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How does the household structure shape the urban economy?

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ABSTRACT

Households in real cities are heterogeneous regarding their size and composition. This implies that the household structure – i.e. the (average) household size, the composition, the relative share of different household types, and the number of households – differs across cities. This aspect is usually completely neglected in urban models used to study economic and policy issues that arise in today's cities. Furthermore, the household structure might change over time. For instance, over the last decades average household size has decreased in many countries. Several implications of this change have been discussed, but usually not in regard to an urban economy with its interdependencies. We develop an applied urban general equilibrium model (based on Anas and Xu, 1999 or Anas and Rhee, 2006) which explicitly takes the household structure into account and thus allows studying the impacts of differences in the household structure on urban areas. The paper shows that the household structure affects an urban economy and its spatial pattern in various ways and may contribute to explain economic and spatial effects on cities and differences across cities. Compared to a 'Base City' which reflects the actual household structure in the United States, urban labor force participation, housing demand, rents, wages as well as urban commuting and shopping patterns are considerably affected by, e.g., differences in the average household size in a city. For instance, wage inequality between differently skilled workers raises and extreme cross commuting drops to almost zero when the city turns into a 'Singles City'. Hence, pure economic forces associated with the household structure may shape cities in a different way, implying that the impacts of urban policies may depend on the household structure and therefore differ across cities.

1. Introduction

The household is the fundamental basic economic unit in the society. But the structure of households varies across cities because households are heterogeneous and differ in size as well as their composition. Furthermore, the household structure – i.e. the (average) household size, the composition, the relative share of different household types, and the number of households – changes over time. For instance, in many countries households have become smaller in recent decades. Between 1970 and 2000, the average number of persons in households in less developed countries fell from 5.1 to 4.4. In more developed nations, it decreased from 3.2 to 2.5 persons per household over the same period (Keilman, 2003). Fig. 1 shows the trend in the United States.

In the U. S. the level of the average number of persons in households declined to 2.57 (2007), whereas total population and thus the number of households grew. Furthermore, the average household size differs considerably across cities (see e.g. the year 2000). The trend is similar in countries of the European Union, as shown in Table 1.

For example in Germany, the average number of persons per household fell from 2.5 in 1982 to 2.2 in 2002 for the whole country, whereas the number of households increased in the same period. Taking into account only the city of Berlin, the average number of persons in households is only 1.8. In addition, in the U.S. the growth in single-parent and single-person households has increased the share of adults in all age groups heading independent households. For instance, 26% of all households consisted of a person living alone in 2006, up from 17% in 1970 (U.S. Census Bureau, 2007a). These figures show that cities are very different concerning their household structure and that most cities face changes in this structure. However, little is known of the consequences of those changes on the cities. In the following, we contribute to this issue by examining the following question: *What do these changes or differences in the household structure imply for an urban economy?* In particular, we are interested in the spatial travel patterns implied by those differences in the household structure.

A differentiated understanding of the interplay between the household structure and the city is important from an urban economic perspective because the number of households located in urban areas is expected to increase over the next decades (United Nations, 2008). Therefore, effects of differences and changes in the household structure mainly arise on the level of cities, such as changes in rents, locations, commuting and shopping patterns with all its consequences.

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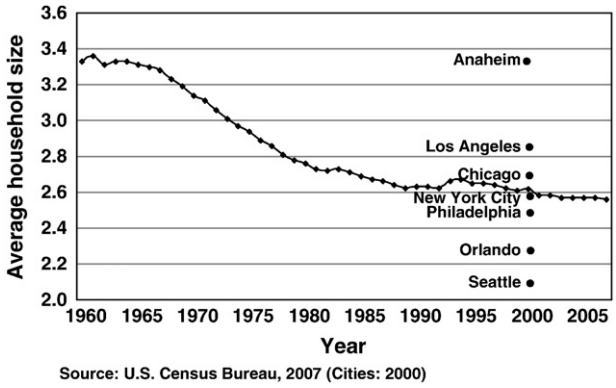

Fig. 1. Average household size in the United States (1960–2007) and some cities (2000).

In the literature, there are several effects that have been discussed, but usually not in regard to an urban economy with its miscellaneous interdependencies, such as the interactions between different markets (products, labor, land), households and firms.

On the one hand, an increase in the number of households raises the demand for housing units. On the other hand, smaller households are less efficient concerning the per capita use of resources because goods and services are shared by more people in larger households. Thus, even when the population remains constant, a higher share of small households induces a larger demand for resources. In other words, the prevailing trend towards a smaller average household size given the same total population means that certain economies of scale with respect to population are being lost. As Ironmonger et al. (1995) suggest, energy use and expenditures per adult decrease with an increase in household size. Thus, economies of scale arise from the number of persons per household. Concerning this matter a similar result is found by Nelson (1988) who empirically determined economies of scale in housing. Logan (2008) provides evidence that increases in household size are correlated with decreases in the share of expenditure devoted to housing. That is, if two adults unite to form one household, they will be better off as they can share a household internal "public" good such as housing. In addition, many taxation schemes treat single-persons and larger households differently. There are schemes such as joint taxation of spouses in Germany or joint taxation of families in France. In addition many countries levy a progressive income tax. Therefore, to examine, e.g., the impact of income taxation on an urban economy, it is necessary to incorporate a more complex and heterogeneous household structure. Other examples are the effects of the household structure on urban labor force participation, gender issues and public transport. But heterogeneity in the household structure is usually completely neglected in the urban economics literature. Most urban models used to study economic and policy issues that arise in today's cities focus almost entirely on different consumer types (if any), e.g. rich and poor persons, but not on differences in the household structure, e.g. the number of equally or differently skilled working household members.

Table 1
Average household size in countries and cities of the European Union.
Source: European Commission — living conditions in Europe (2003); Eurostat—Urban Audit (2009).

Country	Average household size			
	1982	2002	City	2004
UK	2.7	2.3	Manchester	2.24
Germany	2.5	2.2	Berlin	1.80
Italy	3.0	2.6	Milan	1.95
Spain	3.6	3.0	Barcelona	2.50
Finland	2.3	1.9	Helsinki	1.88

Table 2
Number of workers per household in the United States 2007.
Source: U.S. Census Bureau.

Number of workers per household	Share [%]
No workers	26
1 worker	39
2 workers	29
3 or more workers	6

There are only a few urban models taking into account a more complex household structure. For instance, models used to examine the more complex process of location decision concerning households with two working members were developed by Curran et al. (1982) and White (1977). But these models ignore the interactions between different markets, households and firms in the city. Another model which incorporates a more complex household structure was developed by Hotchkiss and White (1993). However, they also do not consider the production sector of the urban economy. Hence, shopping trips required to buy the consumption goods in the city are ignored. But shopping trips are an important aspect when considering different household types. Imagine a household with two working members. Assume there is a wage differential among the household members. Then, the value of time of both household members can differ implying differences in full economic shopping costs, i.e. monetary costs plus opportunity costs of travel time. As a consequence, the heterogeneous household can benefit from internal division of shopping activities. Hence, full economic shopping costs of a two-worker household may differ from those of two identical single-worker households, resulting in economies scale in shopping. This might affect its location decision.[2] A similar conclusion occurs with regard to full economic commuting costs. Because workers optimally choose their number of daily working hours in the model of Hotchkiss and White, commuting costs remain unaffected as long as there is a minimum fraction of working hours supplied per day. As a result, changes in commuting costs only occur if the number of working hours supplied per day fall to zero and, hence, commuting costs drop to zero. Thus, in their model gains from an optimal internal division of labor in a two-worker household cannot arise with respect to commuting. In contrast, because of the complementarity of working days and full economic commuting costs (except for telecommuting), such gains could be realized when workers are allowed to choose their supply of working days. This also has consequences on location decisions. If workers can reduce commuting costs by either changing labor supply or location, distinguishing one and two-worker households with different wages earned offers a rich and more realistic location choice problem. Furthermore, their model treats wages as exogenously given. This means, a more complex income taxation scheme that treats different households differently cannot be considered, because income taxation influences labor decisions and thus wages in the city. Aside from these issues, their model does not incorporate non-working households, although in reality the share of non-working households is substantial, as Table 2 shows.

To explore the impact of changes and differences in the household structure on an urban economy, we modify the urban general equilibrium model of Anas and Xu (1999) or Anas and Rhee (2006) in various ways. The most important innovation is the differentiated household structure we implement. This allows to examine, to our knowledge for the first time within an urban general equilibrium

[2] However, even if a heterogeneous household structure is not explicitly considered, shopping trips are an important aspect that should be taken into account. For instance, in 1995 in the U.S. the trip purpose shopping generated more individual trips than going to work, even if work-related business is added to commuting. In general, in 1995 all non-commuting person trips amounted to about 80% on all person trips (Nelson and Niles, 2000).