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Abstract

In a number of papers A.J. Oswald (1996, 1997) argues that high rates of home ownership may imply inferior labour market outcomes. This paper tests the Oswald hypothesis in a panel of 42 Belgian districts since the 1970s. The use of data going back to 1970 allows us to embed the Oswald hypothesis in a broader model including other key determinants of employment like labour costs and productivity, the skill level of the population, and demography. Considering that ownership may be endogenous to (shocks in) employment, we use IV estimation methods. Overall, we find evidence in favour of the Oswald hypothesis. We observe that a 1 percentage point rise in the rate of home ownership in a district implies a statistically significant fall in the employment rate by about 0.3 percentage points. Our results underscore the importance of including other determinants of employment, of controlling for unobserved fixed regional and time effects, and of appropriately dealing with endogeneity. Disregarding these issues, as is often done in the macro labour literature, may imply very different estimation results. Additional estimation reveals that the size of the Oswald effect falls in the fraction of high skilled in a district.

JEL-Code: E240, J610, J640, R230.

Keywords: employment, home ownership, Oswald hypothesis, Belgian regions, panel data.

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1. Introduction

Throughout recent history, governments in many countries have encouraged home-ownership. Ownership is seen as a secure way for the population to accumulate assets. Moreover, ownership generates significant social benefits. Owners are more likely to have long residence spells, which contributes to local neighbourhood stability and to the accumulation of social capital (DiPasquale and Glaeser, 1999; Rohe et al., 2002; Dietz and Haurin, 2003; Engelhardt et al., 2010). Renters do not bring about the same returns due to their higher degree of geographical mobility. From a labour market perspective, however, rising degrees of home ownership are much more controversial. Home ownership may restrict geographical mobility, and imply inferior labour market outcomes, both for the individual and in the aggregate. Oswald (1996, 1997a,b,c) was among the first to advance this argument. If demand for labour falls in a region, home owners will be less inclined to move to more prosperous regions mainly due to high costs of selling and buying homes. Renters by contrast can move at much lower cost. In equilibrium, higher degrees of home ownership imply higher unemployment. Empirically, Oswald's evidence in favour of his hypothesis relies mainly on cross country macroeconomic data, and on aggregate data for regions within individual countries. Oswald (1996) observed higher unemployment rates in OECD countries with a higher fraction of owners (versus renters). Also, he found that since the 1970s the unemployment rate increased most in those countries with the strongest growth in the rate of ownership. According to his results, an increase of the rate of ownership with 10 percentage points causes an increase of the unemployment rate with 2 percentage points.

The Oswald hypothesis has provoked a large body of theoretical and empirical work. In a recent survey, Coulson and Fisher (2009) show that a change of theoretical assumptions may generate results that differ from Oswald's, both for individual home owners and for the aggregate labour market. Empirically, a wave of studies has not settled the issue, although it may be possible to observe some structure in the results. Studies using microeconomic data very often challenge the Oswald hypothesis, and find home owners to have better employment positions (e.g. Coulson and Fisher, 2002, 2009; Robson, 2003; van Leuvensteijn and Koning, 2004; Munch et al., 2006, 2008). Studies using macroeconomic data are more often in line with Oswald (e.g. Partridge and Rickman, 1997; Pehkonen, 1997; Nickell, 1998; Nickell et al. 2005; Cochrane and Poot, 2007), although various researchers obtain dissident or insignificant results (Flatau et al., 2002; Barrios Garia and Hernandez, 2004, Coulson and Fisher, 2009; Lerbs, 2010). Overall, it is difficult however to draw convincing conclusions from these macro studies due to their imperfect or limited econometric setup.

This paper tests the Oswald hypothesis in a panel of 42 Belgian districts ('arrondissements') since the 1970s[1]. Along the time dimension we have data for six years between 1970 and 2005. Our dependent variable is the employment rate, the fraction of working age population with a job. Our approach and data availability are such that we avoid three limitations in existing empirical macro studies. *First*, many macro studies lack data along the time dimension, which makes it impossible to control for unobserved fixed effects, and which may lead to seriously biased estimates. The availability of data since the 1970s enables us to control for fixed effects. Moreover, it allows us to include in this study the periods with most labour market turbulence since the second World War, and to embed the Oswald hypothesis in a broader model including various other determinants of employment like labour costs and productivity, skill level of the population, demographic variables, etc. If the time

[1] Appendix 1 contains a map and some more information on these districts.

dimension is short, and data availability limited, it clearly becomes difficult to estimate the effects of only slowly changing variables like skill level, and demography. Only Oswald (1996, 1997a, 1997b), Partridge and Rickman (1997), Green and Herdershott (2001) and Nickell et al. (2005) exploit data for the 1970s and the 1980s. *Second,* most existing macro studies neglect the possibility of reverse causality. Yet, due to the potential influence of employment in a region on permanent income and tenure choice of households in that region, ownership may be endogenous to changes (shocks) in employment. Empirically this would require the use of IV techniques. We employ these in this paper. We estimate by means of 2SLS a simultaneous equations model explaining the rate of home ownership and the employment rate. Barrios Garcia and Rodriguez Hernandez (2004), Cochrane and Poot (2007) and Coulson and Fisher (2009) are the only studies we know to have used IV-methods before. *Third*, observing the Oswald effect is (only) one thing. Another may be to understand what determines its size, and economic significance. Our relatively large panel along both the cross-sectional and time dimension allows us to test various interaction effects which may shed light on this. We test the role of structural geographic and schooling related variables. Among these variables are the proximity of a border (country or language border), population density, the skill level of the population, etc.

Our main findings are as follows. We find evidence in favour of the Oswald hypothesis. We observe that a 1 percentage point rise in the rate of home ownership in a district implies a statistically (and economically) significant fall in the employment rate by about 0.3 percentage points. Our results show the importance of including other determinants of employment, and of controlling for both fixed regional effects and time effects. If we do not do this, the estimated Oswald effect can be totally different, highly insignificant, close to zero and sometimes even positive. Our results also demonstrate that the estimated effects may be biased when endogeneity of home ownership is disregarded. Not using IV techniques implies a smaller Oswald effect. Although this paper only concerns Belgium, our empirical findings may shed some light on why the existing empirical macro literature has difficulty coming to robust conclusions. As to the size of the Oswald effect, we find that it falls in the fraction of high skilled in a district. We also obtain indicative results that the Oswald effect may be stronger in more densely populated districts and in districts closer to borders, and that it may be weaker in districts that are closer to one of the five major cores of economic activity in Belgium, but these findings are not statistically significant. Among our other results, we observe negative effects on the employment rate in a district of the ratio of wage costs to productivity, and (insignificant) positive effects of the fraction of high skilled. In the ownership equation we find negative effects of the relative cost of living as owner versus renter. This opens possibilities for the government to affect home ownership by means of tax changes. Finally, in both the employment equation and the ownership equation, we see a (time-varying) influence of some demographic variables, like the age structure of the population. Often, however, this influence is not statistically significant.

In Section 2 of the paper we briefly review the existing theoretical and empirical literature on the relationship between housing and jobs. Section 3 describes our econometric model. We build on the literature on tenure choice initiated by Rosen (1979) and Rosen and Rosen (1980) to model home ownership. Our analysis of equilibrium employment is situated within the New Keynesian competing claims approach developed mainly by Layard et al. (1991). Here we also take into account specific characteristics of wage setting in Belgium. Section 4 describes our dataset. Section 5 presents the results of our econometric analysis. We summarize our main findings in Section 6.

2. Home ownership and employment: a brief review of the literature

(Un)employment rates differ widely across regions in most countries, including Belgium. Geographical mobility can be a vigorous instrument to eliminate these differences by shifting labour supply from high to low unemployment regions. Theoretically, higher wages or a higher probability to find a (suitable) job in prosperous areas could bring about this shift. Empirical evidence shows that the latter is the most important motivation for workers to be mobile (Blanchard and Katz, 1992; Böheim and Taylor, 2002). However, whether an economic agent decides to work in another region depends not only on expected benefits. Moving also generates costs: search and transaction costs when selling and buying a house, commuting costs, uncertainty, costs to overcome cultural or language barriers, personal costs when leaving familiar surroundings, etc.

Oswald (1996, 1997a,b,c) emphasizes the negative effects of home ownership on geographical mobility and labour market performance. Oswald (1997c) describes a perfectly competitive economy with two separate locations that are joined by a road. People have to live in one of them, either as owner or as renter. Each location experiences real shocks to labour demand. Tenure choice is made before these shocks are revealed. When their region is hit by a bad shock, renters can move to the other region at no cost. Owners in the bad region either remain unemployed and accept unemployment benefits, commute to the better region at a commuting cost, or pay a fixed (high) transaction cost and move. The commuting cost rises in the number of commuters. At some number of commuters this cost becomes equal to the transaction cost of moving. Due to commuting or moving costs, owners will have a higher reservation wage for jobs in the other location. As a result, labour supply to each location is horizontal at a low level of wages up to the number of owners in that location and the total number of renters in the economy[2]. It then becomes upward sloping as higher wages will be necessary to induce (rising numbers of) owners from the other location to commute. Labour supply becomes horizontal again when commuting costs have risen to the level of the transaction cost of moving. Everyone is willing to work in a good region at a wage that covers both the unemployment benefit and moving costs. In the end the position of the labour demand curve determines equilibrium quantities and wages. Given the competitive nature of the labour market, owners and renters receive the same wage offers. Due to their higher reservation wage at distant jobs, owners are more likely to be unemployed. Renters are fully employed. Furthermore, at the aggregate level, higher degrees of home ownership imply a leftward shift of the upward sloping part of the labour supply curve. Lower equilibrium employment, higher unemployment and higher wages are the result.

Oswald's arguments may be strengthened by a number of complementary considerations. First, if long distance commuting contributes to traffic congestion, overall production costs may rise, which further undermines employment. Hymel (2009) provides recent empirical proof of congestion damping employment growth in U.S. metropolitan areas. Furthermore, if the overall promotion of home ownership undermines the development of a well functioning rental market, it will also be more difficult for unemployed renters to move to other regions (Oswald, 1999). Traffic congestion and a tight rental market imply that the disadvantages of home ownership are not necessarily concentrated in the segment of owners.

Nickell (1998) and Nickell and Layard (1999) embed Oswald's argument in an imperfectly competitive macro model of the labour market. In this model equilibrium (un)employment reconciles

[2] This low level equals the level of the unemployment benefit (or the value of leisure).

competing claims of wage and price setters. Any factor which raises targeted price or wage mark-ups will imply higher equilibrium unemployment. An important determinant of the price mark-up is the degree of product market competition. Wage mark-ups depend on the unemployment benefit system, union power and the characteristics of wage bargaining, labour taxes, etc. Ownership is important in this setup as a determinant of wage pressure. Following Oswald, rising rates of ownership imply reduced mobility and search effectiveness among the unemployed. The employed can then claim a higher wage mark-up. Ownership may also raise the mark-up of prices on wages because non-wage costs may rise: hiring costs (if it becomes more difficult to fill in vacancies), congestion costs, etc. Overall, equilibrium unemployment will rise.

More recent theoretical work has reconsidered and/or extended Oswald's assumptions and conclusions. Dohmen (2005) basically confirms Oswald's results but emphasizes the role of education and skills. Workers only move to another region in Dohmen's model when the wage in that region exceeds the unemployment benefit and the cost of changing location. Since the latter cost is higher for home owners, owners will be less mobile and face higher unemployment, as in Oswald. Rising ownership rates then go along with inferior labour market performance. Skill differences may however disturb this simple pattern. Skilled workers earn high wages, which may exceed the unemployment benefit plus relocation cost. As a consequence, the skilled may both be owner and mobile. Their mobility raises their chances to find a job. The low skilled, however, earn wages below the sum of the unemployment benefit and the cost of changing location. As a consequence, when a low skilled owner loses his job, he will not move, and remain unemployed. Low skilled renters by contrast remain mobile. The implication of Dohmen's model for empirical work is important. When testing the relationship between ownership and labour market outcomes, it is crucial to control for skill levels. An adverse effect of rising ownership can only be expected to hold when skills are kept constant in the regression. Furthermore, above a certain skill level, there need not be any relationship between ownership and employment.

Munch et al. (2006) raise another possibility which may undermine the Oswald hypothesis. Due to high costs of moving, owners will not only have a higher reservation wage for distant jobs, they will also have a lower reservation wage for local jobs. It is therefore possible that rising ownership goes along with higher employment, but then this should be at lower wages. Brunet and Havet (2009) confirm this idea for French workers. Home owners in their study are more wage downgraded (and feel more overeducated) than renters. In line with this, Rouwendal and Nijkamp (2006) find empirical prove for lower geographical mobility of home owners but also for higher exit rates from unemployment. The latter is due to more intensive search activity and faster acceptance of jobs on the local labour market, especially by highly leveraged owners. Munch et al. (2008) add that increased willingness to accept local jobs need not imply lower actual wages. Immobility may cause owners to invest more in their local jobs, increasing firm-specific productivity. The establishment of a long-term employment relationship may also raise the incentive for firms to train their workers-owners.

Coulson and Fisher (2009) discuss the Oswald hypothesis within a model of search and bargaining in the style of Pissarides (1990). Owners face higher unemployment than renters in this model because they search on a smaller scale. Because their search is narrower, owners have less bargaining power, which implies that firms can make them work at lower wages. The latter effect is important because it implies that an aggregate rise in ownership reduces expected wages and raises expected profits for firms. Higher expected profits may cause new firms to enter. Under certain assumptions this favourable entry effect may dominate the unfavourable (standard) composition

effect according to which an increase in the number of (immobile) owners undermines overall labour market performance.

Theoretical ambiguity underscores the relevance of empirical work on the Oswald hypothesis. Empirical studies do not settle the issue, however, certainly not when it comes to aggregate effects. Among studies that make use of micro data one can observe some degree of consensus. Most of these studies find home owners to have a better employment status than renters (see e.g. Coulson and Fisher, 2002, 2009, for the US; Robson, 2003, for the UK; van Leuvensteijn and Koning, 2004, for the Netherlands; Munch et al., 2006, 2008, for Denmark). A related, but somewhat different issue is whether individual owners are also more mobile after becoming unemployed. Here the answer is less clear. For example, Henley (1998) finds residential mobility to be rather unresponsive to labour market conditions in the UK. He does not find owners to move from high unemployment more easily. Van Leuvensteijn and Koning (2004) find no effect of ownership on 'job-to-job mobility'.

Empirical studies using macro data cannot confirm the message emanating from the (more or less) micro consensus. Many macro studies confirm the Oswald hypothesis that a rise in the rate of home ownership goes along with inferior labour market results (see Table 1 for an overview). The question is how strong and robust this finding is. On the one hand, contradiction between micro and macro findings is perfectly possible. As we have mentioned before, rising degrees of home ownership may cause negative effects (congestion, tightening of rental markets, bargained wage pressure,…) beyond the owners themselves. Even if they are not worse off, aggregate labour market performance may be weaker. Clearly, the aggregate story is important for policy makers. On the other hand, many macro studies may be challenged on methodological grounds. Our summary in Table 1 reveals that many studies have only one observation along the time dimension which makes it impossible to control for fixed regional/country effects. This also makes it more difficult to embed the Oswald hypothesis in a broader model explaining (un)employment, where also differences in wages and productivity, skills, sectoral structure, demography, etc. have their role. Furthermore, only Barrios Garcia and Rodriguez Hernandez (2004), Cochrane and Poot (2007) and Coulson and Fisher (2009) control for endogeneity of home ownership by means of IV methods. Yet, both theoretically and empirically, housing tenure choices have been found to be determined also by one's employment prospects and permanent income (e.g. Rosen and Rosen, 1980; Henley, 1998; van Leuvensteijn and Koning, 2004). Neglecting the possibility of reverse causality could bias the estimates. In the next sections we try to overcome these limitations in an empirical macro study for Belgium.

3. Econometric model

In this section we derive the empirical model that guides our analysis in the next sections. We develop a two equation system explaining home ownership and employment rates. Our empirical setup for home ownership relies on work on tenure choice by Rosen (1979) and Rosen and Rosen (1980). Our setup for the labour market is mainly inspired by Layard et al. (1991) and Nickell and Layard (1999). Their approach to model the determination of wages and employment corresponds most closely to the Belgian situation. We rely on Oswald (1997c) and some of the literature that we summarized in Section 2 when it comes to the effects of changes in ownership.

Micro tenure choice is commonly modelled as a function of the relative cost of living as owner versus living as renter, household permanent income, and a number of social and demographic characteristics of the household (see Rosen, 1979). Rosen and Rosen (1980) derive from this micro

Table 1. Empirical studies of the Oswald hypothesis using macro data.

Study	Regions or countries (# cross-sections)	Time dimension	Methodology	Oswald?
Oswald (1996)	US states (51) UK regions (13)	1986-95, annual 1973-94, annual	Panel data. Fixed effects OLS with time dummies. Bivariate (+ lags), levels.	yes
	regions within France (22), Italy (20) and Sweden (8)	1990s (1 observation)	Correlation between levels in unemployment and ownership, bivariate	yes
	cross-section of countries (11, 18)	1960s (1 observation), 1990s (1 observation)	Correlation between levels in unemployment and ownership, bivariate	yes
Oswald (1997a)	US states (51)	change between 1970s and 1990s (1 observation)	Correlation between changes in unemployment and ownership, bivariate	yes
Oswald (1997b)	regions within OECD countries	1990s (1 observation)	Correlation between levels in unemployment and ownership, bivariate	yes (a)
Partridge and Rickman (1997)	US states (48)	1972-1991, annual	Panel data. Pooled OLS / Fixed Effects OLS with year dummies, multivariate	yes
Pehkonen (1997)	regions within Finland (13)	1991 (1 observation)	OLS, bivariate, multivariate	yes (b)
Nickell (1998)	OECD countries (20)	Mid 1980s and early 1990s (1 observation per period)	Panel data. Random effects GLS. Multivariate.	yes
Hassink en Kurvers (2000)	regions within the Netherlands (COROP) (40)	1990-1998, annual	Panel data. Pooled OLS / Fixed effects OLS, with and without year dummies. Bivariate (+ lags), levels.	no
Green and Herdershott (2001)	US states (51)	change between 1970 and 1990 (1 observation)	Bivariate regression, WLS, different unemployment rates (age groups)	yes/no (c)
Flatau et al. (2002)	Regions (LGA) within Australia (590)	1986, 1991, 1996, 2001 (4 observations)	Multivariate regression, WLS, separate regressions per year.	no
Glaeser and Shapiro (2003)	US Metropolitan Statistical Areas	1998 (1 observation)	Correlation between levels in unemployment and ownership, bivariate	no
Barrios Garcia and Rodriguez Hernandez (2004)	regions within Spain (46)	1991 (1 observation)	Cross section. Multivariate, Simultaneous equation system explaining unemployment and home ownership, 3SLS	no
Nickell et al. (2005)	OECD countries (19)	1961-1995, annual	Panel data. Fixed Effects GLS with year dummies, multivariate.	yes
Bassanini and Duval (2006)	OECD countries (21)	1982-2003 (1 observation)	Bivariate regression of the fixed country effect in a panel study of unemployment on home ownership.	yes
Cochrane and Poot (2007)	regions within New Zealand (58)	1986, 1991, 1996, 2001 (4 observations)	Panel data. Pooled OLS / Fixed Effects OLS / Hausman Taylor estimator. Multivariate.	yes
Coulson and Fisher (2009)	US Metropolitan Statistical Areas	1990 (1 observation)	OLS and 2SLS, multivariate.	no
Lerbs (2010)	regions within Germany (87)	1998, 2002 and 2006 (3 observations)	Separate regressions per year (OLS), Panel data: pooled OLS, fixed effects OLS.	yes/no (d)

Notes:

(a) except for Belgium, Netherlands and West Germany.

(b) significant only in the bivariate case

(c) no for young and older households, yes for middle aged

(d) no for OLS and pooled OLS, yes for for fixed effects

model a simple empirical specification that explains the macro proportion of home owner-occupiers in the population in the US. Next to the relative cost and a proxy for permanent income they consider explanatory variables like a measure for credit availability, income distribution, demographic variables like percentages of the population by age class, the percentage of families without children, etc. Many other studies have estimated similar equations for other countries. Barrios Garcia and Rodriguez Hernandez (2004) provide a recent example within the context of a test of the Oswald hypothesis for Spain. They also provide a wider survey of empirical literature explaining tenure choice and aggregate ownership rates. In line with this literature we specify the following equation for the home ownership rate (OWN_{it}) in district *i* and year *t*.

$$OWN_{it} = \alpha_i + \beta_1 \log(RC_{it}) + \beta_2 Empl_{it} + \beta_3 Schooling_{it} + \beta_4 \log(PopDens_{it}) + \Sigma \beta_j DemO_{jit} + \lambda_{ot} + \varepsilon_{it} \qquad (1)$$

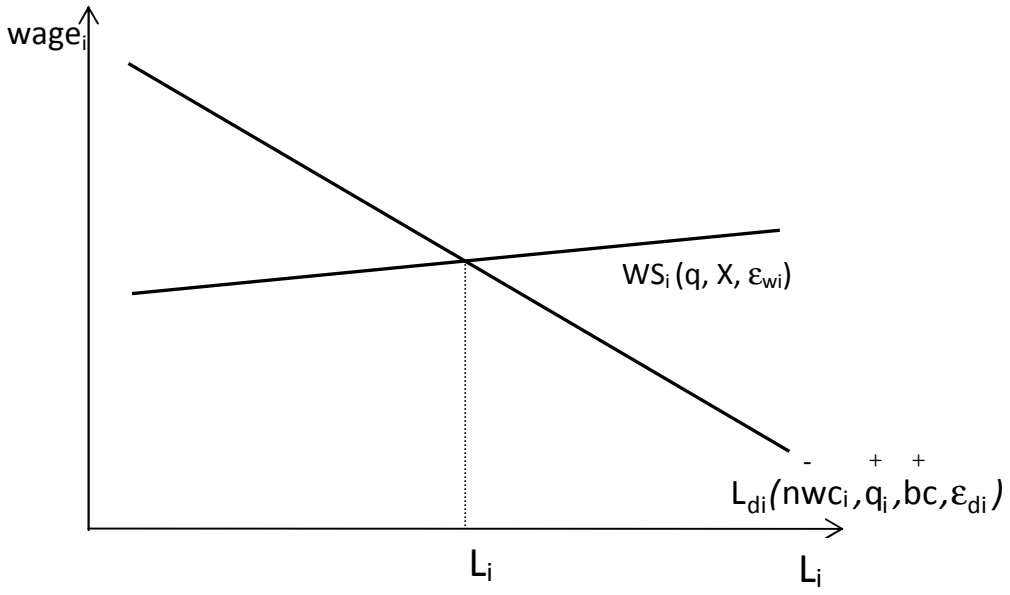
$$\text{with } i = 1,\ldots,42; \quad t = 1970,\ 1977,\ 1981,\ 1991,\ 2001,\ 2005.$$

In this equation RC_{it} is the relative cost - relevant to period *t* - of living as owner versus renter in district *i*. The data that we include are an average of annual RC data for the period of five years up to *t*. We discuss the construction of RC_{it} in greater detail below. As proxies for permanent income in district *i* and year *t*, we include the employment rate ($Empl_{it}$) and a variable measuring the skill level of the population ($Schooling_{it}$). The employment rate indicates the fraction of all people at working age living in the district who have a job[3]. Our measure for the skill level will be the fraction of all people older than 13 in the district with tertiary education. Furthermore, Equation (1) includes population density ($PopDens_{it}$) and a set of demographic variables ($DemO_{jit}$). Population density acts as a proxy for urbanisation, which has in the literature been shown to (negatively) affect the rate of ownership (e.g. Fisher and Jaffe, 2003). As to demography, we include the share of two age groups in total population (20-34, 35 and older) and the fraction of families without children. Our expectation is that larger fractions of people aged 20 to 34 and larger fractions of families without children will go along with lower rates of ownership. Younger people generally have less resources, and may prefer not yet to enter into long-term commitments or to settle. Households with children, by contrast, may be more inclined to settle and prefer the security of a home of their own. Finally, λ_{ot} captures time effects for the year *t* common to all districts, α_i captures fixed regional effects for district *i*. The way we have specified Equation (1) allows for a direct interpretation of coefficients. For example, the coefficient β_1 indicates the effect on the rate of ownership in percentage points of a 1 percent increase in the relative cost; β_2 and β_3 measure the effects on the rate of ownership in percentage points of a 1 percentage point increase in the employment rate and the fraction of high skilled respectively. Note that we tested for different functional form specifications, like including in the regression $\log(OWN_{it})$ instead of OWN_{it}, RC_{it} instead of $\log(RC_{it})$, $\log(Empl_{it})$ instead of $Empl_{it}$, etc. Our main results were not sensitive to these choices (which is in line with findings by e.g. Rosen and Rosen, 1980). We summarize the results of various robustness checks in Appendix 3.

Equation (2) explains the employment rate in district *i* and year *t*. It relies strongly on Figure 1, which describes the underlying labour market and the determination of the equilibrium number of jobs in district *i* (L_i). The latter is clearly a key determinant of the employment rate among the people at working age living there. The equilibrium number of jobs in the district (L_i) is determined at the inter-section of the labour demand curve (L_{di}) and the wage setting curve (WS_i). Labour demand falls in the

[3] Data shortages at the level of individual districts in the 1970s made it impossible to include other proxies like consumption per capita or GDP per capita.

Figure 1. Employment (number of jobs) and wages at the district level



real wage per worker ($wage_i$), including taxes on labour. For a given real wage, labour demand is negatively affected by real non-wage production costs (nwc_i) and positively by labour productivity (q_i). Business cycle and other aggregate labour demand shocks are captured by bc, district-specific demand shocks by ε_{di}. The wage setting curve (WS_i) indicates bargained real wages. It is flat since wages in a district are only very weakly affected by local employment conditions. Wages in Belgium are mainly bargained at the sectoral level, often within a nationally imposed range. In the period that we study, union density exceeds 50%, the coverage rate of collective bargaining exceeds 90% (OECD, 2004). Wages will therefore mainly reflect sectoral and national variables, like sectoral or aggregate labour productivity (q) and overall wage push variables (X). The latter include union power, unemployment benefits, the tax wedge, etc. As mentioned before, Nickell (1998), Layard and Nickell (1999) and Nickell et al. (2005) also see a role for aggregate ownership here. The role for local factors shifting the WS-curve (ε_{iw}) will be very small.

Equation (2) captures the positive effects of labour productivity in a district, and the negative effects of bargained real wages. The parameters γ_3 and γ_4 measure the effects on the employment rate in percentage points of a 1 percent increase in the real wage ($wage_i$) and productivity (q_i) respectively. We expect γ_3 to be negative and γ_4 to be positive. The main reasons to have the rate of ownership (OWN_{it}) in Equation (2) – for given wages and productivity – are as follows. First, ownership may affect non-wage labour costs for firms in a district (nwc_i) due to an increase in traffic and congestion costs. Labour demand may shift to the left. Second, the rate of ownership may affect the reservation wage, search intensity and overall mobility of inhabitants in the district. Owners may have a lower reservation wage, and search more intensively, for local jobs. Given the nature of wage bargaining, the influence on wages is likely to be very small. The probability for firms to fill vacancies, however, may rise, which brings down non-wage labour costs (hiring costs), and promotes employment. The third effect of ownership concerns the employment rate ($Empl_i$) for a given number of jobs in the district (L_i). As argued by Oswald (1997c), owners also have a higher reservation wage for distant jobs. Given wages in other districts they may therefore have a higher probability than renters to be unemployed. The aggregate employment rate in their own district will

then fall, as a smaller fraction of the population will have a job. Which of all these effects is dominant, remains an empirical issue.

Finally, Equation (2) includes the skill level of the population ($Schooling_{it}$) and a number of demographic variables ($DemE_{jit}$). Schooling captures the idea raised by Dohmen (2005). For a given share of owners in a district, overall mobility of the population and expected employment rates will rise the higher skill levels. As demographic variables we again consider the share of certain age groups among the population. We expect the employment rate in a district to be lower when the fractions of the youngest people (age 15-24) and the older people at working age (age 50-64) rise[4]. Again we control for fixed district effects (δ_i) and common time effects (λ_{et}). The latter may capture the effects of common labour demand shocks (e.g. aggregate business cycle effects, oil shocks).

$$Empl_{it} = \delta_i + \gamma_1 OWN_{it} + \gamma_2 Schooling_{it} + \gamma_3 \log(wage_{it}) + \gamma_4 \log(q_{it}) + \Sigma \gamma_j DemE_{jit} + \lambda_{et} + \upsilon_{it} \qquad (2)$$

$$\text{with } i = 1,\ldots,42; \quad t = 1970,\ 1977,\ 1981,\ 1991,\ 2001,\ 2005.$$

The need for IV estimation techniques is obvious from Equations (1) and (2), and Figure 1. Ownership and employment are mutually endogenous, given their reciprocal influence. Wages are endogenous to district specific shocks in labour demand and employment, as is clear from Figure 1. Similarly, the relative cost of living as owner in a district is endogenous to shocks in the demand for/supply of housing property, and the rate of ownership in that district. Schooling may also be endogenous to shocks in employment. The literature for example provides ample empirical evidence that schooling is counter-cyclical (e.g. DeJong and Ingram, 2001; Heylen and Pozzi, 2007). Positive shocks to employment may pull young people out of education and into work, and vice versa. We discuss our choice of appropriate instruments in Section 5.

In Section 5 we extend our estimated Equations (1) and (2) in three directions. First, we allow for time variation in the effects of the demographic variables in both equations. Thinking about ownership, credit availability and/or the frequency of intergenerational transfers may have increased over time, raising the possibility for younger people to become owner (OECD, 2011). Also, the age at which people prefer to have their own house may have changed over time. Concerning employment, preference for leisure may have evolved differently across age groups. In a second extension, we take into account constitutional reform in Belgium. Since the end of the 1980s the Flemish and Walloon regions have gained much more autonomy in the area of housing policy and economic policy, including important aspects of labour market policy (e.g. public employment services and training of the unemployed). We measure the potential impact of different regional policies by adding a separate time dummy for all districts in one region (Flanders) for the period since 1990. Our third extension aims to shed more light on the determinants of the size of the Oswald effect. To that aim we introduce in Equation (2) a number of interaction terms γ_{11} VAR*OWN_{it}, where VAR is a variable that may affect the size of the Oswald effect. This variable may vary along the time dimension or the cross-sectional dimension. Variables that we have in mind are the skill level of the

[4] Note though that these expectations are unconditional. Controlling for (tertiary) schooling, and wages and productivity, expected signs may be less straightforward. Note also that the particular age groups featuring in the employment equation differ from those in the ownership equation. Our selection for the employment equation reflects well-known differences (in all OECD countries) in labour market participation and unemployment rates among young, prime-age and older workers. For employment it is obvious to categorize people of age 20 differently from people of age 30, and people of age 45 differently from people of age 60. For ownership, however, it is not obvious at all to categorize these people differently.

population, population density, the proximity of a country or language border, and the proximity of a major centre of economic activity.

4. Data

We use macro data at the level of Belgian districts. Because of some difficulties in data consistency, and because of its different nature, we have omitted the Brussels district. This leaves us with 42 cross-sections, 22 in Flanders and 20 in the Walloon Region (see Appendix 1). As to the time dimension, we are limited to the years in which a census or a large-scale survey has taken place. The years in our database are 1970, 1977, 1981, 1991, 2001 and 2005. Since in 2005 the survey only took place in Flanders, we are left with a panel of 232 observations. In this section we describe our data. We summarize the main descriptive statistics of all variables in Table 2. Figures 2 to 6 show the evolution of important variables graphically. To bring some structure - it is not practical to show data for all 42 districts - we select those Flemish and Walloon districts that are at the 20th, the 50th and the 80th percentile when ranked from low to high according to the change in the employment rate since 1970. So, these are relatively weak, median and relatively strong performers when it comes to change in the employment rate. In Flanders these districts are respectively Gent, Turnhout and Brugge, in Wallonia Tournai, Nivelles and Waremme. For a detailed description of the construction of our data and their sources, we refer to Appendix 2.

Figure 2 shows the evolution of the employment rate. We observe a fall in about all districts during the 1970s. In Wallonia employment continues to decline on average during the 1980s, whereas in Flanders it then recovers. During the 1990s and 2000s most Belgian districts show rising employment rates. Figure 3 depicts the evolution of the rate of home ownership. This rate represents the fraction of houses that are occupied by their owner. The remaining fraction is occupied by renters. We observe a gradual increase in ownership in about all districts, although the size of this increase clearly differs across districts. Figure 4 shows the evolution of the relative cost of living as an owner versus a renter (RC). Tenure choice, i.e. whether to rent or to buy a house, is generally believed to depend on this variable. As in Hendershott & Shilling (1982) the cost of owning P_{ho} is entered as the numerator, the cost of renting P_r as the denominator:

$$RC = P_{ho} / P_r$$

No data exist concerning the average rental rate for districts. The cost of renting is therefore approximated by the mean national index for nominal rents paid on a 'normal' house. For the cost experienced by owners, we adopt a model that basically corresponds to the ones used by Poterba (1992), Van den Noord (2005) and Cournède (2005). Our approach is however somewhat different from the estimations of Barrios García and Rodríguez and Hernández (2004) due to data restrictions. We calculate P_{ho} as the sum of five distinct components:

$$P_{ho} = P_h(tc + ltv*R_m + (1-ltv)*R_g + d - \pi)$$

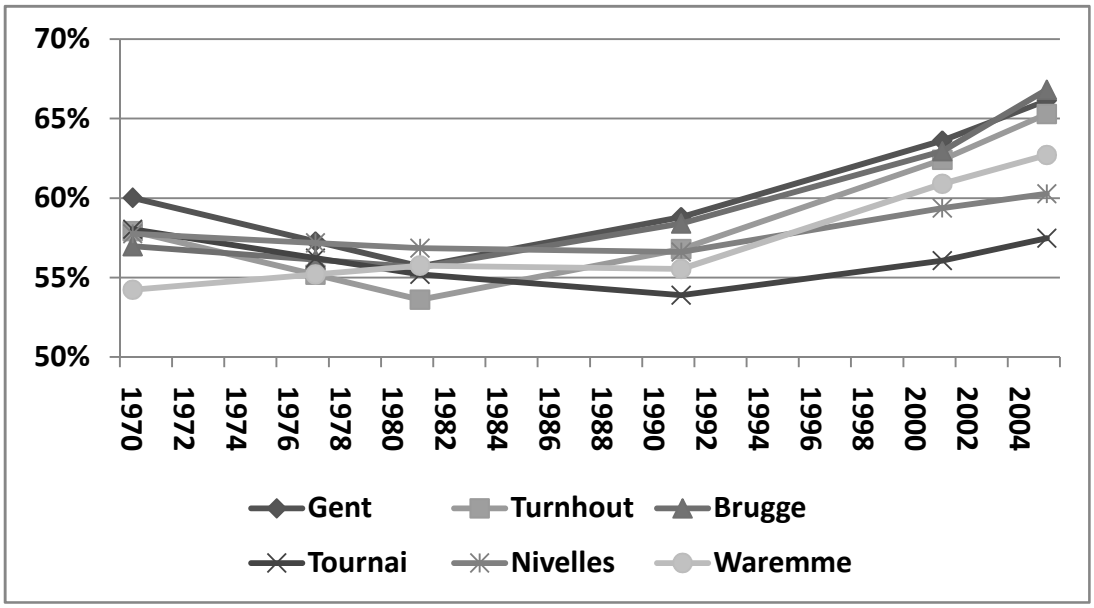
with P_h the nominal price of a house, 'tc' the transaction cost in percent of the house price, R_m the percentage interest rate on mortgages, R_g the nominal interest rate on long-term government bonds, ltv the loan-to value ratio (i.e. the fraction of the house price that can be borrowed in the mortgage market), d a parameter which covers depreciation and maintenance costs and the risk premium on residential property in percent of the house price, and π the expected rate of house price inflation in percent. As increases in house prices result in capital gains, the latter component is deducted from

Table 2: Main descriptive statistics of the variables

	OWN	EMPL	AGE 15-24	AGE 25-54	AGE 55-64	AGE 20-34	AGE 35plus	CHILDLESS	PopDens	RC	SCHOOLING	WAGE	PRODUCTIVITY	WAGE GAP
Overall Mean	69.66%	57.19%	14.33%	39.50%	10.82%	20.69%	52.01%	33.99%	333	1.0233	14.50%	1.5050	1.2860	1.1984
Minimum	44.30%	44.05%	10.68%	32.71%	7.08%	16.35%	41.14%	21.20%	34	0.5303	5.30%	0.6975	0.6005	0.8908
First quartile	64.72%	54.05%	12.58%	37.24%	10.32%	19.36%	49.59%	31.72%	154	0.7168	8.97%	1.2789	0.9631	1.1004
Median	70.75%	56.83%	14.52%	39.54%	10.95%	20.71%	52.21%	33.93%	268	0.8657	12.46%	1.5822	1.1754	1.1912
Third quartile	75.47%	60.04%	15.67%	41.74%	11.44%	21.97%	54.64%	36.74%	506	1.0494	20.04%	1.7663	1.5279	1.3458
Maximum	83.30%	70.44%	20.65%	45.03%	14.89%	25.92%	59.27%	45.85%	955	2.7188	38.66%	2.2981	2.4241	1.5181
Std. Dev.	7.77%	4.77%	1.92%	2.86%	1.04%	1.74%	3.51%	3.77%	226	0.4621	6.67%	0.3806	0.4128	0.1596
Between Std. Dev.	6.69%	3.57%	1.81%	2.68%	0.73%	0.93%	1.67%	2.84%	228	0.1396	2.48%	0.1556	0.2139	0.1205
Within Std. Dev.	4.08%	3.20%	0.71%	1.08%	0.74%	1.48%	1.80%	2.50%	16	0.3482	6.20%	0.3481	0.3543	0.1060
1970 mean	63.78%	56.59%	13.98%	39.28%	11.04%	20.00%	50.41%	33.27%	321	0.7866	8.28%	0.8817	0.8028	1.1084
1977 mean	68.84%	55.18%	14.51%	39.16%	10.88%	21.43%	50.63%	33.62%	326	1.0550	9.18%	1.3197	1.0122	1.3190
1981 mean	68.38%	54.38%	14.74%	39.46%	10.47%	22.38%	50.64%	33.79%	328	1.9526	9.69%	1.4330	1.0951	1.3199
1991 mean	71.20%	55.67%	14.39%	39.94%	10.79%	22.14%	52.17%	33.25%	333	0.8341	14.90%	1.6627	1.4054	1.1980
2001 mean	72.92%	59.41%	14.00%	39.96%	11.03%	19.35%	54.30%	34.89%	342	0.7514	21.23%	1.8566	1.6539	1.1463
2005 mean	75.69%	61.91%	14.35%	39.17%	10.74%	18.81%	53.92%	35.10%	347	0.7599	23.73%	1.8763	1.7463	1.0988
Observations	232	252	252	252	252	252	252	252	252	252	252	252	252	252

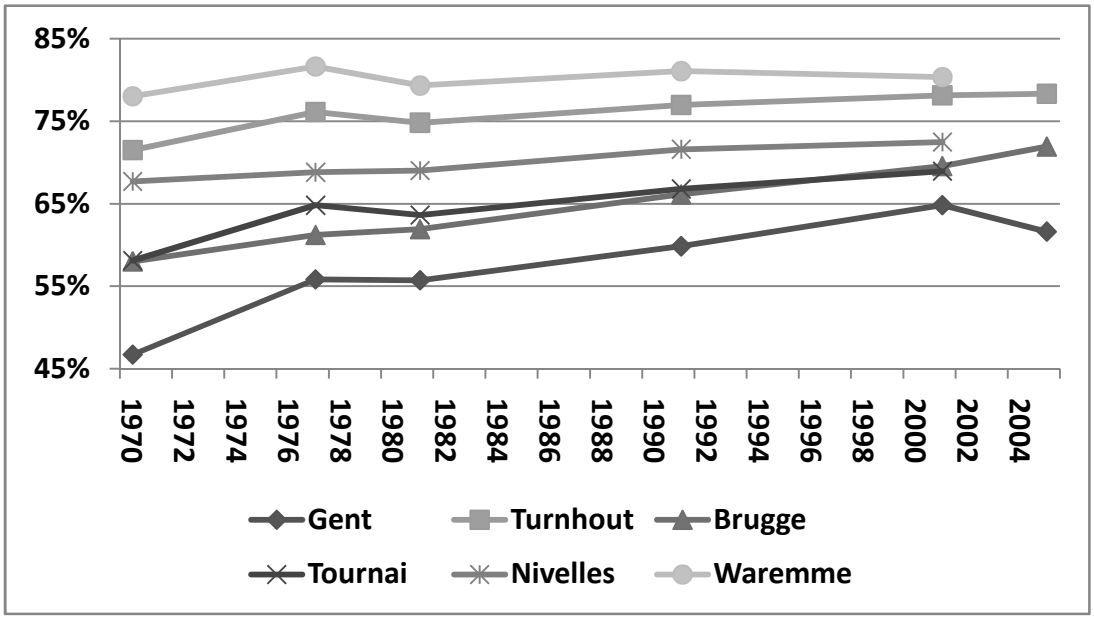
Source: see Appendix 2. Note that the data for OWN in 2005 only include Flemish districts.

Figure2. The employment rate among 15-64 year olds living in the district (Empl)



Source: Appendix 2.

Figure 3. Home ownership rates (OWN)



Source: Appendix 2.

the expression. We now elaborate on the different parts of the expression[5]. P_h represents the average nominal market price of an ordinary house in the district based on the registered sales of houses in that period. As such these prices are mainly representative for the secondary market of housing. Transaction costs in Belgium consist of registration duties on sales of existing houses, value

[5] Compared to Barrios Garcia & Rodriguez Hernandez (2004) we were not able to acknowledge the user cost due to property taxes. As these taxes are levied at the regional, the provincial and the municipal level, these taxes cannot be transformed into a tax rate that holds for the districts without the risk of data bias. We also leave out the effect of the specific housing related deductions in the income tax. Data shortages especially in the 1970s and 1980s explain these limitations.

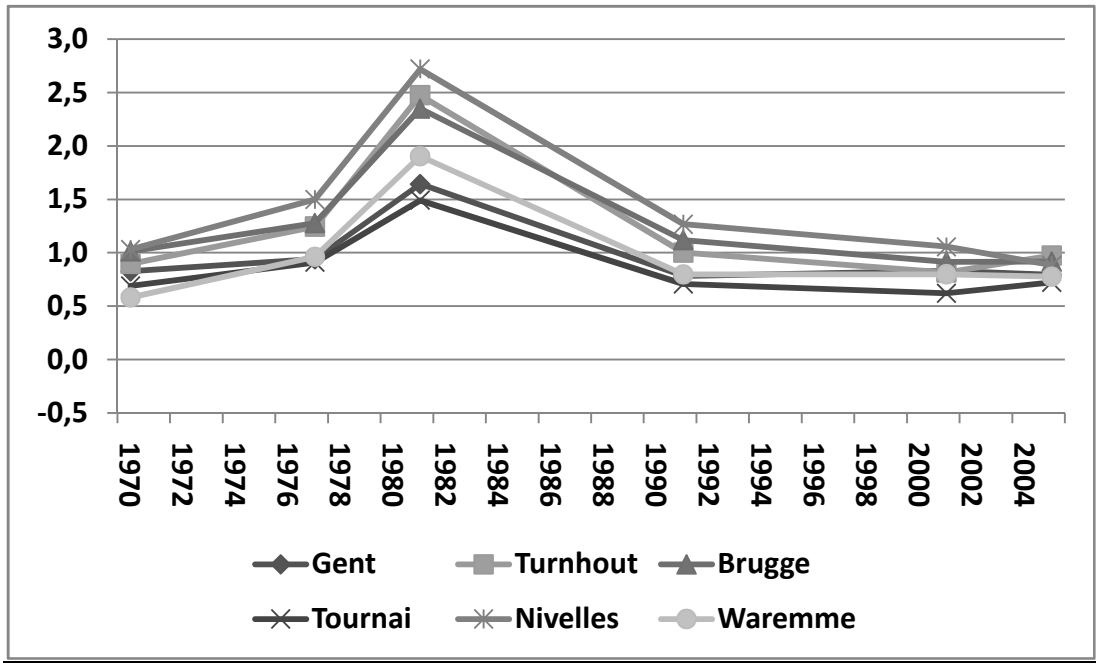
added taxes when buying a house constructed within two years and specific taxes on the deposit of the mortgage contract. In addition one may think of extra costs related to the interference of a notary, solicitor or estate agent. For this study we restrict the transaction cost to the registration duties[6]. Since these are paid only once (when buying the house), while ownership is generally a longer term investment, the transaction costs are recalculated into a yearly burden. To do this, an assumption must be made on the average buyer's horizon. We impose a five year horizon, which is consistent with assumptions that we make later on when computing expected house price inflation (π). Robustness checks starting from alternative horizons did not affect the empirical results that we report in the next sections (see Appendix 3). For the interest rate R_m we use the nominal interest rate on mortgages under a semi-fixed interest rate regime. Since potential owners can only borrow a fraction of the amount needed to buy a house (ltv<1), they will also have to invest personal funds. We assume long-term government bonds to be the best alternative asset. The interest rate on these bonds (R_g) therefore determines the opportunity cost of invested personal funds. As to depreciation and maintenance costs and the risk premium on residential property (d), we follow the literature in assuming that these are equal to 3 percent of the mean nominal market price of an ordinary house. Finally, the π-variable has been generated as forecasted inflation from an autoregressive model estimated for house prices. We regressed annual house price inflation in our panel of 42 districts on lagged inflation (up to five lags). The estimated coefficients were then used to forecast house price inflation of the coming years. π reflects the expected average annual house price inflation in the coming five years. Different choices for the number of years forecasted ahead had minor influence on our regression results. They never significantly affected the estimation results for the Oswald effect.

We were able to compute data for RC on an annual basis since the early 1970s. As we have mentioned before, to explain the rate of ownership in district *i* in year *t* in Equation (1), we use the average of RC in that district in the years *t-4* to *t*. The reason to do this, is double. First, OWN being a stock variable, not only current relative costs will affect current ownership rates, but also recent ones, relating to the recent past. Second, annual relative cost data are relatively volatile, which makes today's levels not always representative for the recent past. Again, changing the period over which we compute this average has no serious effects on our estimation results (see Appendix 3). Figure 4 shows the data. These show a strong increase in the relative cost of owning during the 1970s and (especially) the early 1980s, mainly due to very high real interest rates. Since then we observe a gradual decrease. Low interest rates and the expectation of strong house price increases in the 2000s explain the low relative cost in most districts in the most recent years.

As to skill levels (Schooling) we were able to detract from the censuses the population of 14 years and older that has terminated school, sorted by their highest diploma. For our regressions we use the number of highly skilled people, i.e. people with tertiary education, in percent of the population of 14 and older. Figure 5 shows the data for the six districts that we focus on. We observe a rise in each of them. Compared to most other variables, differences across districts are quite small for this variable (see also Table 2, between std. dev.). The wage gap in Figure 6 reflects the evolution of evolution of wage costs relative to productivity. More precisely, it has been computed as the ratio of

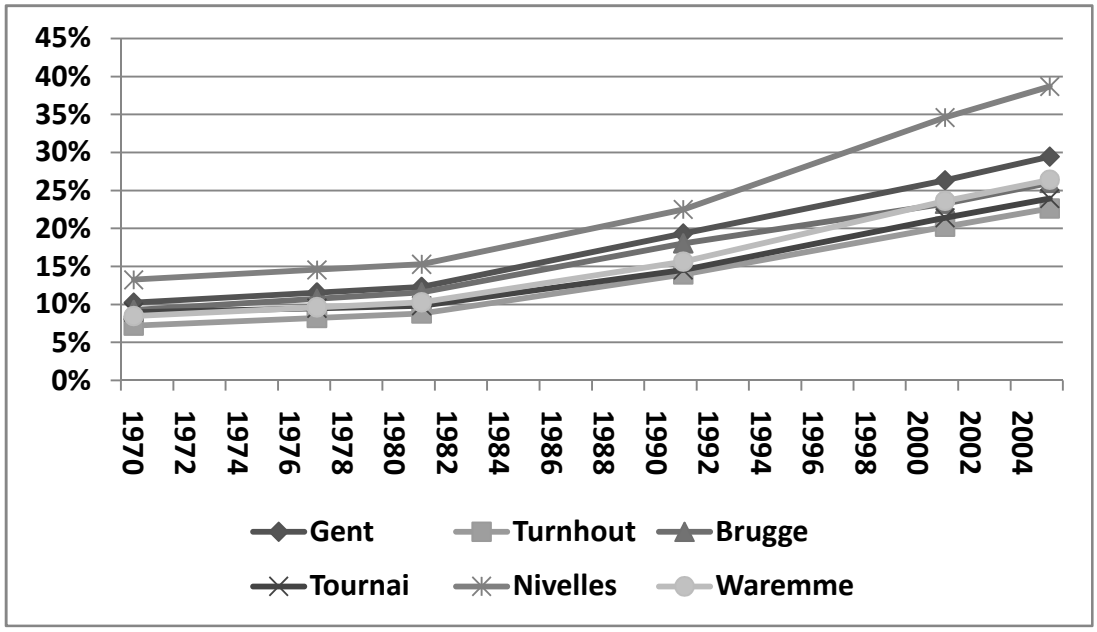
[6] Until 2002 houses generated registration tax income for the government corresponding to 6% to 12.5% of the value of the house sold, the specific tax rate depending on the average imputed rents generated by the house and on characteristics of the buyer. From 2002 onwards, tax rates were reduced respectively to 5% and 10% in the Flemish region. Additional tax base reductions were installed in order to ease the entrance of first homebuyers on the housing market. Registration duties did not change in Wallonia.

Figure 4. Relative cost of being a home-owner versus a renter (RC)



Source: see Appendix 2.

Figure 5. The percentage of highly skilled people (14-... years old) (Schooling)



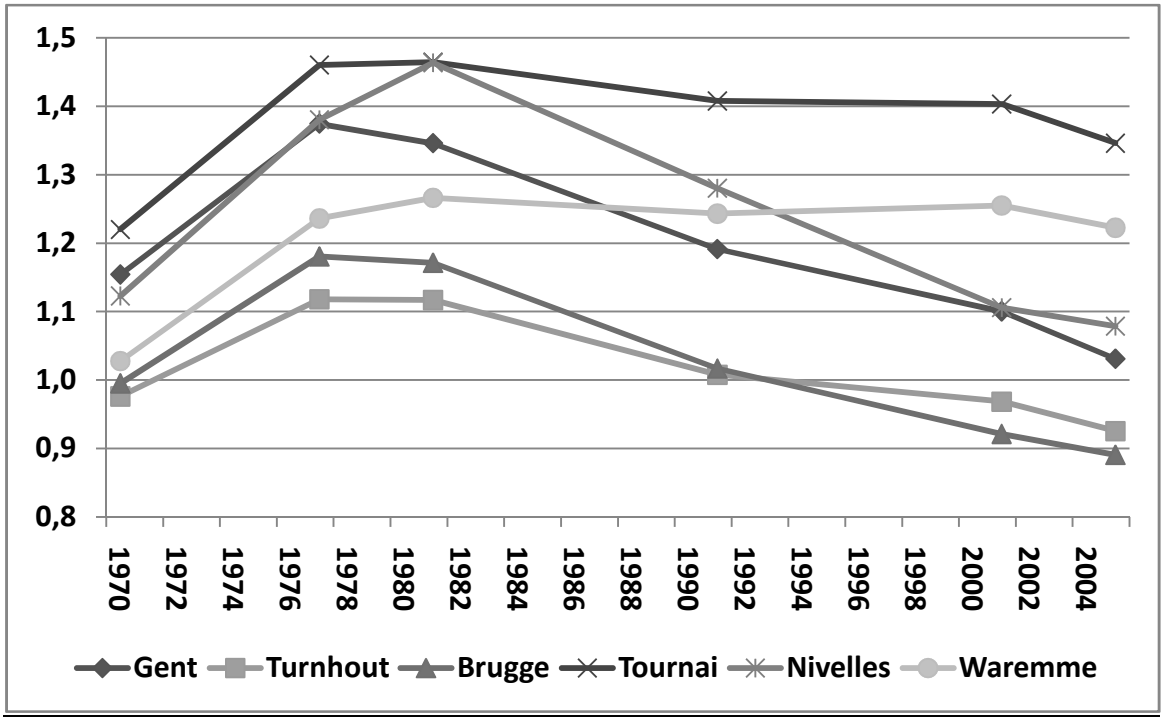
Source: Appendix 2.

real compensation per employee (including taxes on labour) to a proxy for real productivity per employee[7]. Our proxy is real GDP per capita. We prefer this variable above output per employee. The latter is highly endogenous, which may disturb appropriate measurement of the wage gap. A simple example can be illuminating. If wage increases are excessive, which pushes up the wage gap, firms

[7] Due to lack of data at the level of individual districts in the 1970s, our wage and productivity data have been computed at the provincial level. Provinces include about 4 districts on average (see Appendix 1).

may respond by laying off the least productive workers and by substituting capital for labour. As a result output per (remaining) worker may rise, and the wage gap may fall again. In the end, even if there is a serious problem of job losses, the wage gap may reveal nothing. Employing GDP per capita as a productivity measure makes the wage gap much less vulnerable to this perverse mechanism. Our data in Table 2 and Figure 6 are to be interpreted as an index, compared to a benchmark wage gap. As benchmark we chose the mean wage gap over all districts (called 'Belgium') in 1970. The data clearly show a derailment of wage costs in the seventies. During the eighties the wage gap is strongly reduced in Flanders, mainly thanks to higher productivity growth, with comparable wage growth. The wage gap remains much higher in Walloon districts. Wages have not followed (downwards) the weaker evolution of productivity. The data in Table 2 confirm that the variation across districts ('between std. dev.') is much smaller for the wage level than for productivity.

Figure 6. Wage gap with index 'Belgium' 1970 = 1



Source: Appendix 2.

A final series of variables in Table 2 are demographic and socio-geographic variables: the share of various age groups in total population, the fraction of childless households ('childless') and population density ('PopDens'). We measure the latter as the number of people per square kilometre. As we have mentioned before, relevant age groups need not be the same in the ownership equation and the employment equation. We include the fraction of people aged 20 to 34 and the fraction of people older than 34 in the ownership equation. We include the fraction of people aged 15 to 24 and the fraction of people aged 55 to 64 in the employment equation[8].

[8] Also including the fraction of prime age workers in the employment equation implied coefficients which were highly insignificant and almost zero for this age group. Highly insignificant coefficients also resulted when we included the fraction of childless households in the employment equation.

5. Econometric methodology and results

Tables 3 and 4 contain our main estimation results. In line with earlier arguments, we estimate both Equations (1) and (2) using the 2SLS estimation method, except in the last column where we use OLS. Endogenous variables to be instrumented in the equation for ownership are the employment rate, schooling, and the relative cost of living as owner. Endogenous variables to be instrumented in the employment equation are the rate of ownership, schooling, the wage level and productivity. As a result of the endogeneity of wages and productivity, also the wage gap is endogenous.

Good instruments should have explanatory power for the variable to be instrumented and be uncorrelated to shocks υ_{it} (ε_{it}) in the employment rate (home ownership rate) in the individual district. When it comes to instrumenting the relative cost of living as owner, wages, productivity and schooling in individual districts, it will be our hypothesis that the 'aggregate' regional counterparts of these variables contain key information on exogenous drivers, without being affected to any important extend by district-specific shocks. For Flemish districts these 'aggregate' regional variables are the average relative cost, average real wage, average schooling, etc. over all 22 districts in Flanders. For Walloon districts we use averages over all 20 districts in Wallonia. 'Aggregate' real wages for example will reflect changes in wage push variables like union power in key sectors in the region, taxation, and (aggregate regional) labour market policies. They should not reflect idiosyncratic labour demand and employment shocks in individual districts. 'Aggregate' variables may of course reflect common shocks across districts, but due to the use of time dummies these common shocks will not show up in the error term. Along the same line of arguments, the 'aggregate' regional relative cost of living as owner will capture exogenous overall evolutions in house prices or aggregate regional policies affecting the relative cost (e.g. changes in transaction costs when buying a house). Again it is our assumption that they do not reflect idiosyncratic shocks affecting the relative cost of living as owner in an individual district. In addition to these 'aggregate' regional variables we use the exogenous variables from the ownership equation (demographic variables, population density) as instruments for ownership in the employment equation. Also, we add all exogenous demographic variables from the employment equation as instruments for the employment rate in the ownership equation.

Standard Wald tests on the relevance of our set of instruments always yield F-values above 15 (for relative cost RC) or even 20 (for wage, productivity, wage gap, schooling). Overidentification tests (Sargan tests) for their validity are reported at the bottom of Tables 3 and 4. In almost all equations the null hypothesis that the instruments are valid is not rejected.

Table 3 reports estimation results for the rate of ownership, Table 4 for the employment rate. Given that a Hausman test rejects the null hypothesis that the unobserved effects are uncorrelated with the explanatory variables, we use the fixed effects estimator. Columns with the same number in both tables correspond. Column (1) contains estimation results for our basic Equations (1) and (2). Column (2) adds a common dummy for all Flemish districts since 1990 to capture the potential differential effects on employment and ownership from regional policies since the end of the 1980s. Column (3) introduces time-variation in the effects of the demographic variables. We allow effects to be different between the first part of the period that we study (1970-89), and the second (1990-2005). In column (4) we re-estimate column (3), but drop all highly insignificant explanatory variables. We maintain in the regression only those with an estimated *p*-value below 30%. The utter right column in each table re-estimates column (3) by the OLS method. In our discussion we focus on our main findings using the 2SLS method.

Table 3: Estimation results for the rate of home ownership (Equation 1)

HOME-OWNERSHIP	**1 – 2SLS**	**2 – 2SLS**	**3 – 2SLS**	**4 – 2SLS**	**3 - OLS**
Log (Relative cost)	-0.119(**) *(0.058)*	-0.120(**) *(0.054)*	-0.101(**) *(0.026)*	-0.117(***) *(0.045)*	-0.024 *(0.020)*
Employment rate	1.057(**) *(0.510)*	0.846 *(0.568)*	0.470 *(0.376)*	0.849(***) *(0.195)*	-0.373(***) *(0.122)*
Schooling	0.493 *(0.360)*	0.307 *(0.434)*	0.307 *(0.330)*	-	0.282(*) *(0.144)*
Fraction childless families					
1970-2005	-0.428 *(0.290)*	-0.457(*) *(0.272)*	-	-	-
1970-1989	-	-	-0.397 *(0.244)*	-0.600(***) *(0.127)*	0.015 *(0.113)*
1990-2005	-	-	0.150 *(0.228)*	-	0.496(***) *(0.120)*
Fraction age 20-34					
1970-2005	-0.795 *(0.525)*	-0.616 *(0.556)*	-	-	-
1970-1989	-	-	-0.516 *(0.453)*	-0.816(**) *(0.327)*	0.022 *(0.304)*
1990-2005	-	-	0.109 *(0.456)*	-	0.092 *(0.364)*
Fraction age 35 and older					
1970-2005	0.160 *(0.175)*	0.164 *(0.162)*	-	-	-
1970-1989	-	-	0.105 *(0.149)*	-	0.055 *(0.122)*
1990-2005	-	-	0.084 *(0.179)*	-	-0.077 *(0.146)*
Log(Population density)	-0.304(***) *(0.073)*	-0.252(**) *(0.103)*	-0.156(**) *(0.071)*	-0.125(**) *(0.052)*	-0.172(***) *(0.049)*
Dummy Flanders 1991-2005	-	0.014 *(0.021)*	-	-	-
R-squared within	0.62	0.68	0.76	0.71	0.83
R-squared between	0.26	0.26	0.26	0.30	0.20
R-squared overall	0.23	0.24	0.28	0.34	0.23
Sargan (p-value) [(a)]	0.47	0.44	0.46	0.97	-
Time dummies	Yes	Yes	Yes	Yes	Yes
District dummies	Yes	Yes	Yes	Yes	Yes
Number of observations	232	232	232	232	232

Note: * (**) (***) indicates statistical significance at 10% (5%) (1%). Between brackets are estimated standard errors.
(a) Sargan is the Sargan test of overidentifying restrictions. The null hypothesis is that the overidentifying restrictions are correct.

When it comes to ownership, our results reveal a robust significant negative effect from the relative cost of living as owner and a positive effect from the employment rate. Given our specification, an increase of RC by 10 percent implies a fall in the rate of ownership by about 1 to 1.2 percentage points. The effect on the rate of ownership of a rise in employment is less precisely estimated, varying between about 0.5 and 1 percentage point for each percentage point rise in the employment rate. In two of our 2SLS regressions this effect is statistically significant at 5% or better, in a third it is

close to significance at the 10% level. These results illustrate the simultaneity that necessitates the use of IV methods in estimation of the Oswald effect. Furthermore, in line with our expectations, we observe significant negative effects on the rate of ownership from the fraction of childless families and population density. This negative effect of the fraction of childless families has, however, gradually disappeared over time. We do no longer observe it in the last 15 years of our data (columns 3 and 4). As to age composition, our results reveal the expected negative coefficient for the fraction of people aged 20 to 34 in column 2, but its estimated coefficient is not statistically significant. Time-variation may (again) explain part of this. Columns (3) and (4) reveal that the negative effect occurs only in the 1970s and 1980s. Potential explanations could relate to changes in preferences and/or improved credit or financial conditions (for given relative cost of living as owner) in recent decades. Finally, we do not find significant effects from schooling in the ownership equation. Neither do we see a significant differential Flemish policy effect since 1990 (column 2), at least no differential effect for a given evolution of the relative cost. Any policy effect that runs via taxes and other determinants of the relative cost, is of course captured by the (significant) RC-variable.

Our estimation results for the employment rate show significant negative effects of the rate of ownership and insignificant positive effects of the fraction of highly educated (schooling). The effects of productivity are significantly positive, the effects of real wages negative, although not always statistically significant. Given our findings in columns (1) and (2) that the effects of the wage level and productivity are not significantly different at all in absolute value, we introduce the wage gap in columns (3) and (4). This also obtains a significant negative effect. Furthermore, our results reveal a significant positive differential Flemish policy effect on the employment rate of about 2 percentage points since 1990. Finally, we find no significant effects from the demographic variables, although the negative sign of estimated effects is in line with expectations. Note also that this negative sign has become somewhat stronger in the most recent period.

Our results confirm the Oswald hypothesis. If we focus on our 'better' results in columns (2) and (3), considering R^2s and Sargan test results, we find that a 1 percentage point rise in the rate of ownership in a district implies a significant fall in the employment rate in that district by about 0.3 percentage points. Our results also underscore the importance of the estimation method, of controlling for fixed cross-sectional and common time effects, and of taking into account crucial other determinants of employment, when testing the Oswald hypothesis. We observe in the utter right column in Table 4 the bias that may follow from OLS estimation. Given the positive effect of the employment rate on ownership (Table 3), it should be no surprise to observe a much weaker Oswald effect when we do not control for endogeneity. We still find a significant negative effect of ownership on employment, but its estimated size falls by about 30 percent. Table 5 contains estimation results where we do not control for fixed cross-sectional effects and common time effects, or where we do not take into account some of the other determinants of employment. As one can see, anything goes. Not controlling for fixed district effects reduces the estimated negative Oswald coefficient by half (column 3_b in Table 5), but it remains statistically significant. If common time effects are not controlled for, the estimated Oswald coefficient becomes about zero (columns 3_c and 3_d)[9]. In other regressions that we have run, even a positive coefficient may show up[10].

[9] Imagine for example business cycle shocks. Positive shocks may raise both employment, aggregate wages, and household confidence and resources, and the ambition to become owner. If not controlled for in the regressions, such a shock will induce positive correlation between ownership and the error term, and bias upwards the estimated Oswald coefficient.

[10] This is the case for example when we drop schooling from the regression in column 3_d (result not reported).

Our results in Table 5 may also shed light on the (somewhat surprising) insignificance of schooling in Table 4. An explanation may be that (in contrast to other variables) schooling shows a highly similar evolution over time in all districts. Even if this evolution is important for employment, its effects may at least partly be picked up by the common time dummies[11]. Dropping these time dummies in Table 5 yields positive and highly significant schooling effects.

Table 4: Estimation results for the employment rate (Equation 2)

EMPLOYMENT	**1 – 2SLS**	**2 – 2SLS**	**3 – 2SLS**	**4 – 2SLS**	**3 - OLS**
Home-ownership rate	-0.252 *(0.198)*	-0.299(*) *(0.171)*	-0.335(***) *(0.087)*	-0.358(***) *(0.087)*	-0.236(***) *(0.040)*
Schooling	0.164 *(0.132)*	0.065 *(0.119)*	0.082 *(0.117)*	-	0.127(*) *(0.073)*
Log (wage)	-0.320(*) *(0.170)*	-0.200 *(0.153)*	-	-	-
Log (productivity)	0.401(***) *(0.053)*	0.301(***) *(0.059)*	-	-	-
Log (wage gap)	-	-	-0.262(***) *(0.044)*	-0.257(***) *(0.044)*	-0.134(***) *(0.024)*
Fraction age 15-24					
1970-2005	-0.238 *(0.232)*	-0.220 *(0.200)*	-	-	-
1970-1989	-	-	-0.134 *(0.198)*	-	-0.109 *(0.179)*
1990-2005	–	–	-0.311 *(0.221)*	-0.163 *(0.138)*	-0.311 *(0.197)*
Fraction age 55-64					
1970-2005	-0.321 *(0.209)*	-0.289 *(0.180)*	-	-	-
1970-1989	-	-	-0.217 *(0.192)*	-0.130 *(0.131)*	-0.161 *(0.173)*
1990-2005	–	–	-0.371 *(0.232)*	-0.284 *(0.211)*	-0.381(*) *(0.210)*
Dummy Flanders 1991-2005	-	0.019(***) *(0.007)*	0.022(***) *(0.006)*	0.024(***) *(0.006)*	0.033(***) *(0.005)*
R-squared within	0.80	0.86	0.86	0.86	0.88
R-squared between	0.27	0.25	0.19	0.19	0.21
R-squared overall	0.42	0.42	0.39	0.39	0.46
Sargan (p-value) [(a)]	0.05	0.27	0.21	0.105	-
Time dummies	Yes	Yes	Yes	Yes	Yes
District dummies	Yes	Yes	Yes	Yes	Yes
Number of observations	232	232	232	232	232

Note: * (**) (***) indicates statistical significance at 10% (5%) (1%). Between brackets are estimated standard errors.
(a) Sargan is the Sargan test of overidentifying restrictions. The null hypothesis is that the overidentifying restrictions are correct.

[11] The estimated time dummies in Table 4, column (3), are respectively 4.8%, 3.8%, 6%, 8.5% en 10.4% in 1977, 1981, 1991, 2001 and 2005.

Finally, our results allow to assess the relative importance of the wage gap and ownership for the employment rate. Using the results in Table 4, column (3), a one standard deviation change in these two explanatory variables (see Table 2) implies an absolute change in the employment rate by about 2.6 percentage points for ownership and 4.2 percentage points for the wage gap. These findings underscore the importance of housing and the arguments underlying the Oswald hypothesis for employment in Belgium. In this respect, our results are in line with earlier work by Estevão (2002) and OECD (2011). Investigating regional labour market disparities in Belgium, Estevão finds low labour migration, and concludes that "Belgians move too little". He points at linguistic and cultural factors, a compressed wage structure and generous unemployment benefits to explain low mobility. Although our study is not about mobility, it would suggest a high rate of home ownership as another potential explanatory variable. OECD (2011) confirms the negative effect of home ownership on mobility. This study also indicates Belgium as a country with very high transaction costs of buying and selling houses.

Table 5: Additional estimation results for the employment rate (Equation 2)

EMPLOYMENT	**3_b – 2SLS**	**3_c - 2SLS**	**3_d – 2SLS**	**5 – 2SLS**	**6 – 2SLS**
Home-ownership rate	-0.171(**) *(0.071)*	-0.047 *(0.075)*	-0.013 *(0.070)*	-0.157(*) *(0.095)*	-0.681(***) *(0.167)*
Schooling	0.036 *(0.159)*	0.528(***) *(0.056)*	0.518(***) *(0.057)*	0.026 *(0.112)*	0.048 *(0.157)*
Log (wage)	-	-	-	-	-0.388(*) *(0.212)*
Log (productivity)	-	-	-	0.284(***) *(0.047)*	-
Log (wage gap)	-0.272(***) *(0.045)*	-0.159(***) *(0.021)*	-0.173(***) *(0.020)*	-	-
Fraction age 15-24					
1970-1989	0.119 *(0.171)*	-0.009 *(0.208)*	0.305(*) *(0.158)*	-0.292 *(0.193)*	0.041 *(0.283)*
1990-2005	-0.143 *(0.191)*	-0.232 *(0.228)*	0.098 *(0.178)*	-0.167 *(0.212)*	-0.371 *(0.306)*
Fraction age 55-64					
1970-1989	-0.024 *(0.189)*	-0.090 *(0.193)*	0.100 *(0.174)*	-0.309(*) *(0.186)*	-0.108 *(0.258)*
1990-2005	-0.321 *(0.236)*	-0.230 *(0.216)*	-0.066 *(0.205)*	-0.250 *(0.225)*	-0.457 *(0.315)*
Dummy Flanders 1991-2005	0.019(***) *(0.007)*	0.027(***) *(0.006)*	0.026(***) *(0.006)*	0.022(***) *(0.006)*	0.045(***) *(0.006)*
R-squared within R-squared between R-squared overall	0.86 0.33 0.51	0.83 0.38 0.56	0.82 0.48 0.62	0.87 0.32 0.46	0.77 0.05 0.02
Sargan (p-value) [(a)]	0.09	0.00	0.00	0.11	0.01
Time dummies District dummies	Yes No	No Yes	No No	Yes Yes	Yes Yes
Number of observations	232	232	232	232	232

Note: * (**) (***) indicates statistical significance at 10% (5%) (1%). Between brackets are estimated standard errors.

(a) Sargan is the Sargan test of overidentifying restrictions. The null hypothesis is that the overidentifying restrictions are correct.

Table 6 summarizes the results of a series of additional regressions that we have run, and where we include not just OWN in the employment regression, but also one interaction term OWN*VAR, where VAR stands for a structural variable which may affect the size of the Oswald effect. The data in the table indicate the change in the estimated effect of the rate of ownership on the employment rate brought about by the interaction variable. One column shows the results from including each interaction term separately, the other from including all interaction terms together but dropping those with *p*-values below 20%. Our results reveal a weaker Oswald effect in districts with a higher share of highly educated people, thereby confirming Dohmen (2005). This result is statistically significant at 6%. As to other interaction terms, we find a stronger Oswald effect in densely populated districts and in districts closer to a linguistic or country border. Densely populated districts may for example be more vulnerable to congestion problems (and rising production costs) when owners commute. Proximity of a border may imply higher costs to be mobile (e.g. personal costs due to a change of language, or transaction costs due to a shift of legal regime). We also observe weaker Oswald effects in districts closer to the main cores of economic activity (i.e. districts close the major cities). None of these differences are statistically significant, however. Neither do we observe important differences in the Oswald effect over time. Additional tests with different time periods than those reported in Table 6 did not yield any interesting results.

Table 6: Influence of structural and socio-geographic variables on estimated Oswald coefficient

Determinants of the Oswald effect. **Different effect...**	**Change in estimated Oswald coefficient [(a)]**	
	Interaction term included separately	Interaction terms included together (and *p*-value < 20%)
for districts at a national or linguistic border? District where at least 30% of the municipalities are situated at a national or linguistic border (versus other districts)	**-0.112**	**-**
for districts close to an economic centre / major city (b)? Districts close to an economic centre (versus other districts)	**+0.040**	**-**
in the past versus more recent periods? Change in estimated Oswald coefficient for 1990-2005 (versus 1970-1989)	**-0.076**	**-**
for densely populated areas? Effect of a rise in population density by one standard deviation (= +226 persons per square kilometre) (c)	**-0.070**	**-0.130**
depending on the share of highly educated people ? Effect of a rise in the fraction of highly educated by one standard deviation (= +2.45 percentage points in 'schooling') (c)	**+0.043**	**+0.081 (*)**

Note: (*) statistically significant at less than 10%.

(a) A negative change points at a stronger Oswald effect.

(b) Our interaction term is a dummy which equals 1 in districts neighbouring the districts of the major cities/cores of economic activity (i.e. Brussels, Antwerp, Ghent, Liege and Charleroi).

(c) Standard deviations are determined over the 42 district averages for population density/schooling over 1970-2005. These district averages are also the data for VAR that we use in the interaction term (cf. OWN*VAR).

6. Conclusions

This paper tests the Oswald hypothesis in a panel of 42 Belgian districts since the 1970s. Oswald argues that high rates of home ownership restrict geographical mobility, and imply inferior labour market outcomes, both for the individual and in the aggregate. The use of data going back to 1970 allows us to embed the Oswald hypothesis in a broader model including important other determinants of employment like labour costs and productivity, the skill level of the population, and a number of demographic variables. Considering that ownership may be endogenous to (shocks in) employment, we use IV estimation methods.

Overall, we find evidence in favour of the Oswald hypothesis. We observe that a 1 percentage point rise in the rate of home ownership in a district implies a statistically significant fall in the employment rate by about 0.3 percentage points. The size of this effect is economically important. It is more than half the effect of changes in labour costs. Additional estimation reveals that the Oswald effect is smaller in districts with higher fractions of high skilled. Our results underscore the importance of controlling for unobserved fixed regional and common time effects, of including other determinants of employment, and of appropriately dealing with endogeneity. Disregarding these issues (as is often done in the literature), may imply very different estimation results. As to these other determinants of employment, our results confirm the existence of significant negative effects of the ratio of wage costs to productivity. We also observe positive effects from the skill level of the population, but here the evidence is not strong. Interestingly, we also find significant positive effects on employment in Flemish districts from differential regional policies that gained importance since the 1990s. These policies include among others the management of public employment services and the training of the unemployed.

We embed our study of the Oswald hypothesis in a simultaneous equation model where we also explain the rate of home ownership. We find significant negative effects from the relative cost of living as owner versus renter. A 10 percent increase in this relative cost implies a fall in the rate of ownership by about 1 to 1.2 percentage point. In the ownership equation, we also see an influence from some demographic variables. The rate of ownership tends to be lower when the fraction of young people (20 to 34) and the fraction of childless families rise. This negative influence has, however, become insignificant since the 1990s. Our findings here are in line with hypotheses emphasizing changes in preferences or financial liberalisation improving credit availability for young households.

The significant effect on home ownership from the relative cost of living as owner versus renter opens possibilities for the government to affect home ownership by means of tax changes. The literature provides ample reasons why promotion of ownership may make sense. Home ownership may be a secure way for the population to accumulate assets. Moreover, it may generate significant social benefits, like neighbourhood stability and the accumulation of social capital. Policy makers should recognize however that these benefits come at a labour market cost, which may necessitate complementary policy measures to avoid negative ownership effects on geographical mobility and employment.

References

Barrios García J.A. and J.E. Rodríguez Hernández, 2004, "User cost changes, unemployment and home-ownership: Evidence from Spain", In: *Urban Studies*, 41, pp.563-578.

Bassanini A. and R. Duval, 2006, "Employment patterns in OECD countries", OECD Economics Department Working Papers, N° 486.

Blanchard O.J. and L.F. Katz, 1992, "Regional Evolutions", In: *Brookings Papers on Economic Activity*, 1992, n°1, pp.1-75.

Brunet C. and N. Havet, 2009, Propriété immobilière et déqualification dans l'emploi, *Revue Française d' Economie*, 24, pp. 121-155.

Böheim R. and M. Taylor, 2002, "Tied down or room to move? Investigating the relationships between housing tenure, employment status and residential mobility in Britain", In: *Scottish Journal of Political Economy*, 49, pp.369-392.

Chiuri M.C. and T. Jappelli, 2003, "Financial market imperfections and home ownership: A comparative study", In: *European Economic Review*, 47, pp.857-875.

Coulson E.N. and L.M. Fisher, 2002, "Tenure Choice and Labour Market Outcomes", In: *Housing Studies*, 17, pp.35-50.

Coulson E.N. and L.M. Fisher, 2009, "Housing tenure and labor market impacts: The search goes on", In: *Journal of Urban Economics*, 65, pp.252-264.

Cournède B., 2005, "Housing prices and inflation in the euro area", *OECD Economics Department Working Papers*, No. 450.

DeJong, D.N. and B.F. Ingram, 2001, "The cyclical behavior of skill acquisition", In: *Review of Economic Dynamics*, 4, pp. 536-561.

Dietz R. and D. Haurin, 2003, "The social and private micro-level consequences of homeownership", In: *Journal of Urban Economics*, 54, pp.401-450.

DiPasquale D. and E. Glaeser, 1999, "Incentives and social capital: are homeowners bettercitizens?", In: *Journal of Urban Economics*, 45, pp.354-384.

Dohmen T.J., 2005, "Housing, mobility and unemployment", In: *Regional Science and Urban Economics*, 35, pp.305-325.

Engelhardt G.V., Eriksen M.D., Gale W.G. and G.B. Mills, 2010, "What are the social benefits of homeownership? Experimental evidence for low-income households", In: *Journal of Urban Economics*, 67, pp.249-258.

Estevão, M., 2002, Regional labor market disparities in Belgium, *IMF Working Paper*, WP02/134.

Fisher, L.M. and A.J. Jaffe, 2003, "Determinants of international home ownership rates", In: *Housing Finance International*, September, pp. 34-42.

Flatau et al., 2002, "Home Ownership and Unemployment: Does the Oswald Thesis Hold for Australian Regions?", Working paper, 189, 15p.

Glaeser E.L. and J.M. Shapiro, 2003, "The benefits of the home mortgage interest deduction", In: *Tax policy and the economy*, pp.37-82.

Green R.K. and P.H. Hendershott, 2001, "Home-ownership and unemployment in the US", In: *Urban Studies*, 38, nr° 9, pp.1509-1520.

Hendershott P.H. and J.D. Shilling, 1982, "The economics of tenure choice, 1955-79", In: Sirmans C., ed., *Research in real estate*, 1, pp.105-133.

Henley A., 1998, "Residential mobility, housing equity and the labour market", In: *Economic Journal*, 108, pp.414-427.

Heylen, F. and L. Pozzi, 2007, "Crises and Human Capital Accumulation", In: *Canadian Journal of Economics*, 40, pp. 1261-1285.

Hughes G. and B. McCormick, 1981, "Do council housing policies reduce migration between regions?", In: *The Economic Journal*, 91, pp.919-937.

Hughes G. and B. McCormick, 1987, "Housing markets, unemployment and labour market flexibility in the UK", In: *European Economic Review*, 31, pp.615-645.

Hymel K., 2009, “Does traffic congestion reduce employment growth?”, In: *Journal of Urban Economics*, 65, pp.127-135.
IMF, 2006, “Belgium: Selected Issues”, *IMF Country Report* n°06/76, 45p.
Japelli T. and M. Pagano, 1994, “Saving, Growth, and Liquidity Constraints”, In: *The Quarterly Journal of Economics*, 109, pp.83-109.
Layard R., Nickel s. and R. Jackman, 1991, *Unemployment: Macroeconomic Performance and the Labour Market*, Oxford University Press, Oxford.
Lerbs O., 2010, “Does home ownership really cause unemployment? Evidence from German regional data”, Preliminary draft,22p.
Munch J.R., Rosholm M. and M. Svarer, 2006, “Are homeowners really more unemployed?”, In: *The Economic Journal*, 116, pp.991-1013.
Munch J.R., Rosholm M. and M. Svarer, 2008, “Home ownership, job duration, and wages”, In: *Journal of Urban Economics*, 63, pp.130-145.
Nickell S., 1998, “Unemployment: questions and some answers”, In: *The Economic Journal*, 108, pp.802-816.
Nickell S. and R. Layard, 1999, “Labor market institutions and economic performance”, In: Ashenfeiter O. and D. Card (eds.), *Handbook of Labor Economics*, North Holland, New York, 3c, pp.3029-3084.
Nickell S., Nunziata L. and W. Ochel, 2005, “Unemployment in the OECD since the 1960s. What do we know?”, In: *The Economic Journal*, 115, pp.1-27.
OECD, 2004, “Wage-setting institutions and outcomes”, *OECD Employment Outlook*, Chapter 3.
OECD, 2011, “Housing and the economy: policies for renovation”, *Going for Growth 2011 - Economic Policy Reforms*, OECD, Paris.
Oswald A.J., 1996, “A conjecture on the explanation for high unemployment in the industrialized nations: part 1”, Warwick Economies Research Paper, N°475, University of Warwick.
Oswald A.J., 1997a, “Thoughts on Nairu”, In: *Journal of Economic Perspectives*, 11, n°1, pp.227-228.
Oswald A.J., 1997b, “The Missing Piece of the Unemployment Puzzle”, University of Warwick, 49p.
Oswald A.J., 1997c, “Theory of homes and jobs”, Working paper, Dept. Economics, University of Warwick.
Oswald A.J., 1999, “The housing market and Europe’s unemployment : A non-technical paper”, Working paper, Dept. Economics, University of Warwick.
Partridge M.D. and D.S. Rickman, 1997, “The Dispersion of US State Unemployment Rates: The Role of Market and Non-market Equilibrium Factors”, In: *Regional Studies*, 31, pp.593-606.
Pehkonen J., 1997, “Unemployment and home-ownership”, In: *Applied Economics Letters*, 6, pp.263-265.
Pissarides C., 1990, *Equilibrium Unemployment theory*, Oxford: Blackwell.
Poterba J., 1992, “Taxation and housing: Old questions, new answers”, In: *American Economic Review*, 82, pp.237-242.
Robson M.T., 2003, “Housing markets and regional unemployment flows in Great Britain”, In: *The Manchester School*, 71, pp.132-155.
Rohe W., Van Zandt S. and G. McCarthy, 2002, “Home Ownership and Access to Opportunity”, In: *Housing Studies*, 17, pp.51-61.
Rosen H.S., 1979, “Housing Decisions and the U.S. Income Tax: An Econometric Analysis”, In: *Journal of Public Economics*, 11, pp.1-23.
Rosen H.S. and K.T. Rosen, 1980, “Federal Taxes and Homeownership: Evidence from Time Series”, In: *The Journal of Political Economy*, 88(1), pp.59-75.
Rouwendal J. and P. Nijkamp, 2006, “Homeownership and labour market behavior: interpreting the evidence”, In: *Environment and Planning A*, 42, pp.419-433.
Van den Noord P., 2005, “Tax incentives and house prices in the euro area: Theory and evidence”, *Economie Internationale*, No. 101., pp.29-45.
van Leuvensteijn M. and P. Koning, 2004, “The effect of home-ownership on labor mobility in the Netherlands”, In: *Journal of Urban Economics*, 55, pp.580-596.

Appendix 1: Belgian provinces and districts

Flanders (5 provinces, 22 districts)

Wallonia (5 provinces, 20 districts)

Average size of a district : 723 km²
Average number of inhabitants per district: 214.000

Appendix 2: Data Description and Sources

Most our data have been taken from the national censuses held in Belgium. Because we only had censuses in the years 1970, 1981 and 1991, we had to supplement these with data from extensive surveys (Social-Economic Survey, Woonsurvey). These surveys have been tested and confirmed to be representative by the statistical authorities (NIS). Not every variable is available in the censuses and surveys, so for some data we had to rely on other sources. We now consider every variable of our model and give a short description of definition. We mention data sources and possible data shortages or adjustments.

OWN (Home-ownership rate)

The fraction of houses that are occupied by their owner.

Source: Census 1970, 1981 and 1991 by NIS; Social-Economic Survey 1977 and 2001 by NIS; Woonsurvey 2005 by the Flemish Government. Data for 2005 are not available for the Walloon districts.

RC (Relative cost of being a home-owner versus a renter)

This variable has been explained in the main text. The sources of the different parts are:

* P_{ho}: The mean nominal transaction price of a normal house per district. Source: yearly data (1973-2008) from ADSEI. We have extrapolated these district data to the pre-1973 years using the regional (= Flemish or Walloon) mean evolution of house prices according to STADIM.
* *tc*: Nominal registration duty. In percentage of house price, divided by an estimate of expected duration of the length in years of the amortization period. We conjecture this period to be 5 years. As a robustness check, we alternatively assume this period to be 30 years (see Appendix 3).

Source: http://www.belgium.be/nl/belastingen/registratierechten/onroerend_goed/ and annual reports 'FOD Financiën'.

* R_m: Nominal interest rate on mortgages, interest rate on mortgages under a semi-fixed interest rate regime. Source: National Bank of Belgium.
* R_g : Nominal interest rate on long-term government bonds. Source: OECD, Economic Outlook.
* ltv: loan-to-value ratio. Source: Japelli and Pagano (1994), Chiuri and Japelli (2003), IMF (2006).
* *d*: Depreciation, maintenance and the risk premium on residential property (in percentage of the transaction house price. No actual data are available but we held *d* to the 3 percent of the house price per year as described in previous empirical studies.
* P_r: The yearly nominal rental rate. This is a mean national index for rents paid on a 'normal' house. Data per district are not available. Source: 'FOD Economie, KMO, Middenstand en Energie'

Empl (Labour market performance, employment rate)

Employment rate among households living in the district, i.e. the number of employed in percent of the population at working age. Source: Census 1970, 1981 and 1991 by NIS; Social-Economic Survey 2001 by NIS; 'Steunpunt Werk en Sociale Economie' for 2005. The data for 1977 have been interpolated from the years 1970 and 1981.

Demographic variables

- Age xx-yy: People of age between xx and yy in percent of the total population. Source: Census 1970, 1981 and 1991 by NIS; Social-Economic Survey 2001 by NIS for 2001,

and 'FOD Economie, KMO, Middenstand en Energie' for 2005 (Rijksregister). The data for 1977 have been interpolated from the years 1970 and 1981.

- Childless: The number of couples without children divided by the total number of families. Source: Census 1970, 1981, 1991 and ADSEI for 1997-2006. 1977 has been interpolated from 1970 and 1981.

Schooling

The number of highly skilled people (tertiary education) in percent of the population of age 14 or older. Source: Census 1970, 1981 and 1991; Eurostat for 2001. 1977 has been interpolated from 1970 and 1981. 2005 has been extrapolated from 2001 based on the data of 2001 and the evolution of the national mean according to NIS Labour Force Survey.

Wage level

Real compensation per employee. Source: own calculations based on Cambridge Econometrics data. Data for 1970 and 1977 have been extrapolated based on NIS Social Statistics. Due to data limitations, wages have been computed at the level of the provinces. Provinces include about 4 districts on average.

Productivity

Real GDP per capita. Source: own calculations based on Cambridge Econometrics data. Per capita GDP in 1970 and 1977 have been extrapolated based on Cambridge Econometrics and OECD Economic Outlook data. Due to data limitations, productivity has been computed at the level of the provinces. Provinces include about 4 districts on average.

Wage gap

Ratio of wage level to productivity.

PopDens

Population density, number of people per square kilometre.

Sources: district area: Eurostat; district population: Census 1970, 1981 and 1991, Social-Economic Survey 2001, 1977 has been interpolated from 1970 and 1981. 2005: Ecodata, 'FOD Economie, KMO, Middenstand en Energie' (Rijksregister).

Appendix 3: Robustness checks

We here report the results of robustness checks to column (3) in Tables 3 and 4. We report estimated coefficients for the relative cost of living as owner (RC) in the ownership equation, and estimated coefficients for the rate of ownership (OWN) in the employment equation, after introducing one change to the empirical specification, or the computation of our data. This change is indicated in the first column. None of these changes have important effects on our estimates.

Robustness checks: coefficients in case we...	**RC**	**OWN**
Include log(OWN) instead of OWN, both as dependent variable in Eq. (1) and as explanatory variable in Eq. (2) (a)	-0.137(*) *(0.073)*	-0.196(***) *(0.051)*
Include log(Empl) instead of Empl, both as dependent variable in Eq. (2) and as explanatory variable in Eq. (1) (b)	-0.105(**) *(0.047)*	-0.655(***) *(0.154)*
Include $RC_{t-4,t}$ instead of $\log(RC_{t-4,t})$ in Eq.(1)	-0.088(**) *(0.042)*	-0.335(***) *(0.087)*
Include $\log(RC_t)$ instead of $\log(RC_{t-4,t})$ in Eq. (1) Here we do not include the (log of the) average of annual data for RC over a five year period ending in t, but only use data for the year t.	-0.068(*) *(0.038)*	-0.335(***) *(0.087)*
Include $\log(RC_{t-4,t})$ but assume owners to have an horizon of 30 years in the computation of RC. We assume transaction costs to be spread over 30 years, and expected inflation (π) equal to the average annual house price inflation in the district over the whole period 1970-2008.	-0.149(**) *(0.073)*	-0.335(***) *(0.087)*
Compute the employment rate as the ratio of the number of jobs in a district to population at working age	-0.081(**) *(0.040)*	-0.426(**) *(0.167)*
Drop the year 1977 (for which many data were missing and had to be computed by interpolation, see Appendix 2)	-0.106 *(0.084)*	-0.328(***) *(0.089)*
Drop the year 2005 (for which ownership data were missing for Walloon districts, and some other sources had to be explored for other variables, see Appendix 2).	-0.090(**) *(0.036)*	-0.362(***) *(0.103)*
Drop the years 1977 and 2005	-0.080 *(0.070)*	-0.356(***) *(0.107)*

Note: (*), (**), (***) statistically significant at less than 10% (5%) (1%).

(a) The Oswald effect as we report it in this paper (i.e. dEmpl/dOWN) can be derived as the estimated coefficient (-0.196) divided by the level of OWN. Evaluated at the overall sample mean (70%), this implies an Oswald effect equal to -0.28.

(b) The Oswald effect as we report it in this paper (i.e. dEmpl/dOWN) can be derived as the estimated coefficient multiplied by the level of Empl. Evaluated at the overall sample mean (57%), this implies an Oswald effect equal to -0.37.