WORKING PAPER #38 / DECEMBER 1, 2016

AFFORDABILITY: HOUSEHOLDS' INCOME, REGULATIONS, AND LAND SUPPLY

Part I

+ ALAIN BERTAUD

ABSTRACT

Governments try to formulate housing policies that will provide socially acceptable housing standards at an affordable price for all. However, governments may exacerbate the high cost of housing in a city by limiting the supply of housing through regulations and underinvesting in urban expansion. In their search for solutions, urban managers often ignore that households' housing choice is driven by a combination of three attributes: floor area, location, and price of land and construction per square meter. Because floor area and construction quality are the most visible of the three attributes, planners tend to concentrate on improving the design and increasing the area of dwellings when drafting a housing policy. They tend to ignore housing location and its corollary: access to city's labor markets. When low housing standards are largely due to poverty, ignoring location to provide larger homes might devastate the very population the policy is supposed to help.

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This working paper was prepared as part of a forthcoming book about urban planning, tentatively titled "Order Without Design."

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1. "The need to do something": affordable housing

> "…a major impediment to a more efficient spatial allocation of labor are housing supply constraints. These constraints limit the number of US workers who have access to the most productive of American cities. In general equilibrium, this lowers income and welfare of all US workers." Chang-Tai Hsieh and Enrico Moretti [1].

We have seen that prosperous cities depend on well-functioning labor markets. Hsieh and Moretti, two economists, found that the high price of housing in some otherwise extremely successful US cities distorts the spatial allocation of labor nationwide. They calculate the cost of this misallocation to about 9.4 % of the US GDP. Housing affordability is therefore not a trivial issue. Hsieh and Moretti argue that regulatory housing supply constraints contribute heavily to the high price of housing, a position with which I concur and support in this chapter. Some affordability problems are due to poverty, but in most cases they are created or exacerbated by man-made constraints on the supply of land and floor space.

For labor markets to work, households and firms must find an affordable space in which to locate. When selecting this affordable space, they must make trade-offs between rent, floor area and location. Their final location choice will reflect the trade-off that maximizes their welfare. Location is of course extremely important, as the location provides access to the rest of the city and its labor market. The well-worn real estate developers' cliché "Location, location, location" reflects a reality and a wisdom that many government housing affordability experts tend to forget. The floor area, location and price per square meter of a household's housing unit constitute its current "affordability". This currently occupied "affordable housing unit" represents the household's best possible choice among all other housing choices offered by the market.

However, even in a free market, lower income households' optimal housing choice often does not meet socially unacceptable standards. In low- and moderate-income countries, these homes are often poorly constructed, lack standard access to water and sanitation, and provide little floor space per person. In high-income countries, the housing quality is usually acceptable. However, households might consume very little floor space per person relative to their neighbors and pay much more in rent than the 30% of income that is considered normal. The low housing standards and the high rent that affect the lower income population will legitimately soon attract public attention. Social pressure will eventually force governments to "do something about housing".

This need to "do something" pushes governments to formulate new housing policies that will provide socially acceptable housing standards at an affordable price for all. Angus Deaton, in his book, "The Great Escape" writes "*The need to do something tends to trump the need to understand what needs to be done. And without data, anyone who does anything is free to claim success."* This perfectly characterizes the design of many housing policies.

Households consume deficient housing when they cannot afford the high cost of land and construction in a large city. However, governments may exacerbate the high cost of housing in a city by limiting the supply of housing through regulations and underinvesting in urban expansion. Improving low-income households' housing standards requires identifying the relative role of both factors: poverty and inflated housing prices caused by supply constraints.

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[1] Why Do Cities Matter? Local Growth and Aggregate Growth", by Chang-Tai Hsieh and Enrico Moretti, NBER Working Paper No. 21154, May 2015, Revised June 2015

In their search for solutions, urban managers often ignore that households' housing choice is driven by a combination of three attributes: floor area, location, and price per square meter. Because floor area and construction quality are the most visible of the three attributes, planners tend to concentrate on improving the design and increase the area of dwellings when drafting a housing policy. They tend to ignore housing location and its corollary: access to city's labor market. When low housing standards are largely due to poverty, ignoring location to provide larger homes might devastate the very population the policy is supposed to help. Some examples below will illustrate this point.

In this chapter, I will discuss housing affordability policies in several cities and show how these policies impacted the four attributes: floor area, land area, and price of land and construction per square meter.

For households, the price of housing P depends on the value of four observable variables:

P= (land area X price of land) + (floor area X cost of construction)

The rent paid will also be related to these four variables.

The price of land depends on location; a location with a high job accessibility or close to high quality amenities will correspond to high price of land. In general, a highly desirable location has a high land price.

The cost of construction depends on the quality of construction. It is possible to build an informal shelter made of lumber, plastic and corrugated iron roof for as little as US$ 25 per square meter; while the price of construction for an apartment fully equipped with kitchen and bathrooms may cost several thousand US$ per square meters (about US$ 2500 US$/m2 in New York City in 2013 for residential building 3 to 7 stories).

Therefore, households searching for housing at a given price would have to make a trade-off between location, land and floor area, and quality of construction. At time I will use location as a proxy for the price of land, and quality of construction as a proxy for price of construction.

For developers, the cost components of producing housing units are much more complex. In addition to the physical cost described above, developers' cost will include financial costs, overhead, managements and design costs. The ratio between the land and the floor area will be usually constrained by regulations. The cost of construction will also depend in part on regulations. However, for households, the price of land and the price of construction aggregate all these cost components.

In the following chapter, we will be concerned mostly by households' choices when selecting houses. These choices will then be driven by four easily observable parameters: location, land and floor area, and quality of construction.

As we will see, the homes that families end up occupying are starkly different from those they would choose if their income had simply increased by the implicit subsidy they receive. I will judge the merits of various housing policies by comparing the homes they end up with to those they would have chosen with an income subsidy.

2. Defining and measuring housing affordability

Housing affordability is different from the affordability of any other consumer product

"Affordable" means something different when it is used for housing instead of another object, say, a cell phone or a car. A person who cannot afford a cell phone or a car does not have one. However, when housing is said to be unaffordable to households below an income of X, it does not mean that all households below an income of X are homeless. It only means that these households are living in housing units that are unacceptable in quality, floor area, and/or that these households are spending an unacceptably high proportion of their income on rent or mortgage payment.

Housing affordability therefore says whether housing is" socially acceptable," not whether or not a household occupies a housing unit. When we read that housing is unaffordable to households below income X, it means that the trade-offs necessary for households below income X to rent their current dwelling unit are inadequate in terms of rent paid in proportion of income, floor area, quality of construction or location.

The socially accepted minimum housing standards in each city do not correspond to a scientifically accepted universal norm. In this it differs from many other norms. For instance, minimum nutritional daily intake is a universal norm defined for all human beings. Most air pollution norms are established by the World Health Organization and are accepted as universal. By contrast, minimum acceptable housing standards are related to the prevailing standards in the city where they are applied. The socially acceptable minimum housing standards in Stockholm are very different from the standards in Dhaka. This is due to differences in climate and culture in addition to differences in households' income between the two cities.

While many households in Dhaka might happily live in homes meeting the minimum norms prevalent in Stockholm, there is no evidence that Dhaka's households suffer irreparable damages by living in houses of significantly lower standards. Minimum housing standards are therefore always arbitrary. These standards might be useful as a benchmark, but when they become enshrined in laws and regulations they can do great harm to the very population they are supposed to help, as we will see below.

In many countries, such as South Africa, the government identifies a set of minimum housing standards defining a national minimum housing norm. Setting minimum housing standards is a political act. Governments tend to select high standards as an optimistic signal for the future of the city, the sort of optimistic projection that politicians are all obliged to make. Statisticians then compare the standards of the existing urban housing stock (obtained through surveys and census) with the national minimum housing norm established by the government. The number of existing dwelling units below the national housing norm is said to constitute a housing "backlog". To eliminate this backlog, the government commits itself to building enough housing units each year to clear the backlog within a given period, say, 10 years. Note that the housing program is defined only through two attributes: price and physical housing standard. Location is absent from the policy. In any case, it would be difficult to define a location "standard" at the national scale. South Africa's housing program provides a warning of the adverse consequences of ignoring location when defining housing affordability.

How governments define housing affordability is therefore very important when developing housing programs to help the poor. Government bureaucrats tend to make different trade-offs than the households would make for themselves when choosing between price, location, area and quality. If the trade-offs made by government differ a lot from those that households would make, then the housing program will fail despite the money invested and the good intentions of the expert designers. Urban planners do not have enough information to enable them to select an "optimum" combination of rent, floor area and location for each household and firm. The choice of the quantity of land and floor area consumed in a specific location is therefore better left to the end-user whenever possible.

I have seen many governments implement "slum relocation" programs that send households from slums to high quality and subsidized formal housing units in a remote location. To the dismay of government officials, the former slum dwellers often abandon their formal housing to return to a slum where building quality is lower but access to the job market is better. This return is often attributed to slum dwellers' lack of judgement. This is not the case. The residents return because they prefer a well-located home of lower quality than to a poorly-located home of high quality. Policy-makers failed to choose the best trade-off between rent, location and housing standards. Affordability should not be defined by merely whether a household can afford to pay for its dwelling. Affordability must also consider whether that home is the best possible combination of size, quality, location and price.

This is not meant to imply that deficiencies in housing quality are a government invention. Many low-income households aspire to much higher quality housing than what they can currently afford. In many cases, the insalubrity or bad location of their dwelling slows low-income households' integration in the more productive part of the urban economy.

Governments' affordable housing programs are never designed to entice households who live in a different city or rural area to move to the city providing the housing. To the contrary, social housing programs usually specify that potential beneficiaries must have resided in the city several years to qualify for government help. This resident-only policy is meant to prevent an immigration stampede to the city. It is important to define how cities identify the households who are facing an affordability issue, or, in other words, households who made a trade-off that results in unacceptable low housing standards in the view of the community. Because "affordable" housing programs are usually designed for people already living in a city, unaffordable housing is defined by unacceptably small size or low quality of construction, not as a distant location that makes for an unacceptably long commute.

"Affordable housing" policy aims to increase low-income households' housing consumption until they have reached a socially acceptable level. To design this policy, we need to quantify, first, the minimum socially acceptable housing consumption level, and, second, the number of households who consume less housing than this level. Once these two numbers are identified municipal governments can have an informed discussion about what it might do to address the affordability issue. Should it build "affordable housing" at or above the minimum standard and then sell or rent this housing below market prices? Open up new areas for urban development to increase housing supply and lower market prices? Revise regulations that restrict developers from providing housing that meets the minimally acceptable standard? Expand the financial sector to provide mortgages to lower income households? Or directly subsidize households' income so that they can afford a higher quality dwelling in a location of their choice?

Almost always, affordability issues require several simultaneous actions involving investment programs and regulatory reforms. No silver bullet can easily solve housing affordability. However, governments cannot design a credible polity without clear measures of both the threshold below which housing standards are unacceptable and the number of households who fall below this threshold. Therefore, before discussing specific policies in detail I will first discuss the various methods of measuring the affordability threshold and the number of households that fall below it. Fuzzy data on households' income and current housing standards is a significant impediment to creating sensible "affordable housing" policies.

A simple "affordability" index: the Price/Income ratio

The Price/Income Ratio (PIR) measures housing affordability in a city by comparing the median price of a dwelling with the median household income. This simple definition makes it is easy to compare the price of housing in different cities that have different income. However, this index does not say anything about how much housing a household gets for the median price or where this dwelling is located. The PIR also applies only to sales and not rentals, although a rent to income ratio could be developed using the median income.

The "Demographia International Housing Affordability Survey"[2], issued every year since 2004, compares the PIR between some 367 metropolitan markets in nine developed countries (Australia, Canada, Hong Kong, Ireland, Japan, New Zealand, Singapore, the United Kingdom and the United States). Among these cities, 87 metropolitan areas have a population larger than one million. Because

[2]The 12th Annual Demographia International Housing Affordability Survey covers 87 major metropolitan markets (more than 1,000,000 population) in Australia, Canada, Hong Kong, Ireland, Japan, New Zealand, Singapore, the United Kingdom and the United States. http://www.demographia.com/dhi.pdf

the index consistently uses the same methodology, it provides an invaluable tool to compare PIRs between cities as well as to see how these ratios evolves over time.

Let us look at the price/income ratio index for a selection of 26 cities in the year 2015 (Figure 1). The cities selected are representative of the variations of PIR shown in the entire Demographia survey. Among the selected cities, Atlanta has the lowest PIR (3.1), while Sydney has the highest (12.2). Why are there such large variations in affordability? We notice that many of the cities—San Francisco, Auckland, Vancouver and Sydney—with high PIR have a difficult (though beautiful) topography. The mix of water and land makes for attractive cities but removes much of the land available for development. This topographical constraint on the land supply is likely to have an impact on land prices and therefore housing prices. But while topography certainly explains some of the variations in PIR, it is not the entire story. Cities like Chicago, Washington DC and Tokyo-Yokohama also have important water areas close to their CBD but have successfully managed these issues. Those cities have PIRs that are less than Sydney. We will see below that land use policy and regulations constraining city expansion are often largely to blame for a high PIR.

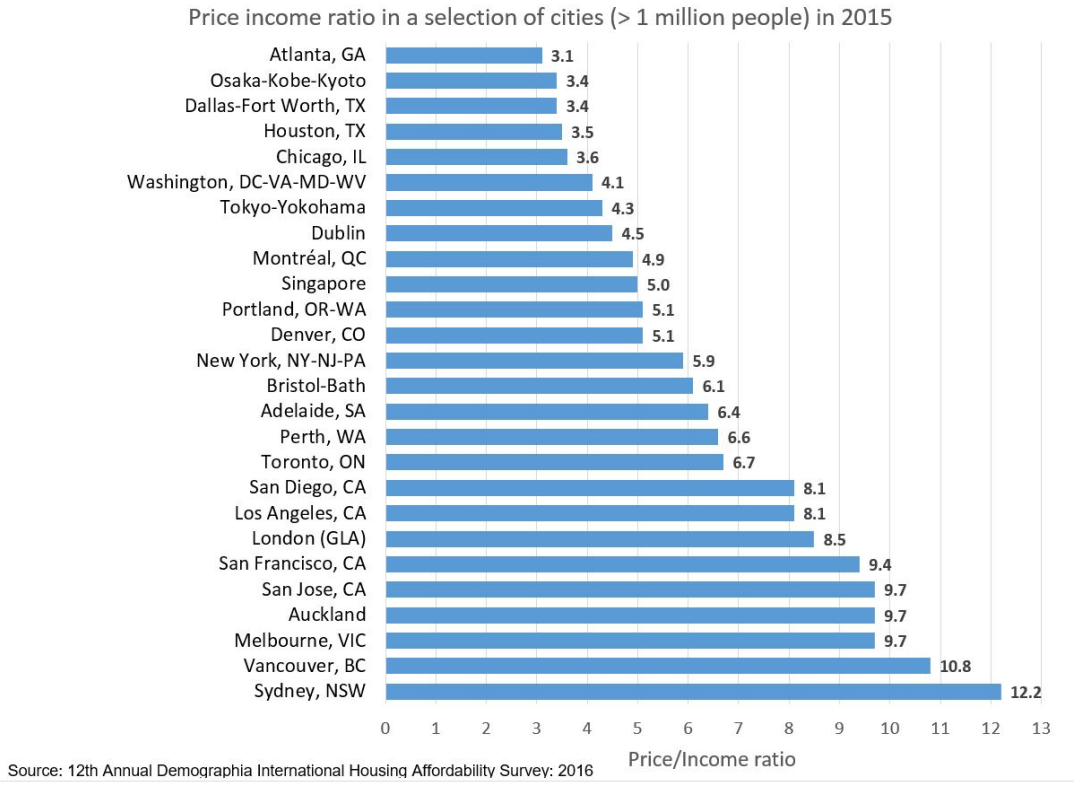

Figure 1: Price/income ratio of a selection of world cities (2015)

What does it mean for a city to have a PIR above 8?

Intuitively, we feel that households' welfare should be higher in a city with a low PIR than in a city with a higher one. If less of income is spent on housing, more can be spent on other items. However, a very low PIR might indicate economic stress. In the Demographia survey for 2015, Detroit' s PIR is a low 2.8. Some Russian cities with heavy population losses can have home prices close to zero in the absence of demand. Obviously, the PIR needs interpretation. While low housing cost compared to income is generally a good thing, it might also indicate other problems. It would obviously be absurd to use Detroit's PIR to justify using that city as a model of good housing policy and affordable housing.

What PIR value would indicate an affordable housing stock? Demographia suggests that housing is affordable in cities where the PIR is equal or below 3. None of the cities whose PIR is shown on Figure 1 qualifies, although Atlanta with a PIR of 3.1 comes close. Demographia' s complete "degree of affordability" categories are as follows:

	PIR value
Affordable	<=3
Moderatly Unaffordable	3.1 to 4.0
Seriously Unaffordable	4.1 to 5.0
Severely Unaffordable	> = 5.1

Households usually borrow money to buy their first dwelling so let us calculate the mortgage payments associated with various PIR. Figure 2 relates the cost of housing as a percent of yearly income for different values of PIR under three possible borrowing interest rates, 5, 7 and 9%, (over 25 years with a down payment of 20%). Mortgage lenders usually would provide loans to households when their monthly payment does not exceed 30% of their income, and the horizontal dotted line on Figure 2 represents this affordability threshold. When the interest rate is 5%, only in Atlanta, Houston, Tokyo and Singapore will the median household be able to obtain a mortgage for the median priced home. With a higher interest rate of 9%, only in Atlanta and Houston will the median income household be able to obtain a mortgage for the median priced home. What would happen to households in the other cities, where the high PIR implies that households at the median income would not be able to afford a mortgage to buy a median priced dwelling?

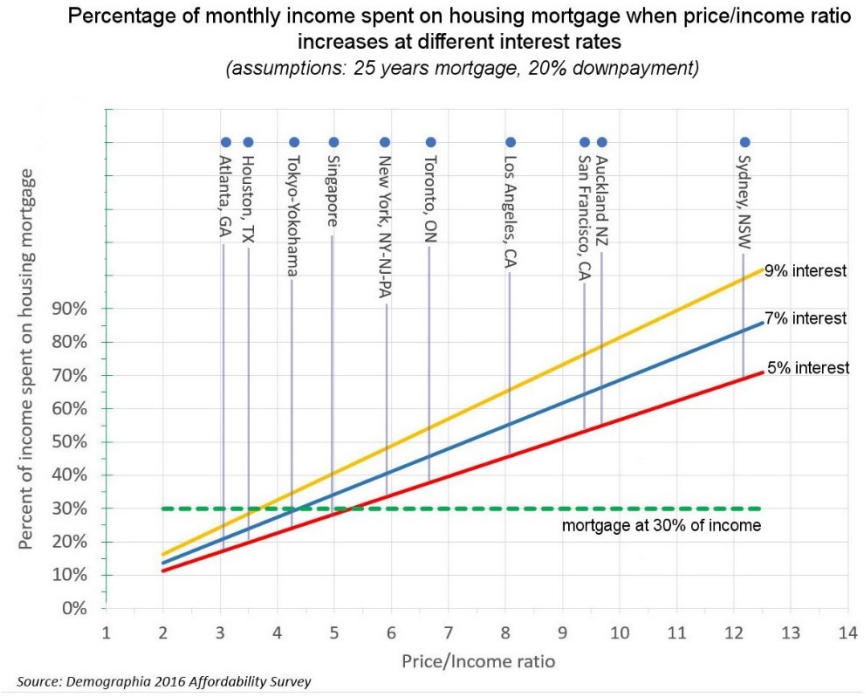

Figure 2: Price/income ratio and affordability in 10 selected cities

Some households might have bought a dwelling some years before when the PIR was still in the affordable range. These households then live in a house that they could not afford to buy now with their income alone, but the increase in PIR means that their capital assets have increased. They could, however, afford to buy a new house by selling their current house, even though the PIR shows that a new house would be unaffordable. These households are therefore probably quite satisfied by the increasing PIR value, even if it shows that housing is unaffordable to them. This fact may explain the

regulatory policy of some cities that seems intended to constantly increase housing prices by restricting new supply.

However, households that have not benefited from previous PIR increases but live in a high PIR city cannot afford to buy a new dwelling. Some might decide to move to a different city with a lower PIR, but changing city has social and financial costs and risks. More likely, the new household will try to find an alternative to buying a home. For instance, newly formed households might rent rather than buy a dwelling. Often, in high PIR cities, monthly rents are lower than mortgage payments for equivalent dwellings. I have compared the PIR of new owners to the percentage of income spent on rent in a sample of 10 US cities (Figure 3). While the percent of income spent on rent tends to increase in cities with a higher PIR, the rental markets tend to be more affordable than buying dwellings. San Francisco is an outlier with a very high PIR of 9.4 but rents at a rather affordable 32% of renter income[3].

However, the number of dwelling units available for rent might decrease when the PIR is high, as landlords would have an incentive to sell due to high home prices and low rents.

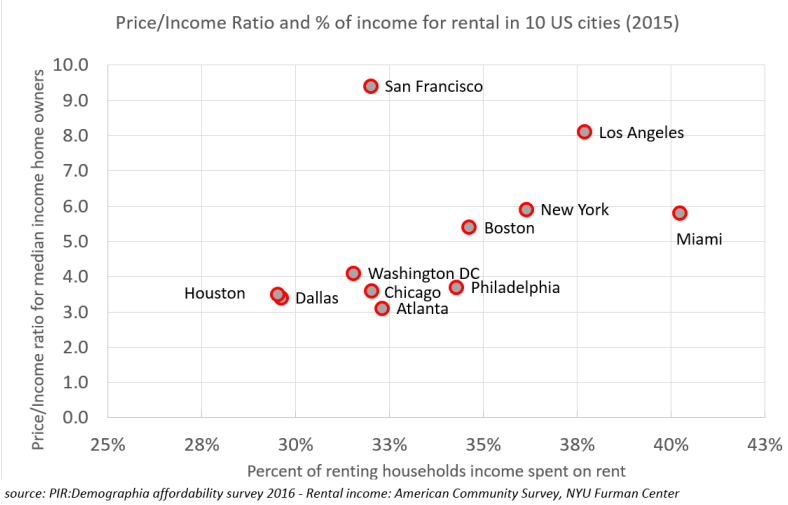

Figure 3: Percent of renting households spent on rents and Price/Income Ratio of owners

Some households might choose to leave the city and look for a city with a lower PIR, even if this means having a lower income. But the majority of households will have two options. Either adjust their living standards and opt for lower standard housing, or spend a much higher part of their income on housing. If households opt for the first solution, households with median income will opt to buy a dwelling whose price is lower than the median price, outbidding in the process households with incomes lower than the median. Households at the bottom of the income distribution will not be able to outbid anybody and will probably be forced to subdivide existing dwellings to be able to afford a new home. In Auckland, New Zealand, with a PIR of 9.7 in 2015, it is reported that a number of households are living in garages, trailers or their parents' home. These are households near the bottom of the income scale that cannot outbid any lower income group. In a city with a high, PIR households are likely to devote a high percentage of their income to housing and also reduce their housing consumption compared to what it would be in a city with a lower PIR. Reducing housing consumption, in this case, might involve reducing any or several of the housing price components. Moving to a less favorable location to reduce land price; moving to a smaller apartment; moving to a dwelling with a lower standard of construction, as the households in Auckland who have moved to trailers and garages. In

[3] The percent of income spent on rent is calculated using the median income of renters, which is on average about 65% lower than the median income of the total population.

Mumbai, a number of median income households, while their income have been rising, have been forced to move into slums as the PIR has increased faster than their income.

Some households considering moving to a city for a job might well choose a different job with a lower salary in a city with a lower PIR. This is what was is implied by Chang-Tai Hsieh and Enrico Moretti, quoted at the beginning of this chapter. The productivity of these usually highly skilled households would become therefore less than what it could have been if they had moved to the city with a higher salary but higher PIR. There is a loss of welfare for everybody.

However, it seems that only higher income households will make this choice. Given the terrible conditions in the slums of many economically dynamic cities, like Rio de Janeiro or Mumbai, it seems that even middle-income households seem to prefer an economically dynamic city to lower housing prices. The possibility of participating in a dynamic labor market attracts very low-income households to expensive cities like Rio de Janeiro or Mumbai, despite the deplorable housing. To be able participate into a dynamic labor market, they are ready to reduce their housing consumption to a bare minimum, or to choose locations with very long commute, or to increase the share of their income that will decrease their spending on health or education. The welfare effects of a high PIR are not trivial. Planners, given their responsibility for constraining land supply, should monitor PIRs regularly and act when the PIR increases.

The PIR is a useful index to identify an affordability problem but it is too crude to identify a policy solution

The PIR is a useful and easily understood index to identify an affordability problem in high-income cities. However, it relates only the median income to the median home price. It has nothing to say about the quality or location of the house at the median price. While the PIR is simple and uncontroversial, collecting income and home price data can be difficult in countries that do not have a systematic sale registration system and in cities that have a large informal sector. This is why Demographia does not yet cover developing countries. Finding the median housing price implies that all transactions are equally well known. In many developing countries, it easier to find the prices at the high end of the housing market than at the low end. It is also easier to find prices of new housing than that of existing houses. In many cities, the data required to calculate a credible PIR does not exist.

How do households adjust to unaffordable PIR!

In cities with a high PIR, housing is assumed to be unaffordable not only to the poor but to the middle class. However, we do not see people leaving high PIR cities en masse for more affordable cities. It seems that in cities like Sydney, Vancouver or San Francisco, life goes on as usual despite a very high PIR. The same could be said of cities for which no PIR can be calculated but have notoriously high real estate prices, such as Mumbai, Lagos and Jakarta. Obviously, the vast majority of households adapt to "unaffordable" prices by choosing not to leave their current city. We even see that the population keeps growing in cities with unaffordable prices because of migration and new households' formation.

But high real estate prices are anything but benign. This apparent "business as usual" response to rapidly increasing housing prices might hide a deteriorating quality of urban life for all but the most affluent residents. Households adapt to housing prices that rise faster than their income by consuming less floor space and spending a higher share of their income on rent.

High prices or absolute poverty force poorer households to consume less housing than the minimum "socially acceptable" level set by regulations as mentioned above. Falling below this minimum will further decrease the housing standards of the poor. Consuming less housing than what is prescribed as "socially acceptable" often prevents their housing from attaining legal status and permanence. This will compound their misery through a vicious cycle: poverty causes low housing consumption which causes more poverty.

In middle and high income countries, many less affluent people can respond to high prices by subdividing existing dwelling into smaller units, formally or informally. In other cases, new households cohabit with their parents or other relatives much longer than either would wish. In either case, high

housing costs results in lower housing consumption. Two case studies discussed below illustrate these forced adjustments: the subdivision of apartments in Beijing suburbs and the cohabitation of adult children with their parents in Europe.

Finally, sometimes cities revise their "socially acceptable" minimum housing consumption to reflect the demand from a changing socio-economic group. This occurred in New York City in 2016. There, the existence of a large number of single person households convinced city regulators to lower the minimum housing standard. This case is also discussed more in detail below as it illustrates the futility of setting minimum socially acceptable standards in the first place.

Informal subdivision of apartments in China

Chinese cities have very few identifiable informal settlements. However, the housing consumption of low-income households is often difficult to measure. Many of the new apartments built in Chinese cities' periphery are too large to be affordable to low-income households. As a result, low-income residents afford housing by renting a room in a subdivided apartment. The street poster appearing in 2013 in a northern suburb of Beijing (Figure 4) advertise an 18 square meters room to be rented within a larger apartment with a kitchen and bathroom to be shared by other tenants. Fortunately, Beijing's government tolerates this practice, although other apartment owners in the same condominium complex protest the practice and routinely try to convince the municipality to ban it. From a housing supply point of view, this adjustment is desirable because it transforms the built housing stock into housing that is affordable. Once a block of apartments has been built it is very difficult to reduce the size of units to meet the demand for smaller units. Informally subdividing existing apartments is the fastest way to match supply and demand. This situation need not be permanent. Over time, the supply of newly built housing will better matching demand, and the practice of subdividing apartments will disappear by itself.

Figure 4: Poster in a suburb of Beijing advertising a room to rent in a subdivided apartment

Government should monitor but not ban the practice of subdividing apartments. If the practice of subdividing apartments persists over time, regulations may be blame. For example, an arbitrary minimum apartment size, or a maximum number of dwelling per block might be responsible for the mismatch between supply and demand. Removing these regulations, which have no discernable benefits, would allow the housing market to respond to changing consumer demand.

Young people living with their parents

In affluent countries, assessing the impact of high price-to-income ratios on the housing consumption of specific income group can be difficult. A 2013 Pew Research Center survey shows the proportion of people aged 25 to 35 who live with their parents in European countries and the US

(Figure 5). This percentage varies from 1.8 percent for Denmark to 56.6 percent for the Czech Republic. Cultural factors may explain some of the difference between countries. However, economic factors, like the employment rate, and housing supply issues also affect the rate. Whatever the reasons for the international differences, my point is to illustrate that housing consumption adjusts when there is a discrepancy between supply and demand for housing.

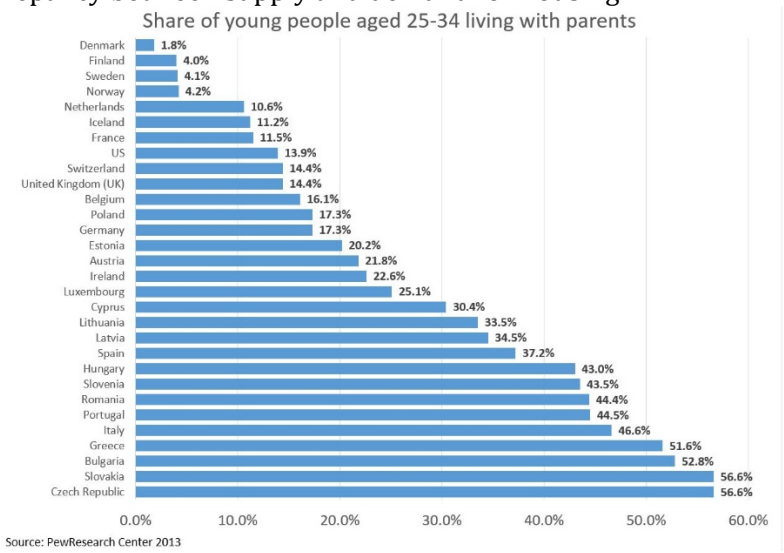

Figure 5: Share of young people aged 25 to 34 living with their parents in Europe and in the US

Reducing "minimum socially acceptable housing standards Micro apartments in New York

In New York, a 1987 city zoning regulation specified that the area of apartments should be at least 37.2 square meters (400 square feet). But the supply of apartments of this size is constrained by another zoning regulations that puts a maximum limit on the number of dwelling units per acre, thus implicitly reducing the number of small apartments that could be built in a block.

However, the demand for small apartments has been increasing as the number of people per households has decreased in the last fifty years. In 2015, the number of non-family households, i.e. households formed by single person or unrelated individuals, represented 38% of all households. Recognizing this problem, in 2015, the zoning board allowed the construction of 55 "mini-apartments" ranging from 24 to 33 square meters, in a single nine story building on the East Side of Manhattan. This was a timid step toward using a common-sense approach to repeal minimum socially acceptable standards.

When the 55 mini-apartments appeared on the market, there were 4,300 applicants for each apartment! This demonstrated the large demand for small units, which is arbitrarily constrained by the minimum apartment size regulation. The apartment building is centrally located with excellent access to New York's labor market. Lowering the minimum apartment size regulation gave individuals the freedom to make their own choice in the trade-off between larger apartments in less central locations and centrally located smaller apartments.

However, if the municipality removed the apartment minimum size constraint for the entire city, developers will still not build more mini-apartments. Another regulation limiting the number of dwelling units per block will prevent that. Limiting the number of dwelling units per block was meant to limit residential density. But since the regulation was put in place, residential density has fallen as the average household size has fallen. Layers of regulations, whose original objective has often been forgotten, prevent housing supply to match demand. These multiple layers of regulations must be repealed for housing supply to be responsive to housing demand.

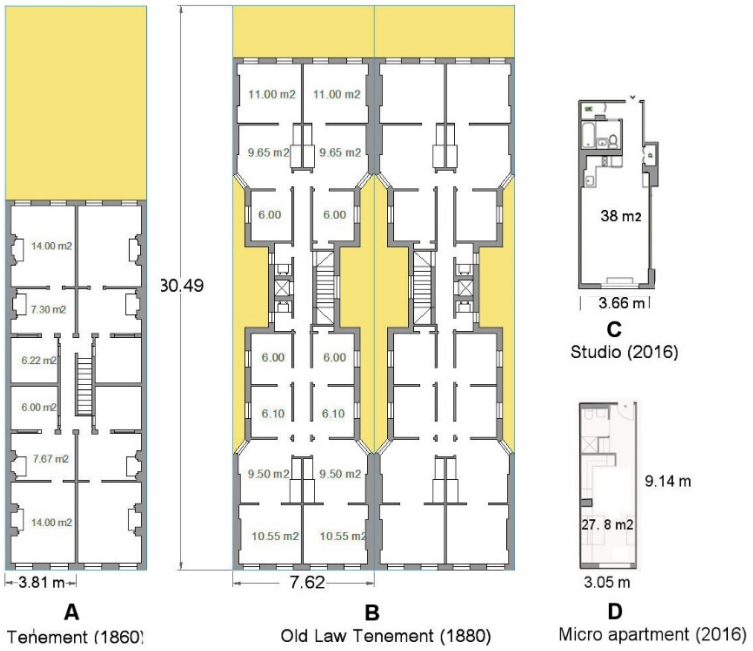

Figure 6: New York City "minimum acceptable housing standards since 1860

In New York City, minimum housing regulations have evolved over centuries. Figure 6 shows examples of floorplans of apartments of the smallest acceptable size at different dates. In 1860, housing construction standards were practically unregulated. Developers responded to housing demand from all socio-income groups. The typical floor plan of a tenement shown as **A** on the left of Figure 6, built in 1860, shows each floor has 4 apartments of 3 rooms each. Only one room in each apartment has windows. Bathrooms were shared among all building tenants and provided on the ground floor in the back yard. The apartments are designed such that households may occupy only one room or several connecting rooms. At the time, households were very large, often six or seven persons per household. The population density in tenement neighborhoods were about 660 people per hectare in 1860[4]. The density peaked at 1530 p/ha in 1910 and fell to 390 p/ha in 2010.

The minimum socially acceptable housing standard evolved over time and a reform movement resulted in the Tenement House Act in 1879 (plan **B** on Figure 6) which required rooms to have access to ventilation shafts. In addition, regulations required a bathroom and toilet on every floor. In 1987, the minimum apartment size allowed by regulations was 37.2 square meters. The plan of a studio of this size, built in 2016 is shown in **C.** Finally, the plan of one of the 55 "micro-apartments" of 28 square meters to be built in the middle of Manhattan mentioned above is shown in **D**.

These examples illustrate the futility of controlling maximum densities or minimum floor area per person through regulations. The very high densities of the tenements in the 1860s were not generated by design or regulations but by the market. The tenements' excellent location and the tenants' very low income created the high density.

Many of these "old low tenements" survive to this day in Manhattan. A study by Stephen Smith and Sandip Trivedi published in the New York Times in 2016 shows that about 40 percent of the existing buildings in Manhattan could not be built today because of the compound effect of overlapping regulations! It is difficult to understand the rationale for such regulations, although practically every city in the world has similar rules.

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[4] " The Rise and Fall of Manhattan's Densities, 1790 – 2010" by Solly Angel and Patrick Lamson-Hall, 5-Dec-2014, Marron Institute of Management, Working Paper Series;18

Informal subdivisions in New York City: creating affordable housing below the minimum socially acceptable standard

Subdividing large apartments into rooms individually rented to people who share a kitchen and bathroom is usually legal in many cities. New York City, however, limits this right to no more than three unrelated individuals. Subdividing apartments or houses into individual independent units with their own kitchen and bathroom is illegal in most cities.

In New York, a recent study [5] showed that between 1990 and 2000 about 114,000 new housing units were illegally created by subdividing existing houses and by transforming basements and garages into new units. These unauthorized dwellings accounted for half of the housing stock added in New York City in the 1990s. The dwellings represented about four percent of the total housing stock, and provided shelter to about 300,000 to 400,000 people.

Subdividing homes like this is illegal, but the action creates affordable new units without any government subsidies. Another study describes the plight of new emigrants from Bangladesh who settle in New York City. Most of these households have very low income and would be unable to afford any legally built dwelling. Several families pool their resources to buy a detached house in a low-income part of Queens. They then subdivide it into several independent units where they live. These illegal units enter the market and are subsequently either sold or rented.

The city sends inspectors to prevent this from happening. The argument against these informal subdivisions is that they overload the utility system, urban transport and schools and because of the higher density they create. However, it is unlikely that the utility system is really affected because of the decrease in household sizes in the last thirty years. However, school might indeed become overcrowded because immigrants tend to have more children than native born households. However, a primary function of a municipality is to provide school space to all the city's children. It does not make sense to prevent families from settling in a neighborhood under the pretext that the existing number of classrooms is insufficient. The interdiction against subdividing is usually a pretext to hide the municipality's inability to provide adequate number of classroom to its residents. Many zoning regulations are established to prevent changes of any nature, including preventing lower income families from living in middle income neighborhoods. In the case of the Bangladeshi migrants, they outbid their more affluent neighbors by consuming less floor space than the existing residents. It is the opposite of gentrification. While the city planning department claims social inclusion, i.e. neighborhoods with mixed households income, as its objective, its prevent the emergence of mixed income neighborhoods by zoning laws that prevent lower income households to afford to live in higher income neighborhoods.

The above examples show how households adjust to high prices by consuming less housing. Ideally, there would be a match between housing supply and demand. Because of the inevitable lag between demand and supply changes—for instance when households size decreases—regulations should allow these informal adjustments to occur legally.

When the poor are unable to substitute capital for land

As cities expand, centrally located land become more expensive. Households and firms respond to this by moving into multistory buildings—apartments and office towers—which reduces their land consumption. By this action, they substitute capital for land. By building multi-storey structures, they can increase their consumption of floor space while decreasing their consumption of land. By

[5] Robert Neuwirth, and Chhaya "New York's Housing Underground: A Refuge and a Resource" Pratt , Chhaya Center for Economic Development CDC (2008).

substituting capital for land and therefore consuming less land per dwelling unit, lower income households can compete for the same land with higher income households.

This is possible in cities where lower income households can afford the increased cost of multi-storey construction, a structure of at least about 18 square meters[6] in reinforced concrete, which would be structurally strong enough to support staking up apartments one above another. In the lowest income countries, where construction is the cheapest, households would need to be able to afford at least US$ 6,000 for a studio of 12 m^2. In other words, substituting capital for land requires a minimum of capital. In some cities, the poorest households cannot afford this minimum cost threshold. Because they are unable to substitute capital for land, the floor space they consume is even smaller than the land they occupy. They can afford a shelter by consuming very little land and even less floor space. The extremely narrow passageways found in slums in many cities is not due to "poor design" but is a rational choice for households who desperately need more floor space and are ready to trade-off street space for additional floor space, as they are too poor to build higher houses.

The following example, taken from Bhayandar West, a Northern suburb of Mumbai, illustrates the consequence of being unable to substitute capital for land. Figure 7 shows two settlements built side by side. On the left, settlement **A** is a very low income community living in an informal settlement where houses are built of scavenged wood and corrugated iron, structures too weak to be extended vertically. On the right, settlement **B,** a middle-class community made of apartments in seven floors buildings. Community A is too poor to substitute capital for land, community B can afford do so. Let us compare the way their consumption of land and floor space differs, shown on the table to the right of Figure 7.

The middle-class community **B** consumes an average of 23 m^2 of floor space per person while the poor community A consumes only 3.5 m^2. However, the land consumption of both communities is relatively close: 4 m^2 for the poor against 6 m^2 for the middle class. The poor households who cannot afford the minimum building cost of US$ 6,000 for one room in an apartment block are obliged to use more valuable land per unit of floor space than the wealthier households in the formal settlement **B.** The poor households in settlement **A** must use 1.16 m^2 of land per square meter of floor space, while households in **B** use only 0.27 m^2 of land per square meter of floor space. Households in **B**, because they can afford apartments in multistorey buildings can also afford to allow 46% of the land to remain as open space compared to 13.5% in the horizontal settlement **A**.

Comparative land use between formal and informal settlements

		A Informal	**B** Formal
Average number of floors	*u*	1	7
Average floor area per dwelling (1)	m^2	17.5	81.3
Area of floor space per person	m^2	3.50	23.21
Area of land per person	m^2	4.04	6.16
Area of land per m2 of floor space	m^2	1.16	0.27
Area of land per dwelling	m^2	20.22	21.55
% of roads and open space	%	13.5%	46%
Gross FAR		0.87	3.77
Net residential density	*people/ha*	2,473	1,624

(1) including common corridors and staircases

Figure 7: Mumbai Northern suburbs - Informal and formal settlement

Despite consisting of only ground floor structures, the residential density of the horizontal settlement **A** is much higher than the vertical settlement **B**. I

[6] This area includes staircases and corridors that are indispensable for multistory structures, it assume a living space of about 12 square meters.

It seems that about US$ 6,000 (in 2016) is the cost threshold below which poor households who cannot afford this sum are condemned to live in horizontal development. In large cities where land is expensive, the poorest households are often obliged to consume more land per unit of floor space than higher income households. This results in extremely low housing consumption for low-income households. By contrast, in cities where poor households can afford to spend more than US$6,000 per house, the horizontal slums shown on Figure 7 tend to disappear and be replaced by multistorey apartments that allow a much higher consumption of floor space. The urban village housing in Shenzhen discussed below will illustrate this case.

The development and diffusion of building technology, like prestressed small prefabricated beams, could substantially lower the US$ 6,000 cost for an apartment in a multistorey building, and would therefore increase the housing consumption of the poor much beyond the savings in construction costs, because it would allow a much larger number of households to substitute capital for land, as higher income groups are routinely doing.

In addition, constructing of multistory apartment buildings typically requires financing. It is nearly impossible for households to self-finance such a structure, the way they do it for horizontal housing which can be improved in stages. A city's financial sector must therefore be able to provide mortgages as well as construction finance for developers to improve land efficiency.

Measuring Income distribution in relation to housing consumption is indispensable for policy formulation

Using Cities' households income distribution

Using a median income to measure affordability is a justified simplification when comparing different cities or when looking for a trend in a time series. It is also an acceptable simplification for cities with large middle class where most households' incomes are closely clustered around the median income. However, when trying to improve housing affordability in a specific city it is necessary to look at the income distribution: a household with a median income may represent only a very small socio-economic group. This is particularly true in large cities of developing countries where incomes are more widely dispersed than in more affluent cities.

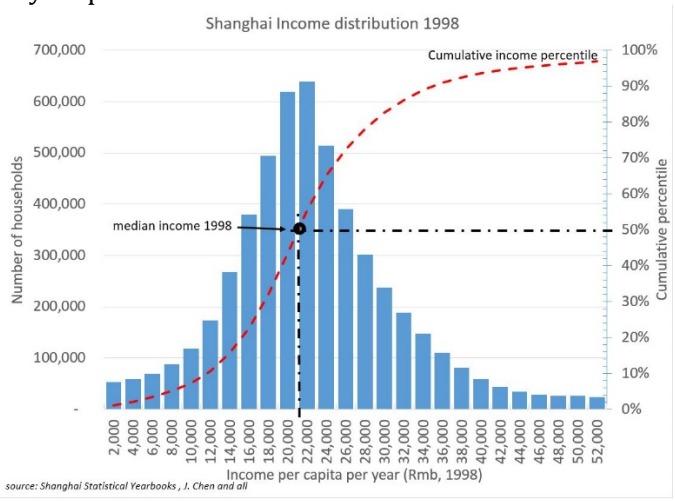

Figure 8: Shanghai households' income distribution in 1998

The graph of Figure 8 shows the distribution of households' income in Shanghai in 1998. The income is displayed at equal intervals along the horizontal axis. The blue bars show the number of households in each interval using the left axis. The doted red curve superimposed on the bar chart shows the cumulative percent of households within each income interval using the right axis. The

graph shows visually the number of households in different socio-economic groups that compete for land and housing. This graphic representation of all income groups in a city conveys much more information than using median income or the imprecise terms of "low income", "medium income" and so on. For instance, using the graph of Figure 8, the 180,000 households with annual income below Rmb 6,000 have a very different affordability problem than the 260,000 with annual income around Rmb 14,000. However, both of those groups had income well below Shanghai's median income of around Rmb 21,000 (horizontal dotted line on Figure 8). A city's income distribution curve is an indispensable tool to analyze and quantify housing affordability issues.

Housing Stock and flow: the trickle down theory

The shape of the income distribution curve may also help anticipate the policy impact of affordability. The shape of the graph enables the testing of whether the "trickle-down" affordability theory[7] is likely to happen of not. For instance, imagine that developers increase by 10% the number of new housing units affordable to households with an income around Rmb 14,000. This would improve affordability for households with income lower than Rmb 14,000, as the number of dwellings vacated by the beneficiaries will likely trickle down to lower income groups and have a significant impact as these groups are less numerous than the original beneficiaries. However, if the same 10% increase in new housing units is built for households with income around Rmb 36,000, the increase in number of housing units will also trickle down toward lower income groups but will soon have an insignificant impact because of the much larger number of households among the lower income group. The trickle-down effect does occur in every case, but its effect will be completely diluted if the increase in dwelling units is targeted to households whose income is much to the right of the distribution mode (in the case of Shanghai as shown in Figure 8, the mode corresponds to households with income around Rmb 22,000). If the number of households by income interval were equal (if the graph was showing a horizontal line rather than a curve) then the trickle down would work perfectly.

Of course, the "trickle down" effect could also become a "trickle up". Imagine that a government constrains the housing supply of higher income groups and favor exclusively the building of lower cost housing units (say, for income around Rmb 12,000 on the graph of Figure 8) in the absence of new supply, higher income groups will outbid the lower income group to occupy the only new units on the markets. The trickle-down will then become a trickle-up. Trickle-up means that housing units previously affordable to lower income are being bought by upper income (gentrification). This happen quite often in government subsidized housing when the overall housing market is heavily constrained by land use regulations or/and lack of infrastructure expansion that constrains land supply. Higher income groups "invade" the housing stock of the lower income group. The effect is particularly severe when higher income groups acquire existing dwellings only to reassemble them into larger ones.

In Chennai, in India, in the 70s, the municipal government had a vigorous program to build subsidized public housing while constraining the development of land for all other income categories through regulations and inadequate infrastructure development. However, low-income households, who had been carefully selected based on income to benefit from public housing, often sublet or informally sold their apartments to higher income households. The government, then, did not react by adjusting its housing policy by releasing more land for housing. Instead, it concentrated its action in preventing trickle-up sales or subletting. It required all members of households in public housing to have identity cards with photographs that could be presented to inspectors who conducted random visits. This was an example of a trickle-up effect that is quite common when land development policy

[7] The "trickle down" affordability theory assumes that any increase in the housing stock, no matter at what unit price, would eventually improve the housing supply of every household, even the poorest. Households benefiting from the supply increase would "move up" to the new housing, thus freeing an equivalent number of units that would become affordable to households with income lower than that of the beneficiaries of new housing. Eventually, the moving up into better housing will repeat itself and the benefits will "trickle down" to the lowest income groups.

and regulations are at odds with housing policy. I will discuss this topic more in detail below when looking at housing policy options. The reaction of the Chennai government is also typical of governments in many countries. When data shows that a policy is not working—beneficiaries selling their subsidized dwelling to higher income groups—governments try to force success through more regulations.

Household income distribution curves show the complexity of any housing policy aimed at insuring a supply of affordable housing to all households, especially when incomes vary widely. I will use the income distribution curve as a major tool to test housing policy options.

What happen when income increase rapidly?

Figure 8 shows Shanghai's 1998 income distribution. The shape of the curve will likely be quite different after only a few years. New unskilled migrants might increase the number of very low income households on the left side of the graph, while the income of other households, who have been urbanized for a longer time, might increase rapidly because of increased productivity and skills. The increase in income will add households in the middle and right side of the graph. The change in households' income distribution will change the demand for housing and require an adjustment in the supply of new housing units. The price and standards of new housing should adjust to the new demand.

Let us compare the income distribution profile of Shanghai of 1998 with that of 2003 (Figure 9). During this period Shanghai median income increased from Rmb 21,000 to Rmb 32,000 in real terms, a 58% increase at an average annual rate of 8.8 %[8] . This very high income growth rate is exceptional. In Shanghai, it was a period where bold economic reforms and large infrastructure investments implemented in the previous decade dramatically increased urban productivity. During the same period the number of households increased by 17% or an average of 3.3% a year, also an exceptional growth rate for a city with a population of 15. 5 million in 1998. The natural demographic growth rate of Shanghai during this period was slightly negative at -0.08%. The population growth rate was therefore entirely due to migration.

While the population and income growth rate of Shanghai are exceptional, they provide insight into housing affordability issues that emerge when urban income distributions are changing. The changes in Shanghai are compressed over a short period of 5 years. In other cities, comparable changes may be spread over a longer period, say, 10 years, but they are nevertheless daunting and need to be addressed. In managing a city, nothing is more damaging than assuming a static situation.

The 58% increase in the median income does not reflect a uniform increase among all income classes. The way households' incomes are distributed has important implications for housing affordability. In spite of the large increase in median income, the number of households in the very low income group, below Rmb 6,000 per year, increased by 53%, representing 70,600 additional households. This increase is consistent with the high rate of migration. A large number of migrants are coming from the countryside and have not acquired yet the skills needed to access productive urban jobs.

In the next category, low middle-income from 6,001 to 24,000 Rmb, the number of households decreases by 1.9 million or -58% compared to the number of households in this category in 1998! By contrast, the income group above Rmb 24,000 increased by 2.8 million households.

According to the Shanghai Municipal Statistic Bureau, 153.8 million of square meters of residential floor area were built during this period, or about 165 square meters per additional households. In aggregate, it seems that the supply of housing has more than kept pace with the growth of population—a remarkable achievement given Shanghai's fast demographic growth. However, the aggregate amount of floor space does not tell us the total number of units built, how large they were, their price or location or what category of households were able to afford them.

[8] http://www.inflation.eu/inflation-rates/china/historic-inflation/cpi-inflation-china-2000.aspx

Housing affordability should not be calculated in aggregate but by income group. Square meters of floor space are not sold individually but in lumps as apartments in specific locations that determine their price. Low-income households therefore may not have access to all the floor space built. Affordability assessment cannot be done in aggregate by comparing new households formation to new housing units built. The flow of new supply, measured in housing units rather than aggregate floor space should be disaggregated by number of new units put on the markets that are affordable to specific income group. In conducting affordability evaluation to test a policy it is necessary to disaggregate the number of units produced with prices/ incomes, floor consumption and location.

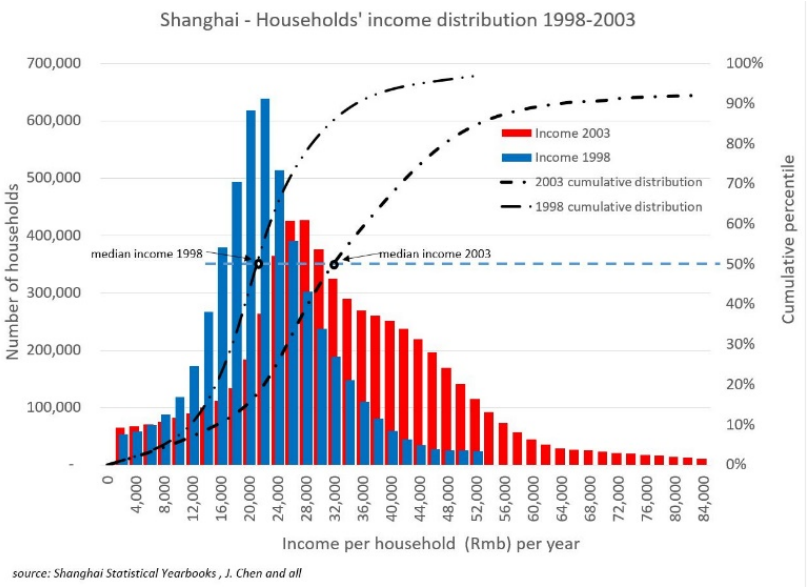

Figure 9: Shanghai changes in income distribution between 1998 and 2003

Income distribution related to housing typology

I have shown the wide variety of income that exists within a city. Every household whose income is represented on an income distribution curve lives in some kind of shelter that it can afford under current conditions. However, the quality of this shelter may range from two square meters of cardboard on a sidewalk to a luxury villa with indoor swimming pool. To identify the real affordability issue we will have to match income distribution with shelter consumption and to decide at what point the shelter consumption have fallen below the socially acceptable minimum. In looking for a policy solution we will have to know how many households currently live in a shelter below the minimum acceptable home quality. The policy options will be different depending on the number of households that falls under this minimum. Imagine that in a city of one million people where only five hundred people are living in shelters made of cardboard and plastic. The solution is probably a welfare budget allocation to move these five hundred households to adequate shelters in a central location, while providing them with education and training so that they eventually integrate into the city's labor force. However, if in the same city, thirty percent of the population live in cardboard and plastic houses, the policy solution will require a very different approach involving looking carefully at demand and supply for land and housing. The solution to the housing problem will require a market intervention, even if some demand subsidies are also used. Developing a housing policy therefore necessarily relates housing affordability deficiencies to the number of households who suffer these deficiencies. This is what I propose in the following section. Whether looking at housing affordability issues in Mumbai or New York City, the households' income distribution curve will be the first building block in developing a solution. It is necessary to quantify the problem in terms of the proportion of households that fall below the socially acceptable minimum standard.

Households' income distribution should then be related to housing consumption by income range; an important dimension that is missing from the PIR index. It is important to link housing payments with what households get for their money. The objective of a housing policy is to increase the housing consumption of households who consume an unacceptably low standard of housing consumption due to their low income. Therefore, a housing policy should never aim to just supply a certain number of housing units per year to fill a "backlog" of substandard housing.

All the households shown on the graph of Figure 8 live in dwellings that can be observed on the ground or from above through satellite imagery or aerial photography. High resolution satellite imagery can be analyzed to identify housing types that can be ranked by their cost and physical characteristics. The area occupied by each housing type can be measured. The entire residential housing supply of a city can then be divided into housing types. Census data and field surveys can complement the information obtained by satellite image interpretation. The entire population of a city can then be distributed among different housing types. Each housing type corresponds to a housing price or rent range that can be related to a household income. It is then possible to merge the type of income distribution graph shown on Figure 8 with the housing typology data to obtain a representation of the distribution of the entire set of households by income group and housing type. The graph of Figure 10 illustrates this method. It shows Hanoi's households income distribution on the left side and their housing typology superposed on the income distribution on the right side. The graphs shows what type of housing is currently affordable to each income group—as they are currently living in it—and the number of households in each housing type.

Hanoi's population has been distributed among eight housing types. These housing types are specific to Hanoi and can easily be identified on a satellite imagery. There is no standard housing typology that can be used across cities; for each city, a new typology has to be defined, reflecting the local history and culture. In the case of Hanoi, two housing types are specific to Vietnam—urbanized village housing and "tube houses". Urbanized village housing corresponds to housing units that were originally located in villages that were on Hanoi's periphery but have been absorbed by the city's expanding urban footprint. These villages retain their original street layout and plot sizes. "Tube houses" are traditional row houses with a frontage of about 3.5 meters and a depth of 22 meters. They can sometimes have up to 6 or 7 floors. They may be used by one extended family or subdivided into apartments or even rented room by room. The income groups that can afford tube house can therefore vary greatly from neighborhoods to neighborhoods and over time.

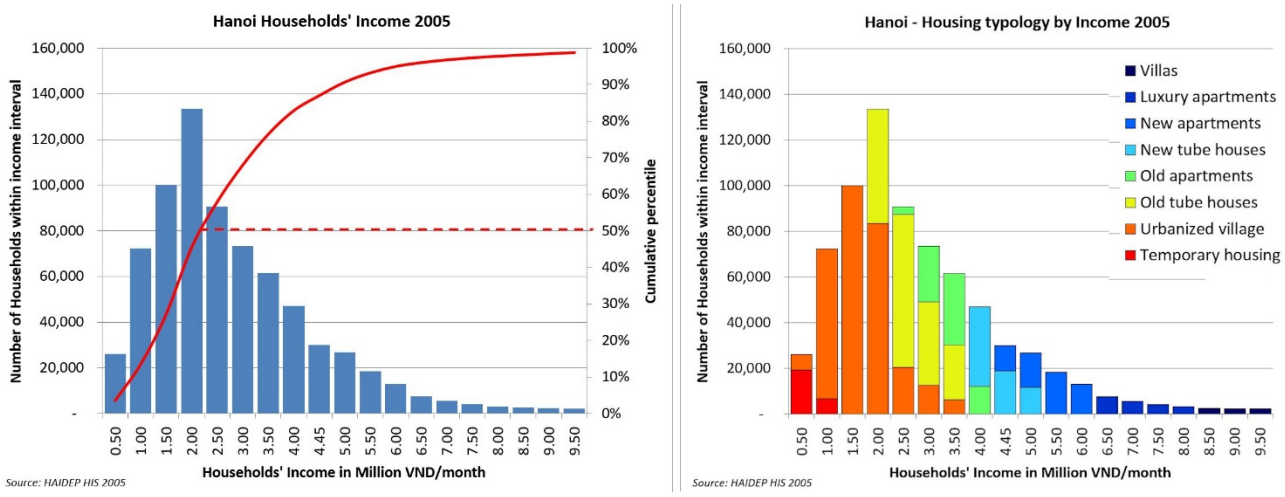

Figure 10: Hanoi income distribution related to typology

The choice of a typology is important in analyzing housing policy. The number of units of a certain house types can increase over time while others are bound to decrease. For instance, the housing stock constituted by "old tube houses" and "old apartments" located in the historical core of Hanoi cannot expand and could only slowly disappear through demolition and transformation into another type of housing, for instance "new apartments," which would be affordable to a different, usually higher, income group.

The graphs of Figure 10 show only a snapshot of the housing situation in Hanoi at the date of the survey. The income distribution will change and the housing stock will be transformed by demolition, reconstruction, and extension into new greenfield development. Neighborhoods rarely remain static, they are subject to "gentrification" or its opposite "degentrification". In general, when incomes are increasing rapidly, as in Shanghai in the 2000s, higher income groups tend to move toward newly built units, while lower income groups replace them in the older units they previously occupied. However, higher income groups may also move back into renovated housing units in older neighborhoods when these neighborhoods are either well located or have an historical cachet.

For instance, in Beijing the "hutong neighborhoods" were often inhabited by high and middle income households before the revolution. They were subdivided when the Communist government took over in 1947, resulting in densification and subsequent "degentrification". In the 80s the municipal government considered the dense hutongs to be slums and bulldozed them and replaced them with high rise apartments. In the early 2000s, some hutong areas became popular and were subsequently re-gentrified into low-density one family compounds or into pricey hotels. The cycle between degentrification and re-gentrification lasted about 50 years. Most cities' ancient neighborhoods have similar stories with longer or shorter cycles between gentrification, degentrification and re-gentrification—for instance, the West Village in New York, the Marais in Paris or Soho in London.

The main lesson to draw from the constant transformation of historical cities is that the entire housing stock might transform. An affordable housing policy should therefore project the likely housing stock and flows. The stock and flow approach is more useful when applied to a housing typology. For instance, in the case of Hanoi, we know that the "old apartment" flow will be by necessity negative, while the villas and new apartments are likely to have positive flows.

It is a common mistake to look only at a slice of the housing market, such as low-income neighborhoods and concentrate on new supply through greenfield development, while the entire housing stock is subject to transformation. In particular, low-income households are usually better off moving into existing centrally located neighborhoods newly affordable to them than moving into newly developed "low income housing" in the periphery with long and expensive commuting trips.

Relating income distribution with housing consumption

After relating households' income to a housing type it is necessary to relate households' income to actual measured housing consumption. Many consumption indicators could be used: floor space per household, land area per household, residential utility consumption like water and electricity, access to transport and community facilities. We could also use a composite index that reflects the weighted aggregate housing consumption of households, including all of the components above.

Whatever consumption measures we select, all housing units are distributed among households according to their price rank. This price will theoretically be directly related to households income. By relating household housing consumption to income distribution we can identify the groups that are particularly deprived and develop a housing policy to address this deprivation.

Hanoi's income distribution is related to floor space consumption of floor space in Figure 11.

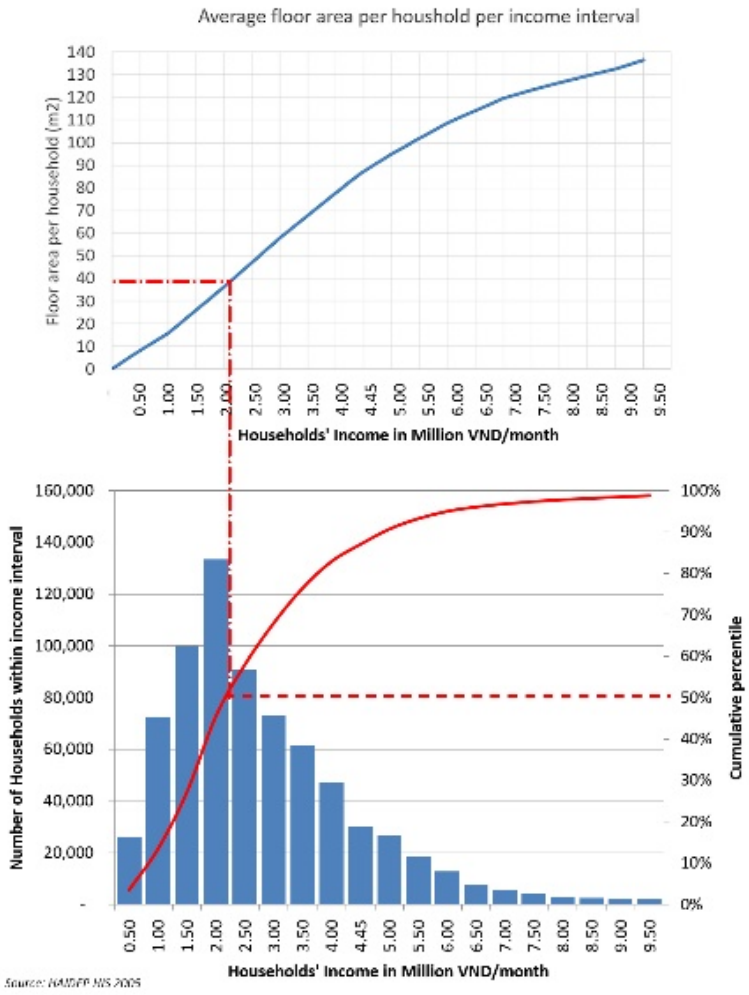

Figure 11: Hanoi – Households income distribution and floor consumption

On the graph of Figure 11 I have reproduced the household distribution of Figure 10 at the bottom of the figure and I have added a new graph above with the same horizontal axis corresponding to households income but with a vertical axis representing floor area per household as it varies with income. The line on the graph is an average per income; different households may consume different quantity of floor areas depending on their circumstances and preferences and home location. However, these variations between people and income groups average out across income groups. This is why the consumption can be conveniently represented by a curve showing the average consumption per income interval rather than by a scatterplot including all the surveyed cases.

The two graphs show how many households consume how much housing. Most housing policies initial step consists in defining the socially acceptable minimum housing consumption, usually in term of floor area. The use of an income distribution curve linked to average housing consumption per income interval would allow one to evaluate the number of households that are below a set consumption threshold. The policy and possibly the threshold could be adjusted accordingly. The average floor area consumption per income interval could also be replaced by other consumption indicators linked to income, for instance water consumption, or any other indicator.

The representation of the two graphs on Figure 11 is a simplification of reality, but it is a useful one to understand and discuss policy options, as we will see in the following sections.