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Changes in the distribution of rental prices in Berlin

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ABSTRACT

In this paper, I analyze the distribution of rental prices in Berlin using quantile estimates and decomposition methods. These methods have been rarely applied in the field of housing economics but have proven to offer relevant insights into the evolution of price distributions. The shift of rental prices from 2007 to 2012 is split into portions caused by changes in the distributions of the explanatory variables and by changes in their coefficients over time. Two main results stand out: firstly, quantile estimates illustrate the constraint of a mean regression as most coefficients differ substantially between quantiles; secondly, coefficients are the primary source of temporal difference in the distribution of rental prices. On the other hand, changing properties of flats being offered affect the increase in the rental price distribution relatively little.

1. Introduction

Berlin has seen a veritable boom in rental prices since the mid-2000s and it is of high urban economical interest to identify factors that drive these rental prices – especially as of all German metropolises Berlin has the highest rate of rented flats (85%).[1] A well-established toolbox in this field is a single hedonic rental price index that constructs conditional prices; an enhancement of this technique, decomposition methods, offer additional insights into the evolvement of appreciation rates. However, the interpretation of such single measurements is limited since these measurements consider only one location along the distribution, the mean, and do not count for different effects at various points on the distribution of rental prices. To overcome this limitation, in this paper I examine changes in the full distribution of advertised rental prices in Berlin by applying a decomposition method based on conditional quantiles.

Berlin rental prices increased throughout the overall distribution from 2007 to 2012, but most rapidly in the upper segment. With this background the question comes to mind: why do unconditional rental prices rise unequally in different segments? Changes might be caused by characteristics being upgraded. Alternatively they might be driven by varying samples of rental offers. That is, higher quality or larger flats were advertised more frequently, or there were more advertisements in highly priced neighborhoods towards 2012. At the same time, appreciation rates can be induced by changes in the estimated hedonic price function and thus the shift is independent of changes in characteristics.

This question can be addressed using a decomposition technique based on conditional quantiles. The approach was introduced by Machado and Mata (2005), and their idea was adopted by Melly (2005), though with different intermediate algorithms, and more recently refined by Chernozhukov et al. (2013). The latter's algorithms are implemented in the empirical part of this paper. To execute their technique, conditional quantiles are initially calculated by quantile regression. This first step yields results that indicate to which amount a particular flat property or its location is priced implicitly at specific points on the conditional distribution of rental prices. These implicit prices already reveal insightful information on the structure of the rental price distribution. In addition, quantile regression results are used to set up a so-called counterfactual simulation, enabling the user to construct prices of one period, assuming that characteristics of the former period remain constant. This allows one to split changes in the distribution of rental prices over time into two effects: the characteristic effect denotes changes that would be generated by altered characteristics; while the coefficient effect captures changes due to altered implicit prices. Consequently, the idea of this decomposition is analogous to the famous decomposition of Blinder (1973) and Oaxaca (1973), but goes

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[1] Source: Statistische Ämter des Bundes und der Länder (2011).

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Table 1
Selected data on Berlin at a glance – 2007 to 2012.

	Year					
	2007	2008	2009	2010	2011	2012
Population (1000)	3245	3259	3270	3287	3326	3375
Household size (∅)	1.76	1.74	1.73	1.74	1.67	1.67
(∅)-household income (2007 = 100)	100.0	100.7	101.3	104.7	106.9	108.6
External migration balance*						
Overall	3.70	4.70	3.22	5.12	11.85	12.24
Surroundings	−2.26	−1.93	−1.52	−1.25	−1.45	−1.63
Rest of Germany	4.53	5.90	7.13	6.73	6.06	5.23
Abroad	1.42	0.72	−2.40	−0.36	7.24	8.65
Internal migration in % of population	10.30	9.80	9.90	9.30	9.10	9.00
New constructions**	1028	1162	1375	1924	1990	2194

Source: Housing Report 2013 of *Senate Department for Urban Development and the Environment Berlin*, Investitionsbank Berlin (2013).
* Per 1000 inhabitants.
** New flats in multi-family-houses.

beyond the mean and enables one to measure both effects for diverse points along the entire distribution. Furthermore, in contrast to prior decomposition techniques using conditional quantiles, Chernozhukov et al. (2013) provide consistent inference theory for their estimators. This is a major improvement regarding the statistical reliability of the estimated results.

Such research relies upon comprehensive rental data on a detailed level and in sufficient number, which is not collected by any statistical office in Germany. On that account, the analysis draws upon advertisements on the Internet, which provide extensive and simply accessible information about flats offered for rent.

This paper is to be considered in the setting of research on quantile house price indices, which has seen rapid growth in the last decade, though little of it elaborates a decomposition technique on housing markets.[2] McMillen (2008) decomposed changes from 1995 to 2005 in the distribution of house prices in Chicago. He applies the decomposition method proposed by Machado and Mata (2005). Nicodemo and Raya (2012) analyze appreciation rates of house prices in six Spanish cities from 2004 to 2007 using the technique of Melly (2005). McMillen (2008) found that the shift in home prices between 1995 and 2005 was considerably larger at the right tail of the distribution. In the whole of Spain, on the contrary, the shift was greater at lower percentiles. But, in most Spanish cities it was larger at both, lower and higher percentiles. Yet, it is true not only for Chicago, but also for all Spanish cities that these shifts cannot be linked to changing characteristics. Instead, prices are mainly driven by altered coefficients. The main results for Berlin presented later are in line with the findings of McMillen (2008) and Nicodemo and Raya (2012) according to the decomposition results. Changes in the distribution, however, only coincide with the structure found by McMillen (2008).

It is to the credit of McMillen (2008) and Nicodemo and Raya (2012) to connect decomposition methods with housing markets. Results of both studies highlight that this technique helps to identify determinants of price shifts along the entire price distribution and demonstrate that decomposition methods are an important tool for housing analyses. Meanwhile, the recent econometric innovation of Chernozhukov et al. (2013) allows one to set up simultaneous confidence intervals in order to assess accuracy of the results obtained. In this sense, the following analysis seeks to supplement existing housing research by applying this approach to Berlin rental prices.

I begin, in Section 2, with a short introduction to the housing market of Berlin focusing on rental prices. In Section 3 I will specify the empirical approach and afterwards, the dataset will be presented in more detail in Section 4. Regression and decomposition results will be presented in Sections 5 and 6 separately and, finally, I summarize my findings in Section 7.

2. A brief introduction to Berlin's housing market

Berlin was a divided city from the end of the Second World War and the building of the Berlin Wall in 1961 intensified this division until 1990. While the eastern part became the capital of the German Democratic Republic with major privileges, the western districts were part of the Federal Republic of Germany and enjoyed special regulations and subsidies due to their geographic isolation. After reunification in 1990, Germany's largest city experienced fundamental political, economic, and demographic transitions that caused remarkable developments in its housing market.[3]

Starting with high expectations for immigration and economic growth in the early 1990s, Berlin's government promoted the construction and modernisation of housing stock in the new capital. Particularly in the eastern part, the government invested in private and public housing with subsidies and tax deductions. This euphoria, however, only lasted into the mid-1990s when the population and the city's economy declined again.[4] Afterwards, Berlin faced a decade of low economic growth, high unemployment rates and out-migration (most notably due to suburbanization, but also resulting from migration to economically stronger western German areas). During this period, shrinking demand for housing met an oversupply created by the construction boom during the 1990s. This tended to result in depressed rental prices.[5]

Berlin's economy recovered in the early 2000s, but still underperformed. At the same time, it attracted many young residents and artists by reason of low living costs compared to other metropolises and this newly developing city appeared to offer opportunities. Thus, it was classified as “poor, but sexy”, which marked the beginning of a renewed boom in Berlin's rental market.[6] Beginning with a small positive migration balance in 2004 (+0.5 per 1000 habitants), this balance climbed steadily from 2007 (+3.7) to one of the highest in Germany in 2012 (+12.2). It is also important to see that especially young people are being drawn to Berlin. Moreover, since 2007 Berlin's population size benefited from nearly all regions throughout Germany, which is exceptional.[7] While this was mainly the result of migration within Germany up to 2010, this is now accompanied by foreign immigration.

[2] See Zietz et al. (2008), Coulson and McMillen (2007) and McMillen and Thorsnes (2006) among others. E.g. Liao and Wang (2012) and McMillen (2013) put their focus on spatial quantile regression analysis. One finds more analytical research enriched with Munich rental prices as empirical examples in Fahrmeir et al. (2013) and Sobotka and Kneib (2012).

[3] See Uffer (2011), Kemper (1998a, 1998b) for details on Berlin's transformation process after reunification and its implication for the housing market.

[4] New constructions reached a time-lagged peak in 1997.

[5] Little data exists on rents since 1991 and available data is not homogenous (different housing and rent types). However, various housing reports of the *Senate Department for Urban Development and the Environment Berlin* indicate a negative trend of rental prices until the mid-2000s. This trend is also outlined in Just and Spars (2006).

[6] This statement was made by Berlin's Mayor in 2004 and has become a well-known Berlin slogan.

[7] Berlin only loses inhabitants significantly to surrounding regions.