, equity finance. A walk through a typical transaction will illustrate the intricate details about the incentives of equity finance and how the changes improve the present situation. Once the walk through is completed, the effects of equity finance will be evaluated from the viewpoint of each of the theories illustrated above. Finally, some of the future steps needed to test and develop this program will be outlined.

Equity Finance

Equity finance requires a limited partner to own part of the home and receive part of the sale price of the home. In a typical situation for a $100,000 home, the equity partner would put up $50,000 for the purchase of the home, while the managing or occupant owner would put up the balance, probably financed with both a mortgage and savings.

The resident homeowner gains because the house now is a smaller fraction of his portfolio of assets, so he have a much more diversified portfolio. He also bear only half the risk of changes in housing prices. Best of all, the time that a typical household would need to save for the down payment and closing costs is cut significantly, since he only need to save enough for half a house.

The non-resident equity partner also has significant gains. A properly repackaged and securitized bundle of real estate partnerships, much like mortgaged backed securities today, would be a welcome addition to many financial portfolios. Real estate returns are almost perfectly uncorrelated with stock returns, and their addition to a portfolio would

[8] Holding credit history and all other factors fixed.

significantly reduce portfolio risk.[9] The nature of real estate also provides significant hedging opportunities for entities whose well being depends on real estate prices, e.g., builders, school districts, and homeowners. Builders and school districts can short a securitized bundle of partnerships in their area and reduce risk. Homeowners can purchase shares of the bundle in their area and diversify the risk of their single house over many houses in the area.

The idea of equity finance is not so far fetched. Securitization of commercial equity has been accomplished through Real Estate Investment Trusts (REIT). Equity sharing by government agencies has been attempted by the federal government in Targeted Partnership Subsidies (TAPS) a community reinvestment scheme of the early 90s and Equity Loan Scheme (ELS) in Wales. Private entities have used forms of equity sharing in sale and leaseback agreements, and negotiated limited partnerships for quite some time. In each case, either a lack of a secondary market or costly property management has hampered the development of the primary partnership market. While it is fairly clear that there could be a market for the equity shares of residential real estate, it is not clear how equity finance will result in better decision making or how it will "transform the market."

Equity finance, through a partnership with an equity partner, adds both reliable information, through the property specification in the partnership agreement, and an expert consumer, the equity partner, whose incentives are perfectly aligned with the resident homebuyer. These perfectly aligned incentives come from the form of the partnership, pre-arranged shares of both the purchase and sales price with additional contract terms about improvements and expenses.

Equity partnerships may be much more effective than consumer education, since the equity partners are involved in many transactions and their incentives are so perfectly aligned. Real estate becomes more like a restaurant meal, frequently purchased, frequently criticized, and very responsive to sophisticated customer demands.

Partnership agreements and a secondary market. The key characteristics of the partnership agreement that will assure a smooth functioning program are reasonable contractual terms that align the incentives of the equity partner with those of the homebuyer and standardization of terms for low cost securitization of the equity.

The general contractual terms are that the homebuyer lives in the house, pays the taxes, and performs the maintenance. The equity partner pays a fraction of the price of the house and then receives the same fraction when the house is sold. There are no imputed rental payment or any other complications.

A potential homebuyer walks into the process with loan pre-approval, for their share of the house, and an agreement with an equity partner. Once the homebuyer chooses a house, the equity partner begins the offer process.

The equity partner's main incentive is to generate the best return on the house, given that the occupant partner will be making the timing decision about the sale. This means that she will want to negotiate the lowest possible purchase price and the highest possible sales price. Those incentives are in line with those of the occupant partner, but she is likely to be negotiating with another equity partner that is as sophisticated and informed as she is.

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[9] Quan, Daniel C; Titman, Sheridan**.** Do real estate prices and stock prices move together? An international analysis, *Real Estate Economics*, Summer 1999, 27(2): 183-207. This paper demonstrated that there are no significant contemporaneous correlation but that there may be longer term relationships.

These equity partners are going to be involved in many transactions, and they are likely to know much more about neighborhood trends, and the characteristics of the homes than the usual homebuyer.[10]

The first implication of equity finance is that durability will be a larger issue. Equity partners need to ensure that the house will survive the time they will be holding the property and anticipate that the next buyer will have the same incentives. This does not mean that the occupant partner does not have the same incentives. They are just less informed and have priorities in other areas. To the extent that operating expenses are inversely correlated with durability, e.g. better envelopes, this incentive will decrease operating expenditures.

The second implication is that operating expenses become a negotiating tool to both lower the purchase price and increase the sales price. Again, because the equity partners can make more informed assessments, she has an incentive to reduce the offering prices on houses with high operating expenses because she anticipates the same tactic will be used on her when she sells the property.

Because a partnership contract is being written, the description of the property will be much more detailed, including descriptions of insulation, installed appliances, bushes, trees, etc. The contract will also specify the changes in equity share because of homebuyer improvements. Some of these are likely to be standardized, so much equity for a fireplace for example. Equity changes for appliance and envelope improvements may also be included in the standard terms.

Once the homebuyer moves into the house, everything proceeds normally. The equity partner packages the equity in this home with others in the area or even across the country, and issues stock supported by the equity shares. With their cash refreshed, they are able to help purchase more houses.

When the resident homeowner decides to sell, the equity partner will advise on negotiation. Again, because the equity partner is also trying to get the highest possible price, her advice should be heeded. The final check on potential indiscretions is the provision that the equity partner has right of first refusal. If an offer or counter-offer is accepted the equity partner may purchase the house for the agreed upon price plus a small fraction. This keeps the occupant from selling the house to a friend or relative at a significant discount.

What does this have to do with energy efficiency? Equity finance can have effects on energy efficiency through both the supply side, via the construction labor force, and the demand side, via the theories that were illustrated above. The supply argument focuses on the skill level and quality incentives of builders.

Low current income or income that has recently decreased results in a lower demand for housing and consequently a lower demand for new houses. The strength of this relationship is so dramatic that housing starts are one of the most frequently used indicators of the health of the economy.[11]

Because of the boom-bust cycle of residential new construction, many contractors exist only for a single boom cycle, never to return again. Reputation for quality and foresight on operating costs never become a competitive factor because the building cycle removes

[10] A longer and more detailed description of the proposed purchase process can be found in Caplin, Andrew, Sewin Chan, Charles Freeman, and Joseph Tracy (1997).

[11] Housing starts are good predictors of future construction expenditures which are a major component of Gross Domestic Private Investment, the most volatile component of GDP.

most fiscally-unsound firms as the bust cycle begins. Financial depth is the most important determinant of survival. Reputation requires many building cycles to have an effect; even then competition with high quality construction companies with little financial depth is likely to result in the high quality firm dropping out of the business. The consequence is that there is a lot of construction done by firms that are just not very good at producing homes.

Firms that do survive from building cycle to building cycle typically weather the storm by reducing the number of employees and only hiring when the boom cycle returns. In this kind of system, it makes no sense to make long term investments in employee training since you never know if the employees will return after they are laid off.

One of the most important effects of equity finance is that it weakens the strong link between housing demand and current income. Equity finance relaxes the income constraint by reducing the size of the required loan. This, in turn, dampens the building cycle, and that is likely to have a very large effect on how contractors act.

First, the building cycle will not be the largest force weeding out unfit builders. Reputation for quality and low operating costs are likely to be more important as financial depth becomes less important. Second, there is likely to be a greater focus on training since employees are more likely to be long term rather than short term, allowing the firms to enjoy the benefits of the training. Equity finance is also likely to interact with the partial theories explained above.

Under the swamping theory, where people just don't notice many attributes of houses, the functioning of the program depends on how the equity partner and the homeowner interact. Suppose the equity partner does not "educate" the homebuyer about operating expenses; then the homebuyer will observe prices that aren't what they would expect given their preferences. Low operating expense houses will have higher prices than they may be willing to pay, and high operating expense houses will have lower prices than they expected.

Because of this effect, educated and educable homebuyers, as well as occupants that defer to the equity partner's expertise, will be attracted to equity finance. Those that keep their own council will be attracted to equity finance when purchasing high operating cost houses because of the lower negotiated price. They will also be attracted to equity finance of low operating cost houses, when the advantages of exceed the apparent higher price. In short, to the extent that equity partners use operating expenses as a negotiation tactic, occupants will go along with it.

In the spanning theory, where people cannot find the best house, operating cost and energy efficiency is already valued and reflected in price, it is just that energy efficiency does not exist in houses with the other characteristics that they value. Equity finance will have no effect on the purchase decision. However, it will have an effect on subsequent remodel decisions. If the equity partners use operating expenses as a negotiating tactic, the value of remodels that are more energy efficient will be capitalized into the value of the house.

If the proxy theory is true and homebuyers use easy to observe characteristics to indicate harder to observe characteristics, then the addition of the equity partner adds a source of information for the homebuyer. Because the homebuyer truly values energy efficiency but cannot adequately observe it, the information provided by the equity partner allows them to include energy efficiency in their own decision making. Energy efficiency will become valued for homes that did not have the energy efficiency proxy. There is also the possibility that the newly observable energy efficiency characteristics will be used as a proxy to indicate other valuable but hard-to-observe characteristics.

If the binding theory is true and the practices of the financial industry are encouraging people to switch out of housing quality and into higher operating expenses, then equity finance also provides benefits. Since equity finance is likely to relax the two constraints that induce homebuyers to purchase houses with higher operating expenditures, there is less incentive to switch to houses with high operating expenses and low purchase prices.

Finally, under the innocence theory, equity finance works just like educating the homebuyer. Since, as we have established above, the equity partner's incentives are so closely aligned with the homebuyer it is almost as if she was a part of the family. The equity partner is then able to share expertise in much the same way one family member would help another.

Resolving the Uncertainties in the Assumptions

The preceding analysis depends on a fairly dense web of behavioral assumptions, beliefs about financial institutions, and the competitive behavior of the construction labor market. Launching this program is going to involve something more than accepting these assumptions at face value and something less than verifying each and every one of these assumptions to the tenth decimal place. Intelligent decision making means economizing on assessments and data collection until it is just possible to make a comfortable and informed decision.

The most significant assumption is that a vibrant and deep secondary market will develop. The answer to this question can be determined by checking if the financial industry really is interested in this. Determining the risk characteristics of a bundle of real estate by looking at the premia and the correlations with the market, as a whole, is a first step into seeing if this is a viable program. The second step involves looking at the REIT market to see what kinds of common practices have made this market less effective than it could be. Finally we could present this proposal to a few finance professionals to see if this financial product would interest them.

Without reducing the large uncertainty about the financial markets accepting this kind of instrument, reducing the uncertainty about other assumptions and assessments is of marginal value at best. If it is unlikely that the financial instruments will be accepted, this program, in its current form, should not be explored further.

If we can verify that the financial industry will be interested, we can move on to either the major supply side or demand side assumptions. The most important assumption on the demand side is that the equity partners will use operating expenditures as a negotiation tactic. One of the checks that comes to mind is seeing if buyer's agents, with an infrequently used agency form that compensates them based on lower sales prices, use operating expenditures when she is negotiating prices. Another possibility is to look into how often REITs use operating expenditures as a negotiation tactic.

Only one of the demand side behavioral theories does not require using operating expenditures as the negotiation technique to be effective. The binding theory requires that equity finance relax the financial constraints and that, because the financial constraints are less binding, operating expenditures are considered in the purchase decision. If this is true, then older empty nest homebuyers that are moving from a large home with lots of equity to a smaller home may be more inclined to purchase with lower operating expenses, specifically energy expenses. Other natural experiments to test this hypothesis are possible.

Plans for reducing the risk and uncertainty about the other assumptions are a waste of effort at this point – until the key, easy-to-test, assumptions described above are resolved.

Summary and Conclusions

Equity finance represents an idea that may form the basis for a non-subsidy energy efficiency program with long-term persistent effects. Equity finance works to improve energy efficiency across a wide range of behavioral models by creating circumstances where energy efficiency characteristics are included in the price of a house. Because the determinants of housing prices influence the incentives in so many of the other traditionally defined "markets," e.g. HVAC, residential new construction, lighting, this program is unlikely to be created and funded by organization focused in any one area.

The program itself is not yet ready to be implemented. Several assumptions, key to eventual success, still need to be tested. These key assumptions should be relatively cheap to test. No massive million-dollar data collection efforts are required; only simple economic analysis of a housing based security and a relatively small survey of negotiating tactics.

Government involvement is also necessary for success of a program like this. Strong secondary markets for mortgages only developed after Ginnie Mae and Fannie Mae came on the scene. Securitization of mortgages did not start in earnest until the Resolution Trust Corporation began cleaning up the savings and loan disaster in the 1980s. The government, not through subsidies, but through organization, created two new markets that improved the functioning of both the market for home loans, but also the market for homes themselves. Equity finance could be the Ginnie Mae of this decade.

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