5 Summary, Practical Implications, and Further Research

This thesis aims at providing an understanding of the impact of public policy measures on the German residential and commercial real estate market and to provide an initial step to close the research gap that exists for the German real estate market in general. This present dissertation is the first empirical analysis of three major public policies affecting the German residential and commercial real estate market.

First, in Chapter 2 we examine the impact of public policy measures on the German residential real estate market from a consumption good perspective. We analyse the largest subsidy ever enacted for the German residential real estate market and its impact on the prices for owner-occupied housing. Employing standard fixed effects regression and DPD regression (difference GMM) models we examine 124 cities over 15 years in order to identify market distortions in terms of increased purchase prices caused by the subsidy. We find significant distortions in the market for owner-occupied single family houses, as well as in the market for newly constructed and existing owner-occupied apartments. Our results indicate that up to 17 per cent of the subsidy never reached the target group – low income households and households with children – but were capitalized into real estate prices and thus other market participants benefited. Our results have various implications. For policy makers, subsidizations of the real estate market lead to market distortions which counteract the intended goals by increasing real estate prices and thus making it harder for low income households to acquire owner-occupied housing. For private households the findings allow to anticipate the price development of their (aspired) premises if subsidies are to be granted by policy makers. The same implications hold true for corporations that provide single family housing.

Second, in Chapter 3 we examine the impact of public policy measures on the German residential real estate market from an investment good perspective. We investigate a second-generation rent control measure in particular a major reform of the German tenancy law in the year 2001 and its consequences for the risk perception of German residential real estate investments. We apply standard fixed effects regression and DPD (difference GMM) regression models for our analysis of the effects of the amendments of the reform. We examine 124 German cities over a period of 15 years. The risk perception is measured by the cap rate. The results of the fixed effects regression show a

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positive significant influence on the risk perception, but are not supported by our results of the difference GMM model, which finds the same positive, yet, insignificant results. The low level of significance of the standard fixed effects model as well as insignificant results of the difference GMM model indicate that the amendments of the existing tenancy rent control did not increase the risk perception of investments, while still making tenants better off. These demonstrate Pareto-efficiency of the reform and also point out the importance of the structure of such reforms: First, the two major components of the reform had counterbalancing effects. Second, the policy changes did only affect a small portion of the population. Since both do not hold true for the upcoming amendments of the tenancy law, different results are expected to be found in future analyses.

Third, in Chapter 4 we examine the impact of public policy measures on the German commercial real estate market. We analyse the impact of a change of the municipal trade tax multiplier on the gross purchase price as well as on the rents of office space. Our analyses include a spatial weight matrix to account for spill-over effects from nearby cities. Thus, we hypothesize that the trade tax multiplier is likely to also affect the price and rent of nearby cities. We perform our analysis by investigating 124 cities over a period of 15 years from 1995 to 2009. We employ a standard fixed effects regression model that includes the spatial weight matrix as well as a dynamic panel regression model also including the spatial weight matrix. Both models find a significant negative impact of an increase in the municipal trade tax multiplier on the office prices and rents for the same city. We again find for the two specifications a positive, yet, insignificant impact of an increase in the trade tax multiplier of nearby cities, which was expected to increase the relative attractiveness of the observed city. In our robustness checks we extend our analyses by applying a SDM in which we find significant spill-over effects and therefore we are able to confirm our initial assumptions. Our findings provide evidence that the tax burden of the trade tax is at least partially passed on to the owner of the building because it capitalizes into real estate prices and rents even though it is levied at the level of the corporation. This has direct implications for local policy makers as well as for corporations. As soon as taxes capitalize into real estate prices and rents this has an impact on the relative attractiveness of a business location. In accordance with the Tiebout (1956) model this is likely to cause migration of corporations and will thus affect tax revenues in the long run. For real estate corporations it implies that changes in the municipal trade tax multiplier will directly affect the value of their prem-

ises and should therefore be anticipated when investing in specific local real estate markets.

Our main results can briefly be summarized as:

(a) Subsidies provided for the German real estate market cause market distortions by capitalizing into purchase prices of owner-occupied housing.
(b) The effects of amendments of the tenancy law on the risk perception of residential real estate investments depends on the number of cities affected as well as on the structure of the policy in force, because individual components can have counterbalancing effects.
(c) Increases in the municipal trade tax multiplier of one municipality capitalize into office rents and gross purchase prices of the same city but also cause spill-over effects and thus capitalize into the prices and rents of nearby cities.

Further research, most importantly, requires more fragmented data which reflects, in the best case, real rents and transaction data. Greater time horizons will be hard to acquire due to the fact that the data available from the German Federal Statistical Office only date back to the year 1995. Furthermore, the policy measures studied in this dissertation have been regarded from one single perspective only. We did not evaluate whether or not the policies were effective in reaching the goals intended by the policy makers. For the home-ownership allowance this implies necessary research on the actual development of the home-ownership rate with a distinct analysis of different age and income groups. Regarding the tenancy law reform act, additional analyses of the separate influence of the reform on rents and prices can improve the understanding of the effectiveness of tenancy protection laws in Germany. Such an analysis also requires detailed real rent and purchase prices in order to separately analyse the two major parts of the policy and to further judge whether or not the policy led to an increased mobility of the workforce. For the municipal trade tax multiplier additional research is necessary with respect to the effect of a change in the multiplier on the development of tax revenues as well as on the location choice of corporations. Again, transaction data would improve the analyses and additional information on the business location of corporations over time would be necessary to perform a detailed analysis.

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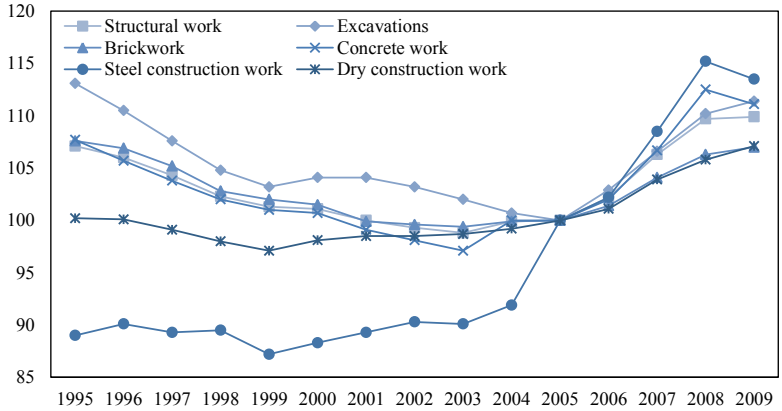
Appendixes

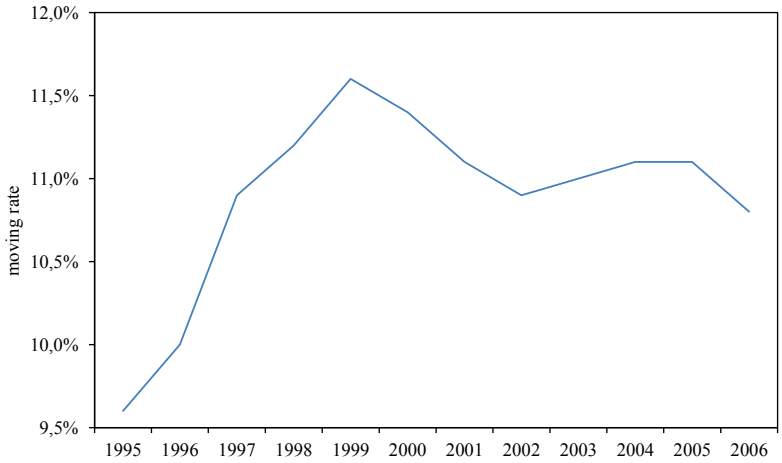
Appendix A

Figure 10: Cost development of major construction works for residential real estate



Source: Statistisches Bundesamt (2013). Own illustration.

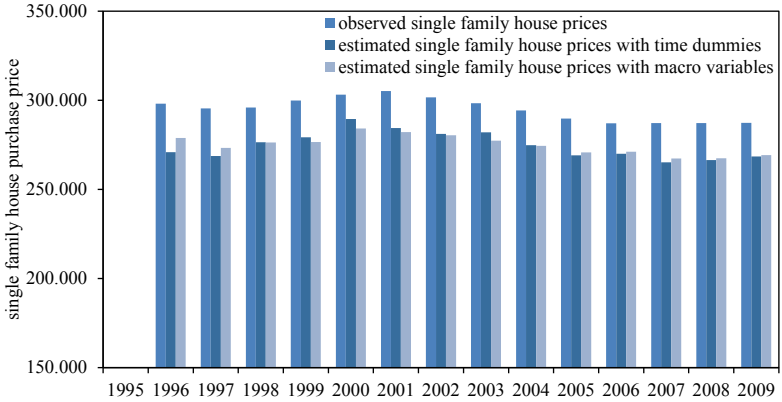
Figure 11: Average moving rate of German residents



Source: Techem GmbH (2012). Own illustration.

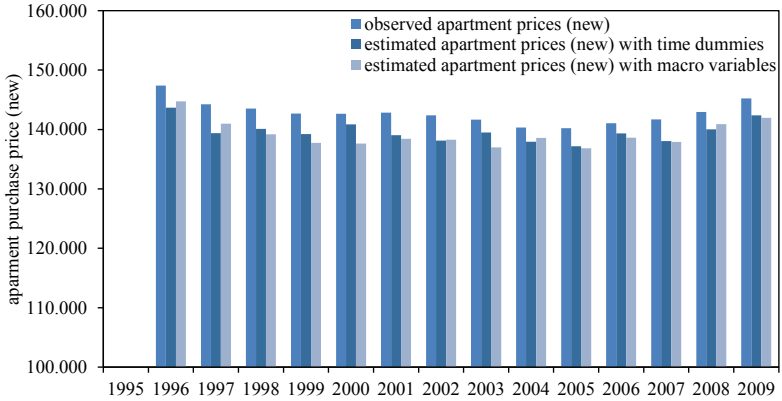
C. Y. Oertel, *Impact of Public Policy Measures on the German Real Estate Market,* Essays in Real Estate Research 11, DOI 10.1007/978-3-658-11553-1, © Springer Fachmedien Wiesbaden 2016

Figure 12: Predicted versus real values for H1: Single family house prices after dynamic GMM regression with time dummies and with macro variables



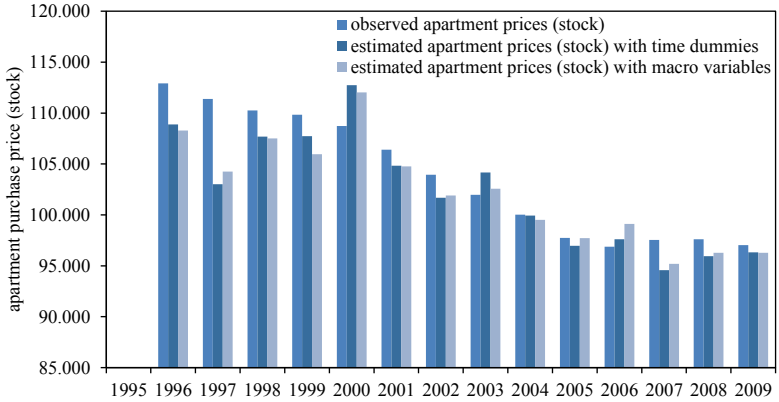
Source: Own calculation.

Figure 13: Predicted versus real values for H2: Apartment prices (new) after dynamic GMM regression with time dummies and with macro variables



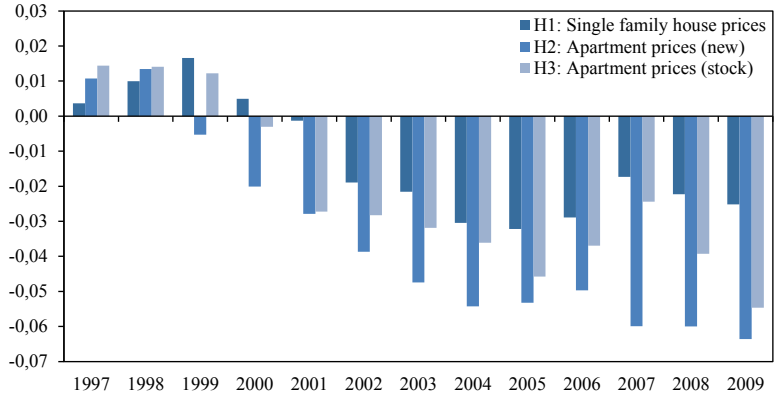
Source: Own calculation.

Figure 14: Predicted versus real values for H3: Apartment prices (stock) after dynamic GMM regression with time dummies and with macro variables



Source: Own calculation.

Figure 15: Beta-coefficients after dynamic GMM regression with time dummies for Hypotheses 1 to 3



Source: Own calculation.

Table 13: Stata commands for regression analyses of Chapter 2

Regression type	Hypothesis	Stata command
Fixed effects	1	xtreg *lppsfh L.lppsfh L.llp L.bki_sfh L.lcppc_sfh L.ldisinc L.lgdp L.mortgr L.ldens L.inflx L.unemp L.lgfk_pp L.dum_hoa*, fe vce(robust)
Fixed effects	2	xtreg *lpp_new_apart L.lpp_new_apart L.llp L.bki_apart L.lcppc_apart L.inflx L.ldisinc L.lgdp L.mortgr L.ldens L.unemp L.lgfk_pp L.dum_hoa*, fe vce(robust)
Fixed effects	3	xtreg *lpp_stock_apart L.lpp_stock_apart L.llp L.bki_apart L.lcppc_apart L.inflx L.ldisinc L.lgdp L.mortgr L.ldens L.unemp L.lgfk_pp L.dum_hoa*, fe vce(robust)
DPD	1	xtabond2 *lppsfh L.lppsfh L.llp L.bki_sfh L.lcppc_sfh L.ldisinc L.lgdp L.mortgr L.ldens L.inflx L.unemp L.lgfk_pp L.dum_hoa*, gmm(*lppsfh lcppc_sfh inflx lgfk_pp*, collapse) iv(*ldisinc llp bki_sfh lgdp unemp mortgr ldens dum_hoa*) nolevel twostep robust orthogonal
DPD	2	xtabond2 *lpp_new_apart L.lpp_new_apart L.llp L.bki_apart L.lcppc_apart L.ldisinc L.lgdp L.mortgr L.ldens L.inflx L.unemp L.lgfk_pp L.dum_hoa*, gmm(*lpp_new_apart lcppc_apart inflx lgfk_pp*, collapse) iv(*ldisinc llp bki_apart lgdp unemp mortgr ldens dum_hoa*) nolevel twostep robust orthogonal
DPD	3	xtabond2 *lpp_stock_apart L.lpp_stock_apart L.llp L.bki_apart L.lcppc_apart L.ldisinc L.lgdp L.mortgr L.ldens L.inflx L.unemp L.lgfk_pp L.dum_hoa*, gmm(*lpp_stock_apart lcppc_apart inflx lgfk_pp*, collapse) iv(*ldisinc llp bki_apart lgdp unemp mortgr ldens dum_hoa*) nolevel twostep robust orthogonal

Source: Own compilation.

Table 14: Fixed effects regression with lagged dependent variable on house and apartment prices

	H1: Single family houses	H2: Apartments (new)	H3: Apartments (stock)
$\ln(ppsfh)_{t-1}$	0.823***		
	(0.020)		
$\ln(lpp\_new\_apart)_{t-1}$		0.831***	
		(0.021)	
$\ln(pp\_stock\_apart)_{t-1}$			0.807***
			(0.024)
$\ln(lp)_{t-1}$	-0.007	-0.004	-0.002
	(0.005)	(0.004)	(0.007)
bki_sfh_{t-1}	0.129		
	(0.079)		
bki_apart_{t-1}		0.139**	0.278***
		(0.059)	(0.090)
$\ln(cppc\_sfh)_{t-1}$	0.008***		
	(0.003)		
$\ln(cppc\_apart)_{t-1}$		0.002	0.007***
		(0.002)	(0.003)
$\ln(disinc)_{t-1}$	-0.019	0.033	0.045
	(0.039)	(0.043)	(0.042)
$\ln(gdp)_{t-1}$	0.014	-0.012	0.041
	(0.021)	(0.020)	(0.027)
$mortgr_{t-1}$	0.113	0.125	-0.647*
	(0.286)	(0.262)	(0.379)
$\ln(dens)_{t-1}$	-0.017	0.030	0.136
	(0.029)	(0.072)	(0.086)
$inflx_{t-1}$	-0.046	0.098	-0.352***
	(0.079)	(0.074)	(0.106)
$unemp_{t-1}$	-0.001	-0.001	0.000
	(0.001)	(0.001)	(0.001)
$\ln(gfk\_pp)_{t-1}$	0.027***	0.018***	0.014**
	(0.004)	(0.004)	(0.006)
dum_hoa_{t-1}	0.009***	0.013***	-0.006
	(0.003)	(0.003)	(0.004)
Constant	2.105***	0.429	0.361
	(0.645)	(0.592)	(0.803)
Observations	1357	1354	1354
R-Squared	0.768	0.775	0.832

Note. Standard errors in parentheses.
* $p < .10$. ** $p < .05$. *** $p < .01$.

Table 15: Fixed effects and Dynamic GMM Regression with House and Apartment Prices

	H1: Single family houses		H2: Apartments (new)		H3: Apartments (stock)	
	Fixed effects	Dynamic GMM	Fixed effects	Dynamic GMM	Fixed effects	Dynamic GMM
ln(ppsfh) $_{t-1}$		0.234***				
		(0.067)				
ln(pp_new_apart) $_{t-1}$				0.232***		
				(0.052)		
ln(pp_stock_apart) $_{t-1}$						0.099
						(0.061)
bki_sfh $_{t-1}$	-0.131	0.063				
	(0.175)	(0.207)				
bki_apart $_{t-1}$			0.379**	0.564***	0.831***	0.953***
			(0.163)	(0.131)	(0.190)	(0.247)
ln(cppc_sfh) $_{t-1}$	0.032***	0.022***				
	(0.006)	(0.007)				
ln(cppc_apart) $_{t-1}$			0.020***	0.000	0.020***	-0.001
			(0.006)	(0.003)	(0.007)	(0.006)
ln(lp) $_{t-1}$	-0.017	-0.057	0.025**	0.041**	0.004	-0.004
	(0.011)	(0.037)	(0.011)	(0.020)	(0.015)	(0.034)
ln(disinc) $_{t-1}$	0.141	0.155	0.221	0.277**	0.464***	0.412***
	(0.096)	(0.142)	(0.137)	(0.114)	(0.157)	(0.159)
ln(gdp) $_{t-1}$	-0.109*	0.028	-0.113	-0.027	0.115	0.129
	(0.057)	(0.100)	(0.074)	(0.083)	(0.084)	(0.103)
mortgr $_{t-1}$	1.652***	0.805	0.078	0.360	0.761	0.246
	(0.563)	(0.602)	(0.602)	(0.387)	(0.703)	(0.616)
ln(dens) $_{t-1}$	0.309***	0.295***	0.348	0.358*	0.509*	0.759***
	(0.090)	(0.075)	(0.321)	(0.215)	(0.261)	(0.275)
inflx $_{t-1}$	0.021	-0.189	-0.137	-0.430**	-1.463***	-1.540***
	(0.214)	(0.277)	(0.246)	(0.192)	(0.288)	(0.326)
unemp $_{t-1}$	-0.006***	-0.004	-0.003	0.001	0.003	0.003
	(0.002)	(0.002)	(0.002)	(0.002)	(0.003)	(0.003)
ln(gfk_pp) $_{t-1}$	0.032***	0.024***	0.009	0.007	0.034***	0.026***
	(0.007)	(0.008)	(0.007)	(0.006)	(0.008)	(0.009)
dum_hoa $_{t-1}$	0.023***	0.017**	0.012**	0.007	0.024***	0.016**
	(0.006)	(0.007)	(0.006)	(0.007)	(0.007)	(0.008)
Constant	8.599***		3.825		-2.102	
	(1.539)		(2.509)		(2.557)	
Observations	1357	1088	1354	1085	1354	1085
Instruments		49		49		49
R-Squared	0.264		0.180		0.524	
AR(1) (*p*)		0.019		0.036		0.958
AR(2) (*p*)		0.847		0.336		0.850
Hansen (*p*)		0.057		0.229		0.013
Sargan (*p*)		0.004		0.286		0.000

Note. Standard errors in parentheses.
* $p < .10$. ** $p < .05$. *** $p < .01$.

Table 16: Dynamic GMM regression for hypothesis 1 to 3 with three years average income

	H1: Single family houses	H2: Apartments (new)	H3: Apartments (stock)
ln(ppsfh) $_{t-1}$	0.240***		
	(0.062)		
ln(pp_new_apart) $_{t-1}$		0.843***	
		(0.169)	
ln(pp_stock_apart) $_{t-1}$			0.117*
			(0.060)
bki_sfh $_{t-1}$	0.025		
	(0.197)		
bki_apart $_{t-1}$		0.130	0.870***
		(0.127)	(0.236)
ln(cppc_sfh) $_{t-1}$	0.023***		
	(0.007)		
ln(cppc_apart) $_{t-1}$		-0.000	-0.003
		(0.003)	(0.006)
ln(lp) $_{t-1}$	-0.057*	-0.011	-0.013
	(0.035)	(0.033)	(0.034)
ln(disinc_3y) $_{t-1}$	0.125	0.044	0.375**
	(0.149)	(0.064)	(0.178)
ln(gdp) $_{t-1}$	0.030	0.036	0.118
	(0.100)	(0.032)	(0.110)
mortgr $_{t-1}$	0.874	0.316	0.566
	(0.603)	(0.325)	(0.607)
ln(dens) $_{t-1}$	0.295***	0.051	0.807***
	(0.082)	(0.152)	(0.281)
inflx $_{t-1}$	-0.126	0.060	-1.373***
	(0.248)	(0.119)	(0.302)
unemp $_{t-1}$	-0.004*	-0.000	0.003
	(0.002)	(0.001)	(0.003)
ln(gfk_pp) $_{t-1}$	0.027***	0.016***	0.033***
	(0.008)	(0.005)	(0.009)
dum_hoa $_{t-1}$	0.019***	0.013**	0.022***
	(0.007)	(0.005)	(0.008)
Observations	1088	1085	1085
Instruments	49	47	49
AR(1) (*p*)	0.012	0.000	0.773
AR(2) (*p*)	0.927	0.739	0.879
Hansen (*p*)	0.047	0.076	0.012
Sargan (*p*)	0.002	0.060	0.000

Note. Standard errors in parentheses.
* $p < .10$. ** $p < .05$. *** $p < .01$.

Table 17: Dynamic GMM regression for hypothesis 1 to 3 with limited lags as instruments

	H1: Single family houses	H2: Apartments (new)	H3: Apartments (stock)
ln(ppsfh) $_{t-1}$	0.179***		
	(0.067)		
ln(pp_new_apart) $_{t-1}$		0.641**	
		(0.279)	
ln(pp_stock_apart) $_{t-1}$			0.026
			(0.061)
bki_sfh $_{t-1}$	0.063	0.008	-0.017
	(0.215)	(0.041)	(0.040)
bki_apart $_{t-1}$		-0.000	-0.001
		(0.004)	(0.006)
ln(cppc_sfh) $_{t-1}$	0.025***		
	(0.007)		
ln(cppc_apart) $_{t-1}$		0.246	1.008***
		(0.212)	(0.245)
ln(lp) $_{t-1}$	-0.104**	0.008	-0.017
	(0.045)	(0.041)	(0.040)
ln(disinc_3y) $_{t-1}$	0.203	0.064	0.350*
	(0.135)	(0.086)	(0.186)
ln(gdp) $_{t-1}$	0.057	0.023	0.197*
	(0.095)	(0.038)	(0.102)
mortgr $_{t-1}$	1.088*	0.247	0.209
	(0.634)	(0.419)	(0.649)
ln(dens) $_{t-1}$	0.381***	0.274	0.765***
	(0.100)	(0.293)	(0.255)
inflx $_{t-1}$	-0.189	-0.054	-1.592***
	(0.273)	(0.219)	(0.314)
unemp $_{t-1}$	-0.005*	-0.000	0.002
	(0.003)	(0.002)	(0.003)
ln(gfk_pp) $_{t-1}$	0.029***	0.013**	0.025***
	(0.009)	(0.005)	(0.010)
dum_hoa $_{t-1}$	0.031***	0.010**	0.024**
	(0.008)	(0.005)	(0.010)
Observations	1088	1085	1085
Instruments	28	24	28
AR(1) (*p*)	0.015	0.056	0.369
AR(2) (*p*)	0.911	0.968	0.814
Hansen (*p*)	0.046	0.023	0.006
Sargan (*p*)	0.003	0.010	0.000

Note. Standard errors in parentheses.
* $p < .10$. ** $p < .05$. *** $p < .01$.

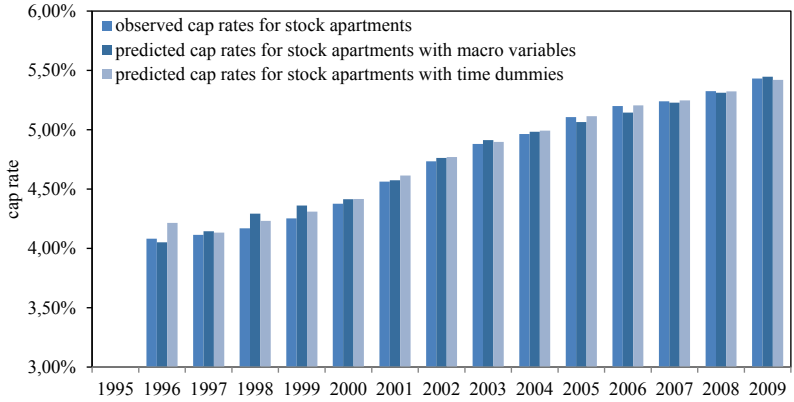
Table 18: Development of the home-ownership rate from 1996 to 2006

	western Germany					eastern Germany				
	1996	2001	2006	trend	change 1996 to 2006	1996	2001	2006	trend	change 1996 to 2006
Overall	40.00%	42.50%	44.70%		11.75%	26.00%	32.80%	33.40%		28.46%
Type of household										
single male	21.20%	22.10%	26.30%		24.06%	10.10%	18.30%	17.80%		76.24%
single female (aged 64 and younger)	18.50%	19.60%	22.30%		20.54%	7.20%	14.50%	13.10%		81.94%
single female (aged 65 and older)	33.00%	38.60%	41.20%		24.85%	11.40%	19.40%	17.70%		55.26%
couples without children	46.40%	51.30%	53.90%		16.16%	30.40%	38.70%	42.10%		38.49%
couples with children (aged 16 and younger)	49.10%	50.70%	52.60%		7.13%	34.30%	42.60%	47.10%		37.32%
couples with children (aged 17 and older)	62.50%	67.80%	68.70%		9.92%	41.70%	58.80%	62.60%		50.12%
single with children	30.10%	26.50%	25.90%		-13.95%	16.30%	18.20%	14.90%		-8.59%
age of the head of household										
up to 40 years	25.30%	22.80%	23.50%		-7.11%	21.60%	22.70%	21.50%		-0.46%
41-65 years	48.40%	52.00%	53.10%		9.71%	32.60%	39.70%	42.50%		30.37%
66 years and older	45.10%	51.30%	55.70%		23.50%	19.80%	32.40%	32.40%		63.64%
income quintiles										
first quintile	25.50%	26.20%	25.20%		-1.18%	19.50%	23.90%	21.00%		7.69%
second quintile	33.80%	37.10%	39.10%		15.68%	28.20%	36.70%	29.80%		5.67%
third quintile	38.30%	43.20%	41.40%		8.09%	28.40%	32.70%	41.90%		47.54%
fourth quintile	43.60%	45.30%	52.40%		20.18%	29.10%	37.20%	38.90%		33.68%
fifth quintile	52.70%	54.80%	58.30%		10.63%	27.90%	42.20%	48.80%		74.91%
households with unemployment	30.50%	28.40%	21.50%		-29.51%	30.90%	30.90%	28.40%		-8.09%

Source: Statistisches Bundesamt (2008; 2006). Own illustration.

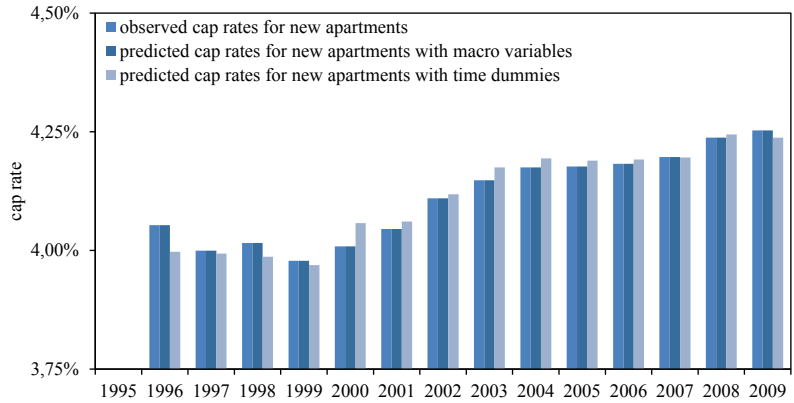
Appendix B

Figure 16: Predicted versus real values for H1: Cap rates for existing apartments after dynamic GMM regression with time dummies and with macro variables



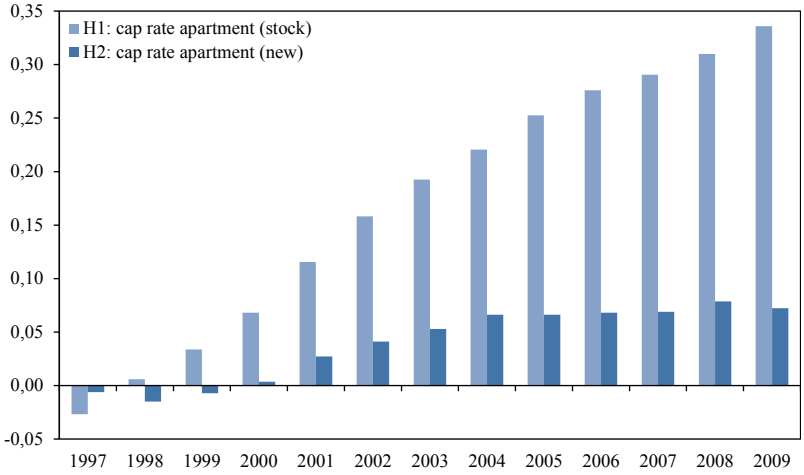
Source: Own calculation.

Figure 17: Predicted versus real values for H2: Cap rates for new apartments after dynamic GMM regression with time dummies and with macro variables



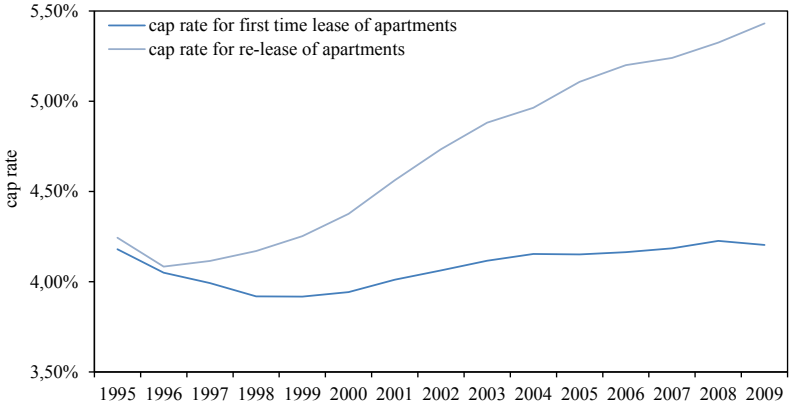
Source: Own calculation.

Figure 18: Beta-coefficients after dynamic GMM regression with time dummies for Hypotheses 1 and 2



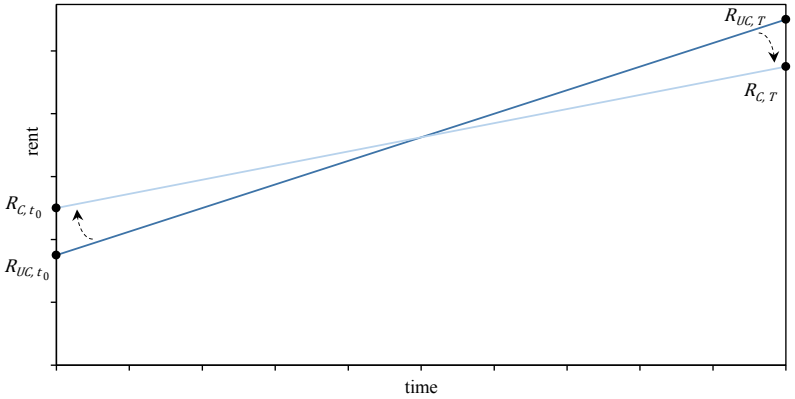
Source: Own calculation.

Figure 19: Development of the cap rate for first time leases and re-leases of German apartment investments



Source: BulwienGesa AG, own calculation.

Figure 20: Expected change in first year leases



Source: own illustration.
Note. R_{UC,t_0} is the first year lease in the market before the reform has been enacted. R_{C,t_0} is the first year lease term after the reform has been enacted. $R_{UC,T}$ is the final lease at the end of the average rental contract before the reform and $R_{C,T}$ is the final lease at the end of the average lease contract after the reform.

Table 19: Stata commands for regression analyses for Chapter 3

Regression type	Hypothesis	Stata command
Fixed effects	1	xtreg *lgiy_stock L.bki_apart L.llp L.inflx L.lcppc_apart L.ldisinc L.lgdp L.mortgr L.ldens L.unemp L.lgfk_pp L.tlr2001*, fe vce(robust)
Fixed effects	2	xtreg *lgiy_new L.bki_apart L.lcppc_apart L.llp L.inflx L.ldisinc L.lgdp L.mortgr L.ldens L.unemp L.lgfk_pp L.tlr2001*, fe vce(robust)
DPD	1	xtabond2 *lgiy_stock L.lgiy_stock L.bki_apart L.llp L.inflx L.lcppc_apart L.ldisinc L.lgdp L.mortgr L.ldens L.unemp L.lgfk_pp L.tlr2001*, gmm(*lgiy_stock inflx lcppc_apart lgfk_pp*, collapse) iv(*bki_apart llp ldisinc lgdp mortgr ldens unemp tlr2001*) nolevel twostep robust orthogonal
DPD	2	xtabond2 *lgiy_new L.lgiy_new L.bki_apart L.llp L.inflx L.lcppc_apart L.ldisinc L.lgdp L.mortgr L.ldens L.unemp L.lgfk_pp L.tlr2001*, gmm(*lgiy_new inflx lcppc_apart lgfk_pp*, collapse) iv(*bki_apart llp ldisinc lgdp mortgr ldens unemp tlr2001*) nolevel twostep robust orthogonal

Source: Own compilation.

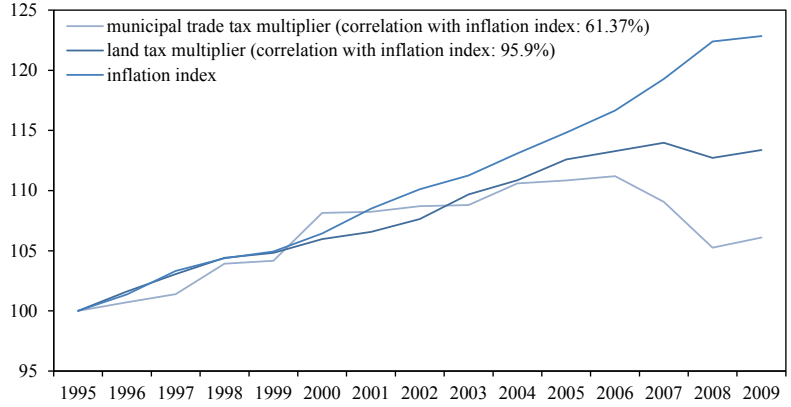
Table 20: Fixed effects regression with lagged dependent variable on cap rate for existing and newly constructed apartments

	H1: cap rate apartment (stock)	H2: cap rate apartment (new)
$ln(cap\_rate\_new)_{t-1}$		0.755***
		(0.018)
$ln(cap\_rate\_stock)_{t-1}$	0.631***	
	(0.030)	
bki_apart_{t-1}	-0.813***	-0.518***
	(0.143)	(0.097)
$ln(lp)_{t-1}$	0.001	0.003
	(0.009)	(0.006)
$inflx_{t-1}$	1.128***	0.502***
	(0.162)	(0.110)
$ln(cppc\_apart)_{t-1}$	-0.006*	0.000
	(0.003)	(0.002)
$ln(disinc)_{t-1}$	-0.099*	-0.066
	(0.059)	(0.045)
$ln(gdp)_{t-1}$	-0.061*	0.015
	(0.037)	(0.025)
$mortgr_{t-1}$	0.719	0.897**
	(0.503)	(0.379)
$ln(dens)_{t-1}$	0.043	0.018
	(0.064)	(0.049)
$unemp_{t-1}$	-0.004**	-0.002
	(0.002)	(0.001)
$ln(gfk\_pp)_{t-1}$	-0.004	0.007
	(0.007)	(0.005)
$tlr2001_{t-1}$	-0.016*	-0.004
	(0.009)	(0.006)
Constant	-0.940	-1.424**
	(0.951)	(0.717)
Observations	1354	1354
R-Squared	0.838	0.666

Note. Standard errors in parentheses.
* $p < .10$. ** $p < .05$. *** $p < .01$.

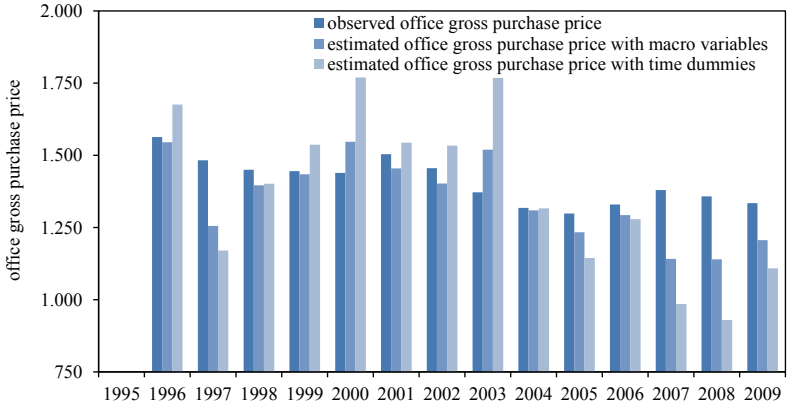
Appendix C

Figure 21: Development of the land and municipal trade tax multiplier



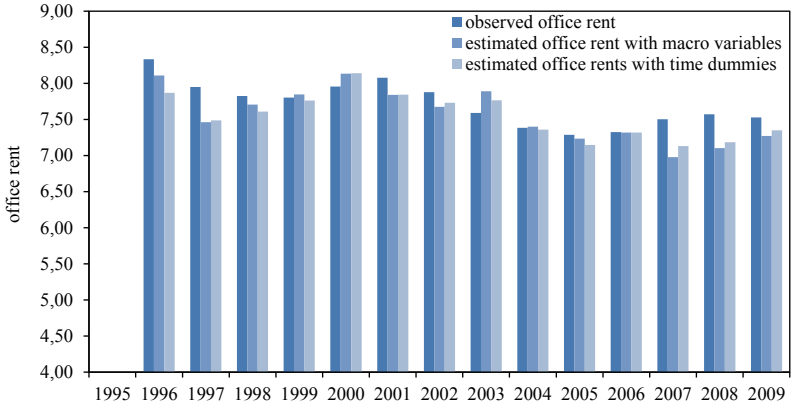
Source: Statistisches Bundesamt (2013). Own calculation and illustration.
Note. Indices refer to 1995.

Figure 22: Predicted versus real values for H1&2: average gross purchase prices for office space after dynamic GMM regression with time dummies and with macro variables



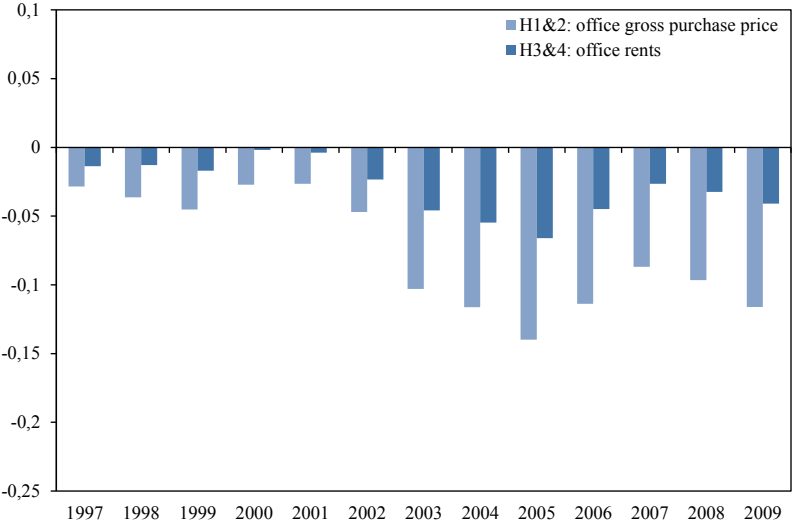
Source: Own calculation.

Figure 23: Predicted versus real values for H3&4: average office rents after dynamic GMM regression with time dummies and with macro variables



Source: Own calculation.

Figure 24: Beta-coefficients after dynamic GMM regression for office gross purchase prices and rents



Source: Own calculation.

Table 21: Stata commands for regression analyses of Chapter 4

Regres-sion type	Hypo-thesis	Stata command
Fixed effects	1&2	xtreg *lgpp_office L.bki_office L.lgfa_office L.llp L.ldisinc L.inflx L.lgdp L.mortgr L.ldens L.unemp L.lifo L.lmttm L.wlmttm*, fe vce(*robust*)
Fixed effects	3&4	xtreg *lrent_office L.bki_office L.lgfa_office L.ldisinc L.llp L.inflx L.lgdp L.mortgr L.ldens L.unemp L.lifo L.lmttm L.wlmttm*, fe vce(*robust*)
DPD	1&2	xtabond2 *lgpp_office L.lgpp_office L.bki_office L.lgfa_office L.ldisinc L.llp L.inflx L.lgdp L.mortgr L.ldens L.unemp L.lifo L.lmttm L.wlmttm*, gmm(*lgpp_office inflx lgfa_office lifo*, collapse) iv(*bki_office llp ldisinc lgdp mortgr ldens unemp lmttm wlmttm*) nolevel twostep robust orthogonal
DPD	3&4	xtabond2 *lrent_office L.lrent_office L.bki_office L.lgfa_office L.ldisinc L.llp L.inflx L.lgdp L.mortgr L.ldens L.unemp L.lifo L.lmttm L.wlmttm*, gmm(*lrent_office inflx lgfa_office lifo*, collapse) iv(*bki_office llp ldisinc lgdp mortgr ldens unemp lmttm wlmttm*) nolevel twostep robust orthogonal

Source: Own compilation.

Table 22: Fixed effects regression with lagged dependent variable on office gross purchase price and rent

	H1& H2: office gross purchase price	H3& H4: office rent
$ln(gpp\_office)_{t-1}$	0.748***	
	(0.021)	
$ln(avr\_rent\_office)_{t-1}$		0.723***
		(0.021)
bki_office_{t-1}	0.103	0.054
	(0.116)	(0.097)
$ln(gfa\_office)_{t-1}$	0.038	0.034
	(0.069)	(0.065)
$ln(disinc)_{t-1}$	0.067	0.045
	(0.091)	(0.076)
$ln(lp)_{t-1}$	-0.009	-0.003
	(0.008)	(0.006)
$inflx_{t-1}$	-0.472***	-0.282**
	(0.170)	(0.137)
$ln(gdp)_{t-1}$	-0.061	-0.030
	(0.040)	(0.037)
$mortgr_{t-1}$	-2.313***	-1.352***
	(0.423)	(0.308)
$ln(dens)_{t-1}$	0.130**	0.125**
	(0.056)	(0.048)
$unemp_{t-1}$	-0.005***	-0.005***
	(0.001)	(0.001)
$ln(ifo)_{t-1}$	0.332***	0.269***
	(0.030)	(0.027)
$ln(mttm)_{t-1}$	-0.031	-0.024
	(0.033)	(0.027)
$wln(mttm)_{t-1}$	0.000	-0.001
	(0.002)	(0.002)
Constant	1.982*	0.043
	(1.151)	(1.063)
Observations	1294	1294
R-Squared	.739	.703

Note. Standard errors in parentheses.
* $p < .10$. ** $p < .05$. *** $p < .01$.

Table 23: Fixed effects and dynamic GMM regression on gross purchase price and rents for office space (travel distance for weight matrix capped at ≥1 hours)

	H1: office gross purchase price		H2: office rent	
	Fixed effects	Dynamic GMM	Fixed effects	Dynamic GMM
$ln(gpp\_office)_{t-1}$		0.120		
		(0.076)		
$ln(rent\_office)_{t-1}$				0.107
				(0.066)
bki_office_{t-1}	0.285	0.569*	0.287	0.545**
	(0.249)	(0.302)	(0.205)	(0.220)
$ln(gfa\_office)_{t-1}$	0.071	-0.012	0.062	-0.174
	(0.197)	(0.260)	(0.139)	(0.196)
$ln(lp)_{t-1}$	0.015	0.110	0.016	0.065
	(0.016)	(0.071)	(0.012)	(0.042)
$ln(disinc)_{t-1}$	0.155	0.283	0.111	0.221
	(0.188)	(0.248)	(0.148)	(0.182)
$inflx_{t-1}$	-1.110***	-1.151**	-0.822***	-0.856***
	(0.389)	(0.455)	(0.286)	(0.325)
$ln(gdp)_{t-1}$	-0.042	-0.165	0.004	-0.042
	(0.079)	(0.135)	(0.064)	(0.111)
$mortgr_{t-1}$	-0.351	-0.705	-0.276	-0.372
	(0.560)	(0.715)	(0.457)	(0.490)
$ln(dens)_{t-1}$	0.944***	0.735***	0.750***	0.597***
	(0.223)	(0.235)	(0.153)	(0.176)
$unemp_{t-1}$	-0.015***	-0.010***	-0.013***	-0.008**
	(0.003)	(0.004)	(0.002)	(0.003)
$ln(ifox)_{t-1}$	0.334***	0.349***	0.222***	0.201***
	(0.044)	(0.060)	(0.033)	(0.042)
$ln(mttm)_{t-1}$	-0.330***	-0.440**	-0.254***	-0.247*
	(0.122)	(0.200)	(0.080)	(0.140)
$wln(mttm)_{t-1}$	0.006	0.005	0.000	0.001
	(0.004)	(0.006)	(0.004)	(0.004)
Constant	-0.375		-3.635*	
	(3.100)		(2.180)	
Observations	1294	1029	1294	1029
Instruments		50		50
R-Squared	0.347		0.311	
AR(1) (p)		0.009		0.030
AR(2) (p)		0.760		0.224
Hansen (p)		0.004		0.016
Sargan (p)		0.000		0.000

Note. Standard errors in parentheses.
* p < .10. ** p < .05. *** p < .01.

Table 24: Fixed effects and dynamic GMM regression on gross purchase price and rents for office space (travel distance for weight matrix not capped)

	H1: office gross purchase price		H2: office rent	
	Fixed effects	Dynamic GMM	Fixed effects	Dynamic GMM
$ln(gpp\_office)_{t-1}$		0.121		
		(0.076)		
$ln(rent\_office)_{t-1}$				0.107
				(0.066)
bki_office_{t-1}	0.276	0.570*	0.282	0.545**
	(0.250)	(0.305)	(0.205)	(0.220)
$ln(gfa\_office)_{t-1}$	0.068	-0.006	0.059	-0.176
	(0.197)	(0.262)	(0.139)	(0.195)
$ln(lp)_{t-1}$	0.015	0.110	0.017	0.065
	(0.015)	(0.071)	(0.012)	(0.042)
$ln(disinc)_{t-1}$	0.152	0.282	0.110	0.220
	(0.187)	(0.249)	(0.148)	(0.183)
$inflx_{t-1}$	-1.098***	-1.148**	-0.815***	-0.858***
	(0.389)	(0.458)	(0.286)	(0.324)
$ln(gdp)_{t-1}$	-0.042	-0.169	0.004	-0.037
	(0.079)	(0.134)	(0.064)	(0.111)
$mortgr_{t-1}$	-0.331	-0.678	-0.275	-0.356
	(0.557)	(0.709)	(0.456)	(0.491)
$ln(dens)_{t-1}$	0.942***	0.729***	0.747***	0.599***
	(0.224)	(0.233)	(0.153)	(0.178)
$unemp_{t-1}$	-0.015***	-0.010***	-0.013***	-0.007**
	(0.003)	(0.004)	(0.002)	(0.003)
$ln(ifox)_{t-1}$	0.334***	0.350***	0.222***	0.200***
	(0.044)	(0.060)	(0.033)	(0.042)
$ln(mttm)_{t-1}$	-0.382**	-0.479**	-0.246**	-0.268*
	(0.160)	(0.235)	(0.105)	(0.157)
$wln(mttm)_{t-1}$	0.005	0.004	-0.000	0.002
	(0.005)	(0.006)	(0.004)	(0.004)
Constant	-0.268		-3.480	
	(3.165)		(2.234)	
Observations	1294	1029	1294	1029
Instruments		50		50
R-Squared	0.346		0.311	
AR(1) (p)		0.009		0.031
AR(2) (p)		0.757		0.222
Hansen (p)		0.004		0.015
Sargan (p)		0.000		0.000

Note. Standard errors in parentheses.
* p < .10. ** p < .05. *** p < .01.