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Reforming housing rental market
in a life-cycle model

Michał Rubaszek

Reforming housing rental market in a life-cycle model.[☆]

Michał Rubaszek^{a,b}

^a*Warsaw School of Economics, Al. Niepodległości 162, 02-554 Warsaw, Poland*

^b*National Bank of Poland, ul. Świętokrzyska 11/21, 00-919 Warsaw, Poland*

Abstract

Housing rental market share in most countries around the world is low. We explore the reasons behind this underdevelopment with a survey conducted among a representative group of 1005 Poles. It turns out that strong tenure preferences of households toward owning can be attributed to both economic and psychological factors. Building on these findings, we develop a life-cycle model and evaluate the effect of the following reforms aimed at improving the functioning of the rental market: (i.) changing the quality of rental services, (ii.) reducing the risk of investment in rental housing and (iii.) removing fiscal incentives for owning. The results indicate that the reforms, if introduced simultaneously, significantly increase the rental market share.

Keywords: Housing rental market, survey data, life-cycle model, heterogenous agent model.

JEL classification: D91, E21, R21.

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Email address: michal.rubaszek@sgh.waw.pl (Michał Rubaszek)

1. Introduction

The role of housing cannot be overstated. Decisions on how to satisfy housing needs are among the most important economic choices of households over their life cycle. The most popular form of satisfying these needs is ownership. In this case the house serves a dual purpose. It provides utility and is an investment vehicle that allows for storing value. The results of the US Consumer Finances Survey or the Eurosystem Household Finance and Consumption Survey show that both in the US and across European countries housing constitute a substantial part of households' assets (Bricker et al., 2012; Arrondel et al., 2016). An alternative form of satisfying housing needs is renting, which allows to separate the dual role of housing. The tenant derives utility from housing services and the landlord obtains profits from housing investment. It can be argued that this feature of the rental market has an important impact on the macroeconomic outcome. For instance, Arce and Lopez-Salido (2011) build a theoretical model to show that the availability of rental housing reduces the risk of a house price bubble. In the same vein, Rubaszek and Rubio (2017) develop a DSGE model to show that a larger rental sector allows to limit business cycle fluctuations. In both cases the reason is the same: if renting is a viable alternative to buying a house with a mortgage the economy is less susceptible to financial market shocks, including shocks to collateral constraints. These theoretical considerations are confirmed by an empirical study of Cuerpo et al. (2014), who indicate that good private rental market regulations diminish the response of house prices to economic and demographic disturbances. On top of that, it can be added that a number of studies show that well-functioning rental market facilitates population mobility, hence better allocation of the labor force (Barcelo, 2006; Caldera-Sanchez and Andrews, 2011). On the other hand, some studies argue that homeowners are more likely to invest in community and social capital (DiPasquale and Glaeser, 1999), which means that high rental market share might be detrimental to long-term growth.

If one agrees that a well-functioning rental market improves macroeconomic stability, then a low share of private market tenants observed in most countries around the globe raises a question about the reasons behind rental market underdevelopment. We address it by investigating the characteristics of the rental market in Poland, a country that is characterised by very low share of private market tenants. We do it by conducting an original survey among a representative group of 1005 Poles, which allows us to better understand their attitudes toward various housing tenure choices. The results show that the preferences of the respondents are strongly tilted towards owning, which is driven by both economic and psychological factors. Ownership is perceived not only as

a cheaper form of satisfying housing needs, but also as the only way to provide a safe place for the family and to really “feel at home”. Building on the survey results, we propose a life-cycle heterogenous agent model with housing and use it to quantify the effects of several reforms aimed at improving the functioning of the rental market. Our results indicate that a comprehensive reform allows to increase the size of the rental market from 9.6% to 35.4%. We also show that for poor households, who are the main beneficiaries of the reform, welfare gains are equivalent to over 2% of their expected lifetime income. Even though the survey results and model simulations allow us to undertake a policy discussion on how to improve the functioning of the rental market in Poland, they could be extended for other countries as the sources of rental market underdevelopment around the globe are broadly the same (e.g. Priemus and Mandic, 2000, show that these reasons are similar for Central European countries).

Our work is closely related to the two strands of the literature. The first one uses survey data to analyse what determines housing tenure decisions. According to the results tenure choices are not only affected by demographic and economic factors (Bourassa, 1995; Drew and Herbert, 2013), but mostly by psychological ones, including goals and values (Coolen et al., 2002; Ben-Shahar, 2007). The second strand of the literature uses heterogenous agent life-cycle models, as developed by Huggett (1996), to evaluate the effects of selected economic policies. In particular, we propose a life cycle model with housing that incorporates the following features:

- fiscal incentives to own (Gervais, 2002);
- maintenance costs dependent on tenure status (Yao and Zhang, 2005);
- transaction costs of selling and buying houses (Yang, 2009);
- disutility from renting (Kiyotaki et al., 2011);
- credit constraints (Chambers et al., 2009; Iacoviello and Pavan, 2013);
- mortgage rate spread (Bajari et al., 2013).

It can be noted that our model is most similar to the framework developed by Chen (2010), whereas the research question is closest to the analysis by Attanasio et al. (2012), who also asks what factors affect tenure decisions of households over the life-cycle.

The rest of the paper is organized as follows. In Section 2 we describe factors that might be responsible for low rental market share observed in many countries. Sections 3 and 4 outline the

life-cycle model and its calibration. Next, Sections 5 and 6 present the benchmark economy and the effects of rental market reforms. The last section concludes and provides some interpretation of the results in the form of policy recommendations.

2. What determines housing tenure structure

The size of the private rental market is very diverse across European countries (Figure 1). According to Eurostat data in 2015 the fraction of “market price” tenants was the lowest in Macedonia (0.5%) and Rumania (1.2%), the highest in Switzerland (49.2%) and Germany (39.9%), and for all EU countries stood at 19.7%. It can be added that the total rental market share in the EU (30.6%) was comparable to the one observed in the US (36.1%), as indicated by American Community Survey by the US Census Bureau. Figure 1 also shows that all former communistic countries, but the Czech Republic, are characterised by a relatively tiny fraction of private market tenants, standing at levels well below 10%. In Poland, which is the focus of our analysis and which can be considered to be a good representative of these countries, the detailed tenure structure is as follows: “market price” tenants (4.5%), “reduced price” tenant (11.8%), owners without mortgage (72.8%) and owners with mortgage (10.9%). A high proportion of owners and a marginal share of tenants in Central European countries can be justified by a number of factors, the most important of which seems to be the lack of consistent housing policy to develop the rental market. It is aptly summarised by Priemus and Mandic (2000), who claim that the rental market at the beginning of the twenty-first century was “no man’s land.”

An important question is what are the individual reasons behind the low shares of the rental market in many countries around the globe? It is possible that solely financial factors are important, namely that owning is just a cheaper option to satisfy housing needs than renting. The alternative is that badly regulated relations between the landlord and the tenant as well as cultural and psychological factors might cause that only owning can provide true satisfaction from housing services. To address this question we discuss the responses to the survey on housing preferences that we conducted among a representative group of 1005 Poles between 9 and 13 June 2016 within a regular Omnibus CAPI survey by IPSOS¹.

We start by focusing on answers to five direct questions about housing tenure preferences. The

¹All questions and the data are available on the webpage <http://web.sgh.waw.pl/~mrubas/badania.html>.

first one was aimed to understand how households perceive the relative cost attractiveness of two tenure forms. They were able to choose one of the two variants:

- a. Buying a house makes more sense because you're protected against rent increases and it is a good investment decision over the life cycle.
- b. Renting makes more sense because it enables flexibility, financial liquidity and protects you against house price declines. Taking into account financial considerations, it is actually a better deal than owning.

As shown in the first panel of Table 1 answer (a.) was selected by the vast majority of respondents (80.7%).² We interpret this result as a clear indication that in general owning is perceived to be a better investment than renting. In the second question the respondents were declaring their preferences by choosing between renting and buying a house on credit. Given that taking a mortgage is costly, the percentage of respondents selecting ownership decreased to 52.6%. In the third questions the relative cost of ownership was increased even further, as households were asked whether they would decide to buy even if renting was cheaper. In this case the share of respondents selecting owning was still high and amounted to 47.1%. These results show that the low rental market share cannot always be explained by the relative prices of the two tenure forms. The last two questions were aimed to check how rational are the respondents in their assessment on the relative costs of both tenure forms. They were asked to present their attitude towards two statements:

- i. Paying rent is a waste of money.
- ii. Buying is better than renting because after repaying the mortgage you are left with a dwelling and after paying rents you are left with nothing.

These sentences clearly present flawed economic reasoning as paying rent provides housing services, whereas the evaluation of relative attractiveness of the two tenure forms should be based on the comparison of their present value. The results show that individual choices are not always based on rational calculations. 43.7% of respondents agreed with the first statement and 78.0% of them agreed with the second one.³.

²It can be noted that the answers of US respondents to a similar question within the Fannie Mae National Housing Survey were comparable (87%, Drew and Herbert, 2013).

³Similar results were obtained by Ben-Shahar (2007) in a survey among Israeli students, in which 85% of respondents agreed with statement (ii)

Looking at the results from Table 1 we can infer that housing tenure choices are strongly affected by non-financial factors. In general, it can be claimed that households derive greater utility from living in owned rather than rented dwellings. This hypothesis for selected EU countries is confirmed by two empirical studies based on individual data from Eurostat's European Community Household Survey (Elsinga and Hoekstra, 2005; Diaz-Serrano, 2009). Both articles show that the tenure status significantly affects the answers to the question: *How satisfied are you with your housing situation?*. To explore the relative importance of financial and non-financial factors on tenure choices, we have asked a series of questions related to economic and psychological reasons to own or rent. As regards the former, basing on the literature, we have focused on the four following factors (Henderson and Ioannides, 1983; Bourassa, 1995; Sinai and Souleles, 2005):

- E1. The relative cost of renting and servicing mortgage
- E2. The risk of house prices or rents fluctuations
- E3. Transaction costs
- E4. Taxes and fiscal incentives

Then, taking into account the results of Coolen et al. (2002) and, above all, Ben-Shahar (2007), we selected the following psychological factors:

- P1. Social status
- P2. A sense of freedom and independence
- P3. Peace of mind
- P4. Family
- P5. Happiness

The results in Table 2 clearly indicate that the low rental market share is determined by both psychological and economic factors. The distribution of answers to question *E1* shows that 64.0% of respondents think that servicing a mortgage is cheaper than paying a rent, whereas 12.6% is of the opposite opinion. Moreover, answers to *E2* demonstrate that for a dominant part of respondents (65.6%) the risk of rental price changes is higher than the risk of house price fluctuations. This means that renting is considered to be financially less attractive than owning. Regarding the five psychological factors, the distribution of answers is broadly similar for all of them: about 70% of respondents prefer owning and about 10% of them indicate renting, whereas about 20% has no opinion. These shares would indicate that psychological factors are even more important for tenure

decisions than the economic ones. The result that is worth emphasising is that for question *P4*, the shares are the most tilted towards owning, which indicates that dominant part of respondents do not consider rented dwellings to be a good place for a family.

We have also asked a series of questions aimed at assessing which factors are the main hindrance to the rental market development. The upper panel of Table 3 shows that among factors that are considered to decrease the comfort of being a tenant, the most important ones are related to how the rental market is organised and regulated. More than half of respondents agree that tenants are excessively constrained in arranging the interior of the rented apartment and landlords are inspecting housing units too often. This lack of professionalism among individual landlords obviously decreases satisfaction from living in a rented apartment as compared to owning it. Also inefficient regulations on rent control and tenant protection are decreasing the comfort of renting. The level of rents and the offer of dwellings for rental turned out to be important, albeit not so much as the factors discussed above. The lower panel of Table 3 demonstrates that the main factor that decreases the attractiveness of investment in houses to let is related to the low culture of tenants. This, combined with high protection of tenants against eviction, causes that the risk of investing in rental housing is high, which must be reflected in the rent price.

So far we have presented arguments showing that the low share of tenants in a representative economy can be explained by a series of economic and psychological factors, which are magnified by false economic reasoning. This raises the following questions:

- i. Can we build a model that would explain the currently low rental market share observed around the world?
- ii. What kind of reforms would trigger rental market development?
- iii. What would be the effects of these reforms?
- iv. Is developed rental market welfare improving?

These questions are addressed in the remaining sections of this article.

3. A model

We consider a standard life-cycle economy with housing, uncertain lifespan and idiosyncratic productivity. The model extends the framework proposed by Chen (2010) for the US and adjusted

by Rubaszek (2012) to the Polish economy. In short, households derive utility from consumption of non-housing goods and housing services, as well as from leaving bequests. Housing services might be satisfied by purchasing a house, subject to minimum down-payment constraint, or renting it. For younger households we also allow cohabiting with parents. To analyze the impact of economic and psychological factors on housing tenure decisions, we incorporate several important features such as taxes and subsidies, mortgage interest rate spread, disutility of renting and differentiated maintenance costs for owned and rented dwellings. The structure of the model is as follows.

International capital markets. The model economy is small and open with access to international capital markets. The level of the domestic real interest rate is

$$r = r^* - \xi \frac{B}{Y}, \quad (1)$$

where r^* stands for the foreign real interest rate, B denotes the value of net foreign assets, and Y is the level of domestic output. The parameter ξ measures the level of international financial markets imperfections. Two special cases are autarky, in which $\xi \rightarrow \infty$, and perfect international financial markets, in which $\xi = 0$ (see Ca' Zorzi and Rubaszek, 2012, for an extended discussion).

Firms. The goods market is perfectly competitive and characterized by constant returns to scale. Identical firms of measure one are producing goods according to the Cobb-Douglas technology, so that aggregate output is

$$Y = K^\alpha L^{1-\alpha}, \quad (2)$$

where K and L denote the aggregate capital stock and effective labor input, respectively. The production can be consumed, invested in physical capital or costlessly transformed into housing. Factor prices are determined by profit maximization, hence are equal to their marginal products

$$\begin{aligned} \partial Y / \partial K &= r + \delta \\ \partial Y / \partial L &= w, \end{aligned} \quad (3)$$

where w is the real wage and δ stands for the capital depreciation rate.

Demographics. The economy is populated by a continuum of households of different age $j \in \mathcal{J} \equiv \{1, 2, \dots, J\}$. Their lifespan is uncertain: the probability of being alive next year at age j is equal to s_j . The unconditional probability of surviving till age $j > 1$ at time of birth is $S_j = \prod_{i=1}^{j-1} s_i$. Consequently, the share of age cohorts in total population are heterogeneous and amount to μ_j .

Preferences. Households derive utility from consumption of non-durable goods c and the service flow of housing, which can be owned h_o or rented h_r . For the youngest cohorts we also allow for cohabiting with parents. In this case $h_o = h_r = 0$ and the value of housing services is exogenous and amounts to h_c . For older cohorts h_c is very low and is interpreted as homelessness. Next, we assume that due to psychological factors the utility from living in a rented house is lower than in the same house that is owned. In particular, the momentary utility function is of the form

$$u(c, h_o, h_r) = \frac{(c^\theta (\max\{h, \vartheta h_r, h_c\})^{1-\theta})^{1-\eta}}{1-\eta}, \quad (4)$$

where $\vartheta \leq 1$ measures the disutility of renting, θ is the share of non-housing consumption in the utility and η stands for the risk aversion.⁴ We also assume that households derive utility

$$u_b(beq) = \kappa \frac{beq^{1-\eta}}{1-\eta} \quad (5)$$

from giving bequests beq , which can be in the form of financial and housing assets. The degree of altruism is governed by the parameter κ , where for $\kappa = 0$ bequests are accidental as the lifespan is uncertain.

Individual income process. The economic activity of households consists of two distinct periods. During initial \tilde{J} years each household works by supplying one unit of time in the labor market. The productivity is the product of age-dependent deterministic component z_j and a stochastic component $e \in \mathcal{E} \equiv \{e_1, e_2, \dots, e_K\}$, i.e. $z(e, j) = z_j \times e$. The stochastic component follows a Markov process with the elements of the transition matrix $\pi_{kl} = P(e' = e_l | e = e_k)$, where $\pi_{kl} \geq 0$ and $\sum_{l=1}^K \pi_{kl} = 1$ for every $k, l \in \{1, 2, \dots, K\}$.⁵ In the second part of life households receive

⁴It can be noticed that the disutility of renting is justified by Kiyotaki et al. (2011) by imperfect contract enforcement: landlords are afraid that tenants may modify the property against their interests, hence restrict their discretion over the use and modification of the house. This mean that the value of ϑ parameter depends on the quality of renting services.

⁵Throughout the paper we use x' to denote the next period value of a variable x .

pension $pen(e, j)$. The resulting income over the life-cycle is

$$y(e, j) = \begin{cases} (1 - \tau_w)wz(e, j) & \text{for workers} \\ pen(e, j) & \text{for retirees,} \end{cases} \quad (6)$$

where τ_w stands for the tax rate (personal tax plus the social contribution rate). As regards the value of pensions, we assume that it is constant

$$pen(e, j + 1) = pen(e, j)$$

and amounts to a fraction $\chi(e)$ of labor income at retirement age:⁶

$$pen(e) = \chi(e) \times (1 - \tau_w)wz(e, \tilde{J}). \quad (7)$$

For clarity, it can be added that in this notation we implicitly assume that for retirees individual productivity is constant ($e' = e$).

Financial sector and the housing market. The financial sector collects deposits from households, which are invested in corporate bonds, including bonds of firms that buy houses for rent (called henceforth ‘landlords’) and mortgage loans. The interest rate on deposits as well as corporate bonds is equal to the domestic interest rate r . In turn, for the interest rate on mortgage loans r^m we assume that it is higher:

$$r^m = r + \psi^m \quad (8)$$

due to a spread ψ^m , which is treated as a deadweight loss. The spread causes that the interest rate cost of buying a house on credit is higher than if the house is purchased from savings.

For landlords the cost of borrowing is r , hence the rental price of housing (before taxes), which is consistent with zero-profit condition, equals to:

$$p_r = r + \delta_r, \quad (9)$$

⁶We assume that the pension depends on the labor income at retirement age and not the entire history of earnings as the latter solution would require introducing a new state variable and would make the model much more sophisticated.

where δ_r is the depreciation rate. In particular, we interpret δ_r as a fraction of the house value that needs to be spent each period on maintenance to keep the standard of the housing unit unchanged.

Additionally, we consider two standard frictions in the housing market. First, adjusting the size of owned house is costly. A household that changes a house of size h to a house of size h' has to pay

$$\phi(h, h') = \begin{cases} \phi_1 h + \phi_2 h' & \text{if } h' \neq h \\ 0 & \text{if } h' = h, \end{cases} \quad (10)$$

where ϕ_1 and ϕ_2 measure the transaction cost of selling and buying a house, respectively. The second friction relates to the constraint that buying a house requires an amount of cash up front. The down-payment equals to at least a fraction $\gamma \geq 0$ of the house value, which means that mortgage debt d must satisfy

$$d \leq (1 - \gamma)h. \quad (11)$$

Finally, we assume that the size of an owned house is a discrete variable with values from the set $\mathcal{H}_o \equiv \{0, h_1, h_2, \dots, h_M\}$. As for the size of a rented house, similarly to what was done in Iacoviello and Pavan (2013), we allow that it can take also an additional value $h_0 < h_1$, so that $\mathcal{H}_r \equiv h_0 \cup \mathcal{H}_o$. By adding h_0 we allow for shared rental, as it is often the case that for young tenants.

Taxes. To control for fiscal incentives of owning versus renting we introduce various taxes that have an impact on housing market tenure structure (see Gervais, 2002, for an extended discussion on which taxes influence housing tenure decisions). In particular, apart from the labor income tax τ_w , we allow for the following taxes and subsidies:

τ_a : capital income tax, so that tax payment on financial assets income is $\tau_a \times ra$;

τ_m : mortgage subsidy, so that subsidy on mortgage service is $\tau_m \times r^m d$;

τ_o : tax on imputed income from owning, so that tax payment on owned house is $\tau_o \times r h_o$.

τ_r : tax on income from rental, so that tax payment on rental services is $\tau_r \times p_r h_r$.

It can be added that all government revenues (from taxes and bequests) are spent on pensions and lump-sum transfers tr to households. The budget is balanced in each period, which will be discussed in the next section.

Household budget constraint. A household of age j with idiosyncratic productivity e enters a period t with (i.) the housing stock h , (ii.) financial assets a and (iii.) mortgage debt d . The net financial assets is equal to $na = a - d$ and net worth is $nw = h + a - d$. At the beginning of period the household receives after-tax net return on financial assets $(1 - \tau_a)ra$ or pays the interest rate on mortgage debt $(1 - \tau_m)r^m d$. Moreover, homeowners must cover maintenance costs and the relevant taxes $(\delta_o + \tau_o r)h$. Then the household decides on the size of occupied house during period t and whether it is going to be owned, in which case $h_o = h'$, or rented. If $h \neq h'$ then the household must cover the transaction costs $\phi(h, h')$. During period t the household receives labor income $y(e, j)$ and transfers from the government tr and spends resources on consumption c and payment for renting services $(1 + \tau_r)p^r h_r$. The household ends the period with net worth $nw' = h' + a' - d'$. The resulting budget constraint is:

$$nw + y + (1 - \tau_a)ra + tr \geq nw' + c + (1 + \tau_r)p_r h_r + (\delta_o + \tau_o r)h + (1 - \tau_m)r^m d + \phi(h, h') \quad (12)$$

Financial disadvantage of renting. To compare the relative cost of owning versus renting let us investigate a situation in which a household inhabits a house of size h that can be rented or purchased from savings. In the case of renting the household has to pay the rent $(1 + \tau_r)p_r h$, but can invest in financial assets to receive interest income equal to $(1 - \tau_a)rh$. In the case of owning, the household must pay the maintenance costs and tax on imputed income $(\delta_o + \tau_o r)h$. Given the formula for the rent level (9), the additional cost of renting equals to:

$$\underbrace{(\delta_r - \delta_o)h}_{\text{maintenance}} + \underbrace{\tau_r p_r h}_{\text{rental tax}} + \underbrace{(\tau_a - \tau_o)rh}_{\text{taxation of assets}} . \quad (13)$$

The economic disadvantage of renting is determined by (i.) the differences in the depreciation rates, (ii.) the existence of the tax on income from renting as well as (iii.) differences in taxing housing and financial assets. As regards the last component, its value is different if the house is purchased with a mortgage. The economic disadvantage of renting becomes smaller and amounts to:

$$\underbrace{(\delta_r - \delta_o)h}_{\text{maintenance}} + \underbrace{\tau_r p^r h}_{\text{rental tax}} + \underbrace{(\tau_m - \tau_o)rh}_{\text{taxation of assets}} - \underbrace{(1 - \tau_m)\psi^m h}_{\text{lending spread}} \quad (14)$$

The above calculations show explicitly that regulations and taxation might affect tenure decision. The scale of relative costs of two housing tenure options is discussed in detail in the next sections.

Household problem. The optimization problem of a household at the beginning of the first period is to maximize the expected life-time utility:

$$\sum_{j \in \mathcal{J}} \beta^{j-1} E_0 \{ S_j u(c_j, h_{o,j}, h_{r,j}) + (S_{j-1} - S_j) u_b(\text{beq}_j) \}, \quad (15)$$

where β is the discount factor, $E - 0$ is the operator of expectations formulated at the beginning of the first period and $S_{j-1} - S_j$ is the probability of leaving bequest at age j . The value of this bequest is

$$\text{beq}_j = (1 + (1 - \tau_a)r)a_j + (1 - \delta_o - \tau_o r)h_j - (1 + (1 - \tau_m)r^m)d_j. \quad (16)$$

The above optimization problem can be written down recursively. At the beginning of a period the household's state x can be characterized by net financial assets, housing assets, individual productivity and age $x = (na, h, e, j)$.⁷ Let $V_r(x)$ and $V_o(x)$ denote the value functions of the household in the case of renting and owning, respectively, and $V(x)$ stand for the proper value function. They can be calculated as the solution of the following optimization problem:

$$\begin{aligned} V_r(x) &= \max_{c, h_r, na'} \{ u(c, 0, h_r) + \beta [s_j E(V(x'|x, h' = 0)) + (1 - s_j) u_b(\text{beq}')] \} \\ V_o(x) &= \max_{c, h_o, na'} \{ u(c, h_o, 0) + \beta [s_j E(V(x'|x, h' = h_o)) + (1 - s_j) u_b(\text{beq}')] \} \\ V(x) &= \max \{ V_r(x), V_o(x) \} \end{aligned} \quad (17)$$

subject to the budget constraint (12), the minimum down-payment restriction (11), the value of bequest (16) and conditions: $c > c_{min}$, $h_o \in \mathcal{H}_o$ and $h_r \in \mathcal{H}_r$. The optimal decision is given by the policy functions $c(x)$, $na'(x)$, $h_o(x)$ and $h_r(x)$.

Equilibrium. Given the heterogeneity of households in terms of the state variable $x \in X \equiv \mathfrak{R} \times \mathcal{H}_o \times \mathcal{E} \times \mathcal{J}$, to calculate the value of aggregate variables we need some measure of the distribution. Let

⁷We assume that $a \times d = 0$ so that households are holding financial assets or mortgage debt, but never both.

$(X, \mathcal{X}, \lambda)$ be a probability space, where $\mathcal{X} \equiv \mathcal{B}(\mathfrak{R}) \times \mathcal{P}(\mathcal{H}_o) \times \mathcal{P}(\mathcal{E}) \times \mathcal{P}(\mathcal{J})$,⁸ and λ is a probability measure, so that for each set $Y \in \mathcal{X}$ the share of individuals with $x \in Y$ in total population is equal to $\lambda(Y)$. For a given policy functions $c(x)$, $na'(x)$, $h_o(x)$ and $h_r(x)$ the values of aggregate variables consistent with individual behavior can be calculated as:

$$\begin{aligned}
\text{Effective labor: } L &= \int z(x)d\lambda \\
\text{Consumption: } C &= \int c(x)d\lambda \\
\text{Financial assets: } A' &= \int_{na' \geq 0} na'(x)d\lambda \\
\text{Financial debt: } D' &= \int_{na' < 0} na'(x)d\lambda \\
\text{Housing assets (owners): } H_o &= \int h_o(x)d\lambda \\
\text{Housing assets (landlords): } H_r &= \int h_r(x)d\lambda \\
\text{Transaction costs: } \Phi &= \int \phi(h, h_o(x))d\lambda \\
\text{Pensions: } Pen &= \int_{j > \bar{j}} pen(x)d\lambda \\
\text{Bequests: } Beq &= \int (1 - s_j)beq(x)d\lambda
\end{aligned} \tag{18}$$

A stationary equilibrium is defined as the policy functions, prices, stock variables as well as the distribution $\{\lambda\}$, that fulfill the following conditions:

1. Given w , r , tr the policy functions are optimal.
2. Aggregate variables are consistent with the policy functions, in line with (18).
3. Markets clear:

$$\begin{aligned}
A' &= K' + D' + H_r(1 - p_r) + B' \\
Y &= C + \delta K' + \delta_o H_o + \delta_r H_r + \Phi + \psi^m D' - rB'.
\end{aligned} \tag{19}$$

4. The international capital market condition (1) is met.
5. Factor prices are equal to marginal products as in (3).

⁸ $\mathcal{B}(Y)$ denotes the Borel σ -algebra on Y and $\mathcal{P}(Y)$ the power set of Y .

6. The rental price is consistent with the no-arbitrage condition (9).
7. The government budget is balanced:

$$Pen + G + tr = Beq + \tau_w wL + \tau_a rA' - \tau_m r^m D' + \tau_o rH_o + \tau_r p_r H_r, \quad (20)$$

where G stands for government spending.

8. The distribution of households over the state variable x is time invariant.

In the stationary equilibrium, the economy is time invariant at the aggregate level. However, at the individual level there is a lot of movement going on. Households are getting older, are hit by idiosyncratic productivity shocks, accumulate financial assets as well as buy or sell houses.

4. Calibration

We calibrate the model using the data for the Polish economy, with a particular emphasis on the functioning of the housing market, including the low share of private tenants. The benchmark parameter values, which are displayed in Table 4, are as follows.

Demographics. The model period corresponds to one year. Households become economically active at age 20, work for $\tilde{J} = 45$ years, retire at 65 and then live up to the maximum age of 100. That means that the model describes the behavior of $J = 81$ cohorts of age from 20 to 100. For workers the conditional survival probabilities s_j are assumed to be 100%. In turn, for retirees the probability to be alive next year is evaluated using the data from the Demographic Yearbook by Central Statistical Office, which were interpolated with a polynomial of degree eight. The results, which are presented on the upper panel of Figure 2, imply the share of retirees in adult population at 27.7%, which compares to 18.3% observed in 2013 and projected 28.0% in 2030 according to the European Commission Ageing Report 2015.

Individual income process. The deterministic age profile of idiosyncratic productivity z_j , which is presented on the lower panel of Figure 2, is taken from the estimates of Kolasa (2012) based on the Polish Households Budget Survey data covering the period 2000-2010.⁹ For the stochastic

⁹I would like to thank Aleksandra Kolasa for providing the series.

component e , we follow the literature and assume that its logarithm is an AR(1) process:

$$\ln e' = \rho_e \ln e + \epsilon, \quad \epsilon \sim N(0, \sigma_\epsilon^2) \quad (21)$$

with two parameters: persistence ρ_e and volatility σ_ϵ . We fix ρ_e to 0.97, which is in the middle of estimates for developed countries (e.g. Floden and Lindé, 2001; Storesletten et al., 2004), and calibrate the value of σ_ϵ^2 at 0.03, so that the GINI coefficient of earnings was equal to about 0.30, i.e. the value for Poland in 2013 reported by the OECD. Next, we approximate the continuous AR(1) process by a five state Markov chain. In particular, we assume that individual productivity might be in one of five states $\mathcal{E} = \{0.37, 0.56, 0.86, 1.32, 2.03\}$ and use the Tauchen (1986) method to calculate the transition matrix of the Markov process. Additionally, for the productivity at the initial age, following Huggett (1996) and taking the evidence that earnings inequality is increasing with age (Heathcote et al., 2005), we set its variance at two thirds of the unconditional variance of e .

As regards the level of pensions, we assume that the replacement rates $\chi(e) \in \mathcal{C}$ are decreasing with income level, even though according to the OECD report “Pension at a Glance 2015” in Poland these rates are rather flat and stand at around 0.50. In particular we set $\mathcal{C} = [0.750.680.600.530.45]'$. The rates are differentiated to take into account that in the model economy pensions depend on the last wage only, whereas in reality they are determined by the entire history of labor income.

To express values in terms of Polish zlotys (PLN), under the benchmark parametrization we set the average, annual before tax wage income of households to 67k PLN. This value is equivalent to monthly income of 1800 PLN per person and average “working age” household size of 3.2 persons, which is consistent with the Households Budget Survey data.

Preferences. The discount factor β is fixed at 0.98 and the relative risk aversion coefficient η is chosen to be 2, which is in the middle of the range commonly used in the literature. As regards the share parameter in the utility function, we fix its value at $\theta = 0.75$. This reflects the structure of Polish households spendings and at the same time is consistent with the estimates for the U.S. economy (Li et al., 2009; Kiyotaki et al., 2011). Next, the parameter describing the fraction of utility loss from renting is set to $\vartheta = 0.85$, which is below the value of 0.91 assumed by Kiyotaki et al. (2011) for the US economy. The reasons behind this choice are twofold. First, this value helps to fit the model to the Polish data, in which the share of private market tenants is much lower than

in the US. Second, this value is consistent with the survey results described in previous sections, which show that the strong preference of Poles toward owning is highly influenced by psychological factors. As regards the level of h_c , which represents the exogenous value of housing services for households that neither own ($h_o = 0$) nor rent ($h_r = 0$), we assume that it depends on a household's age. We interpret it as cohabiting with parents for the first ten cohorts and homelessness for the older ones. In particular, for the youngest cohort we assume that h_c is equivalent to housing services provided by renting a 16 sq. m. apartment, which is 80% of the size of the smallest apartment for rent. For the next 9 cohorts the value of h_c declines linearly by 10% per year so that for cohorts of age above 29 the value of h_c is a very small number. In equilibrium nobody decides to be homeless, but the positive value of h_c ensures that the utility function is always finite. Finally, for bequests we calibrate the altruism parameter at $\kappa = 10$, so that the marginal propensity to consume in the last period of life was close to 0.20, in line with the study of Cagetti (2003). This means that a household who is sure to die next year would consume about 20% of her or his wealth and leave the remaining 80% to heirs.

Technology. We model an open economy where households have access to foreign capital subject to international markets imperfections. We assume $r^* = 0.03$ and $\xi = 0.0075$ so that an increase in the foreign debt by 10% of GDP would lead to an increase in the level of domestic interest rate by 0.075 percentage point, in line with the data for the level of net International Investment Position and yields on government bonds. The capital share $\alpha = 0.3$ and the capital depreciation rate $\delta = 0.08$ are set to standard values used in the literature and to match data on investment to GDP ratio.

Housing sector. For the housing sector the depreciation rates are chosen to be $\delta_o = 0.015$ and $\delta_h = 0.025$ so that the ratio of annual rents to house value p_r stood at around 6%, in line with the data presented in the report “Information on home prices and the situation in the housing and commercial real estate market in Poland” (Laszek et al., 2016). The higher value of the depreciation rate for rented houses is introduced to take into account that in Poland there is a non negligible risk of letting a dwelling to a “bad tenant”, which should be priced in the level of rents.¹⁰ Next, the transaction costs of selling/buying a house are set to $\phi_1 = 0.05$ and $\phi_2 = 0.05$. These costs include the intermediation fee, tax on civil law transactions or notarial acts, but also any non-financial costs

¹⁰It can be noted that the depreciation rates might differ also because tenants tend to utilize dwellings more intensively, as described in the theoretical model of Henderson and Ioannides (1983).

of moving such as time devoted to find a new house. The choice is somewhat lower than the usual values for the U.S. economy (Li and Yao, 2007; Yang, 2009; Bajari et al., 2013). Finally, for the parameter describing the minimum down-payment requirement we fix its value at $\gamma = 0.8$, in line with the current restrictions related to the maximum loan-to-value.

In the grids \mathcal{H}_o and \mathcal{H}_r there are six house sizes. The smallest one that can be purchased h_1 costs triple the average annual pre-tax household income, i.e. 200k PLN. Given that the average price of a square meter stood at about 5k PLN, as described in the report by Laszek et al. (2016), this corresponds to a 2-room apartment of size 40 square meters. The other house values available for purchase are 350k PLN (70 m²), 500k PLN (100 m²) and 667k PLN (semi detached house). Moreover, the size of rented apartments can also take the value h_0 equal to 100k PLN (20 m²), which can be interpreted as a single room in shared flat.

Taxes. All tax rates are set to reflect the situation in Poland in mid 2010s, which clearly favors owning to renting. In particular the tax on income from financial assets τ_a is 19%, whereas the tax on imputed income from owning τ_o is null. We assume that there are subsidies on mortgage debt service τ_m at 10% to take into account two programs aimed at promoting homeownership.¹¹ As regards the tax on the revenues from renting τ_r its current rate is 8.5%. Finally, the tax on labor income τ_w is calibrated using the data for the average personal income tax augmented for the social contribution rate at 34.7%. It can be noted that this rate is relatively flat in Poland in comparison to other OECD countries. To close the model, we assume that government spendings are equal to 15% of GDP on the basis of the National Account statistics.

5. The results for the benchmark model

The model has no closed-form solution, and therefore we have to solve it numerically. For that purpose we discretize the space for net financial assets na over grid points $\mathcal{A} = \{na_1, na_2, \dots, na_M\}$, where we set the bounds na_1 and na_M at levels not constituting a constraint for the optimization problem. Moreover, we do not restrict households to select na' lying on the grid \mathcal{A} , but instead use

¹¹Within the first program, Rodzina na Swoim (Family on its Own), the government was subsidizing up to 50% of mortgage interest payments for the first eight years after the purchase of an apartment. In 2014 Rodzina na Swoim was modified into Mieszkanie dla Młodych (Apartment for the Young), in which the government was subsidizing downpayment for young families, where the subsidy amounted up to 30% of an apartment value.

the golden section search method to cover any intermediate choices. Subsequently, we apply the following algorithm to calculate the stationary equilibrium:

1. Set the value of r and tr .
2. Compute w and K consistent with r with (3).
3. Solve the optimization problem (17) by backward induction to compute the policy functions for each $x \in X$.
4. Compute the distribution λ by forward induction.
5. Calculate the value of aggregate variables with (18).
6. Calculate the value of net foreign assets with (19).
7. Calculate the value of the real interest rate with (1)
8. Check whether the values of r and tr calculated in steps 5 and 7 are equal to those from step 1. If yes, stop. Otherwise go to step 1 and update r and tr .

The equilibrium values of key variables and ratios describing the functioning of the housing market in the model and data are displayed in Table 5. The level of the real interest rate is $r = 0.038$, in line with the 1998-2016 average of 3.9% calculated with the Eurostat data. Given the depreciation rate $\delta_r = 0.025$, equation (9) implies the rent level at $p_r = 0.063$, which broadly consistent with the average value of around 6% over years 2007-2016 (Laszek et al., 2016). Next, the average size of owned house in the model is 51.2 sq.m., slightly below 63.7 sq.m. reported in the National Population and Housing Census 2011 for urban households. It should be noted, however, that the difference can be partly attributed to the fact that a fraction of Poles inhabit large houses, which affects the average seen in the data and is not well taken into account by the model.¹² As regards the tenure structure, the share of homeowners in the model is almost the same as in the data (84.3% vs. 83.5% in 2014 reported by Eurostat within EU-SILC). On the contrary, the fraction of tenants is overestimated by the model (9.6% vs. 4.3% market price tenants in 2014 reported by Eurostat). The difference might be explained by the fact that the model does not allow for non-market price tenants, whose fraction in the EU-SILC data stood at 12.3%. Finally, Table 5 shows that the model is good in fitting the mortgage debt to GDP ratio. The model's ratio of 40.2% is only slightly above the one reported by Eurostat (36.8%) for consolidated household debt

¹²In the census 2% of households live in houses larger than 200 sq.m., whereas 11% inhabit houses of size between 100 and 200 sq.m.. Moreover, 44% of urban households live in houses smaller than 50 sq.m.

at the end of 2016.¹³ To summarize, the model seems to be successful in reflecting the key variables describing the structure of the Polish housing market.

Figure 3 presents the life-cycle paths of key model variables. We show the average values for all age cohorts as well as the individual values for three selected households (poor, middle-class, rich), assuming that they survive till the last period. The left-upper panel presents the after-tax annual labor income. For the working age population the average value is hump-shaped, since it is determined by the age profile of individual productivity (lower panel of Figure 2), whereas for the retirees it is flat. Individual income, conditional on age, can take five different values, depending on the realization of the idiosyncratic productivity $e \in \mathcal{E}$. The scale of individual income dispersion due to this heterogeneity can be illustrated by comparing the earnings of the “poor” and “rich” households. For the former labor income fluctuates at around 20k PLN per year for the entire life-cycle, whereas for the latter it is between 80k and 100k PLN for most of the working age periods and stands at around 40k PLN during the retirement period.

The exogenous differences in life-time earnings are reflected in the decisions taken by households related to consumption, housing and non-financial assets. The right-upper panel of Figure 3 shows that the lifetime profile of average consumption is hump-shaped over the life-cycle, but its time variability is much lower than that of income. This points to the consumption smoothing mechanism implied by the model and which is seen in the data reported by Kolasa (2012). It can be noticed that consumption level for younger cohorts is relatively low. The reasons are twofold. Young households earn relatively little and they accumulate assets for the down-payment necessary to buy their first house as the borrowing constraint (11) is binding. This chart also shows that individual consumption profile reacts to changes in individual income, which is consistent with the evidence for the US economy, as evidenced by Carroll and Summers (1989).

The middle panels of Figure 3 present the value of inhabited houses, which can be owned or rented. The average size of owned house increases till age 60, then flattens out to decrease somewhat after age 85. At the individual level, households change the size of owned house very infrequently: once or twice during the lifetime. The “rich” household rents for the first two years to buy the first apartment at age 22, move up on the property ladder at age 33 and 52 and downsize housing assets when 91 years old. On the other hand, the “poor” household strive to save for the downpayment

¹³For non-consolidated statistics the ratio amounted to 42.2%.

to become homeowner. She or he cohabits with parents for the first initial years, then rents the smallest possible apartment and at age 34 purchases a two-room flat. At age 66 the household has to sell the flat and becomes the tenant once again.

The bottom panels of Figure 3 present the values of financial and total assets, which are determined by choices related to consumption spending and housing. It can be noticed that, on average, in the initial periods households tend to take loans for house purchases, which is reflected in negative values of net financial assets for cohorts below 40 years old. Then, the average value of net financial assets increases to reach the peak at age 65, and declines steadily thereafter as households are using their life-time savings to keep consumption above their income, which is determined by the value of pension. The panels also present the scale of wealth inequality generated by the model. The peak value of total assets of the “rich” household is about 1500k PLN, whereas for the “poor” household it is only 150k PLN. Even though this clearly underestimates the true wealth inequality, we believe that it is realistic enough to well describe house tenure choices of Polish households.

6. Reforming the rental market

The proposed model allows us to examine the impact of selected rental market reforms on the economy. Toward that aim we compare stationary equilibria in economies with various values of the parameters describing the functioning of the rental market. In particular, we focus on the quantitative effects of the following reforms.

reform 1. lowering the disutility of renting by professionalizing renting services, which we call “higher standards” reform;

reform 2. increasing the protection of landlords against bad tenants, which we call “bad tenant risk” reform;

reform 3. removing some of fiscal disincentives to rent, which we call the “fiscal policy” reform.

In terms of the model parameters reform 1 is introduced by changing the disutility of renting parameter ϑ from 0.85 to 0.95. This effect can be achieved by professionalizing rental services changing psychological attitudes toward renting, e.g. by encouraging institutional investors that specialize in managing and building rental housing or supporting associations of individual landlords. The second reform is introduced to the model by decreasing the value of maintenance cost for

rental housing δ_r so that it equals to δ_o . This could be achieved by improving regulations protecting landlords against “bad” tenants, which would limit the risk associated with investing in rental housing that is included in the level of rents. The third reform decreases the relative cost of renting by eliminating taxes on income from renting τ_r and mortgage interest rate subsidies τ_m . It should be pointed out that in this scenario taxes are not neutral due to different taxation of assets, as implied by equation (13). Finally, we also evaluate the effects of introducing three reforms together.

Aggregate effects of reforms. The results of the reforms for the key variables and ratios are displayed in Table 6. The table is organized so that the first column describes the benchmark model, each of the three middle columns presents the effects of a single partial reform, whereas the last column shows the effects of introducing the three reforms together. To increase the readability of the results, the first panel of the table presents the assumptions on the parameters that we change within the reforms. In turn, the second panel reports the scale of economic disadvantage of renting calculated with formulas (13) and (14). It can be seen that in the benchmark scenario this disadvantage is 2.1% of a house value per year, if the alternative is purchase from savings, and 0.4% if the home is purchased with a mortgage. If one takes into account that on top of this additional financial cost households lose 15% of utility from housing services due to psychological factors, in the benchmark economy everyone tries to buy a house as quick as possible and only credit constraint households decide to rent. The situation is different in the full reform scenario. If home purchase is financed from savings, the economic disadvantage declines to 0.7% of the house value per year. If the purchase is financed with a mortgage, owning becomes more expensive: a homeowner has to pay 1.5% of the house value more than a tenant. Given that the disadvantage of renting due to the psychological factors is also attenuated, all the results that are in the next panels are intuitive.

In particular, the third panel shows the effects of the reforms on the housing tenure structure. It turns out that (i.) improving the quality of housing services would increase the rental share by 3.1 pp. (from 9.6% to 12.7%), better regulations allow to raise the ratio by 7.8 pp (to 17.4%), whereas removing the taxation of renting and subsidies to mortgages leads to rental market share growth of 4.6 pp (to 14.2%). An interesting feature of the model is that it allows for the interaction effects. In particular, introducing three reforms together increases the share of tenants in the economy by 25.8 pp (to 35.4%), which is almost double the sum of the effects of introducing three reforms separately (15.5 pp). The explanation is straightforward: to make the rental market an interesting alternative

to owning you need to remove or alleviate all barriers that make renting unattractive.

The fourth panel of Table 6 presents how the reforms affect living conditions, interpreted as the average size of inhabited dwelling. The first row shows that the effect of the reforms on the average size of inhabited houses is not sizable. On the contrary, the next two rows show that the full reform (but none of the partial reforms) raises the average size of both owned and rented dwellings.¹⁴ The increase is the most visible for the rental housing, where the average size increases from 20 to 32.4 sq.m. The explanation is that in the reformed economy young households are more eager to rent larger apartments and for longer periods. They decide to become homeowners after gathering enough financial assets to buy the house from savings rather than with a credit. In fact, the fifth panel of Table 6 indicates that the complete reform postpones the moment at which households acquire their first house by almost ten years, from the age of 28.0 in the benchmark model to 37.9 in the reformed economy.

The last panel of Table 6 reports how the reform affects the mortgage market. In the complete reform scenario owning with mortgage is more expensive than renting, hence the fraction of households with a mortgage declines from 20% to only 4.6%. Consequently, the mortgage debt to GDP ratio falls from 40.2% to 12.5%. This indicates that reforming the rental housing market can bring more stability to the economy, by making it more resilient to financial sector shocks (see Rubaszek and Rubio, 2017, for an extended discussion).

Life-cycle effects of reforms. The results from Table 6 are complemented by Figure 4, which presents the effects of the rental market reform on the decisions taken during the lifecycle. The upper panels of the figure show that the average paths of spending on consumption and housing services are little affected by the reform, both partial or the full one. In contrast, the middle panels demonstrate that the impact of the complete reform on the life-time path of net financial assets and mortgage debt is sizeable. The reform is strongly limiting the demand of households to take a mortgage in the early stage of life as they now satisfy their demand for housing services by renting. This is illustrated by the bottom panels of Figure 4, which clearly shows that in the reformed economy cohorts that are below 30 years old mostly rent or cohabit with parents. Then, the homeownership ratio increases to about 80%, and stays at this level for cohorts of age up to 80 years. Thereafter there is a tendency

¹⁴Even though both averages increase, the average size of the occupied house is decreasing because of the change in the tenure market structure.

to sell houses, which can be justified by the fact that some households decide to increase liquidity.

Welfare effects of the reforms. So far we have shown that rental market reform would lead to a sizeable change in the housing market tenure structure. We complement our findings by evaluating welfare gains of the reform. We do it by comparing ex-ante expected life-time utility of the newborn cohort in the stationary equilibrium of the benchmark and reformed economy. It should be noted that since we focus on the stationary equilibria, we investigate only the long-term effects of the reforms, abstracting from any costs or benefits related to the transition dynamics. Moreover, our analysis does not consider any welfare gains of changes in the rental market share due to its attenuating effect on business cycle fluctuations.

We estimate the welfare gains of the reform with two methods. First, we evaluate how much a newborn household with individual productivity e must be paid (in PLN) so that she or he would be indifferent to live in the benchmark and reformed economy. The ex-ante expected life-time utility of this household in both economies are:

$$\begin{aligned}
 V_1(na, h, e) &= \sum_{j \in \mathcal{J}} \beta^{j-1} E_0 \{ S_j u(c_j, h_{o,j}, h_{r,j}) + (S_{j-1} - S_j) u_b(b_j) | na, h, e \} \\
 V_1^*(na, h, e) &= \sum_{j \in \mathcal{J}} \beta^{j-1} E_0 \{ S_j u(c_j^*, h_{o,j}^*, h_{r,j}^*) + (S_{j-1} - S_j) u_b(b_j^*) | na, h, e \},
 \end{aligned} \tag{22}$$

where “*” denotes the reformed economy. Given that in the model economy all households are born with no assets ($na = 0$ and $h = 0$) to answer the question we need to solve the below equation for ω_1 :

$$V_1(\omega_1, 0, e) = V_1^*(0, 0, e). \tag{23}$$

The interpretation of ω_1 is in terms of financial loss due to the dysfunctional rental market.

In the second analysis we evaluate how much a newborn household with individual productivity e must be paid in terms of consumption, housing services and bequests during the entire lifespan so that she or he would be indifferent between living in the benchmark and alternative economy.

In this case one needs to solve the below equation for ω_2 :

$$V_1^*(0, 0, e) = \sum_{j \in \mathcal{J}} \beta^{j-1} E_0 \{ S_j u((1 + \omega_2)c_j, (1 + \omega_2)h_{o,j}, (1 + \omega_2)h_{r,j}) + (1 - S_j)u_b((1 + \omega_2)b_j) | 0, 0, e \}. \quad (24)$$

The interpretation of ω_2 is in terms of a fraction of expected life-time income that is lost due to dysfunctional rental market.

The results of welfare computations are presented in Table 7, in which two panels describe gains or loses expressed in absolute (PLN) and relative (% of expected lifespan income) terms. A quick glance at the table is enough to notice that poor households, i.e. with the lowest productivity, gain most from the reform. In the absolute terms the gain from the complete reform is 27.8k PLN, which is an equivalent of 5.5 sq.m. of a housing unit. In the relative terms this is an equivalent of 2.22% of expected lifetime income. There are several reasons behind this result. The first one is that in the benchmark economy for young and poor households the probability of being a tenant later during the lifespan is relatively high. In a *ceteris paribus* analysis, the reform causes that living in rented apartments becomes more comfortable (reform 1) and cheaper (reform 2 and 3). On top of that, in a dynamic analysis, the reform makes these households to change tenure decision over the lifespan. Instead of taking costly mortgages to become homeowners as soon as possible, they now satisfy their housing needs by renting. As regards the richest households, welfare gains are negligible or, in the tax reform scenario, even negative. The result is intuitive as rich households usually decide to buy a house, even in the environment of well functioning rental market.

7. Conclusions and policy recommendations

The share of the rental housing market in many countries around the world is low. This might be explained by the popularity of housing policies promoting homeownership, but also by other non-financial factors. In this paper we have explored the reasons behind rental market underdevelopment using individual data from an original survey among the representative sample of 1005 Poles. We have found that the preferences of the respondents are strongly tilted towards owning due to economic and psychological beliefs. Poles perceive ownership not only as a cheaper form of satisfying housing needs, but also as the only way to provide a safe place for the family and to really “feel at home”. The survey also allows us to identify the most important barriers to demand for and supply of rental housing. Among the former, inefficient institutions and the lack of professional

renting services turned out to be the most important factors. In the case of the latter, the low culture of tenants combined with their high protection seems to dominate.

Given the above diagnosis we have proposed a life-cycle model with rental housing and collateral constraints and calibrated it to the Polish data. This model allows us to quantify the equilibrium effects of three rental market reforms: (i.) improving the standard of rental services, (ii.) limiting the “bad tenant effect” on the level of rents, (iii.) diminishing fiscal incentives to own. All three reforms lead to an increase in the share of the rental market in the long run. Simulation results indicate that introducing the three reforms would shift the rental share from 9.6% in the benchmark economy to 35.4% in the reformed one. Another important result is that the total effect of the complete rental market reform is much larger than the sum of the effects of the three reforms separately. Next, we have shown that the reform of the rental market leads to a sizeable decrease in the household debt to GDP ratio. This means that a well-functioning rental market might lead to more stable financial system, hence lower macroeconomic volatility. Finally, the welfare analysis clearly indicate that the complete reform significantly improves the well-being of the poorest households over the lifecycle.

The above results justify why developing the rental market should be considered as a priority for housing policy in many countries. Based on the results of the study we may formulate a number of recommendations for housing policy. First of all, lowering the relative cost of renting in comparison to owning seems to be one of the key factors. This could be achieved by developing regulations limiting the risk associated with investing in rental housing as this risk is included in the level of rents. Eliminating fiscal measures promoting ownership would also help. Second, stimulating the professionalization of rental services could contribute to changing psychological attitudes towards renting. This could be achieved by encouraging professional investors that specialise in managing and building rental housing, but also by supporting associations of individual landlords or rental management companies. Finally, it is worth mentioning that the decision about buying a dwelling is often based on a “false economic reasoning”. This might lead to the conclusion that education or information campaigns about advantages and disadvantages of different forms of housing tenure could contribute to the increase in demand for rental as well as better housing choices of households.

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Table 1: Tenure preferences
(% shares of answers).

Sentence closer to your opinion:	
Buying a house makes more sense because it is a good investment over the life cycle	80.7
Renting makes more sense because it enables flexibility and financial liquidity	19.3
Do you prefer:	
Owner-occupied home despite the burden of a housing loan/mortgage	52.6
Rental home because of the lack of a burdensome housing loan	29.7
no opinion	17.7
I would prefer to buy even if it was more costly than renting.	
strongly/ rather agree	47.1
no opinion	28.0
strongly/rather don't agree	24.9
Do you agree that paying rent is a waste of money?	
strongly/rather yes	43.7
no opinion	26.5
strongly/rather no	29.8
Buying is better than renting because after repaying the mortgage you are left with a dwelling and after paying rents you are left with nothing	
agree	78.0
no opinion	11.0
don't agree	10.9

Source: The results of the survey.

Table 2: Economic and psychological factors influencing housing tenure preferences.

	definitely owning	rather owning	no opinion	rather renting	definitely renting
Economic factors					
E1. Mortgage / rental costs	24.1	39.9	23.4	10.9	1.7
E2. Risk of house price / rent fluctuations	24.2	41.4	22.8	10.4	1.2
E3. Transaction costs	21.5	40.6	26.1	9.9	2.0
E4. Taxes	21.9	39.1	25.3	12.0	1.7
Psychological factors					
P1. Social status	33.8	37.0	19.5	7.3	2.4
P2. Freedom and independence	35.8	35.3	16.5	9.8	2.6
P3. Peace of mind	35.4	35.5	17.8	8.9	2.4
P4. Family	37.6	35.0	18.0	7.1	2.3
P5. Happiness	34.3	34.4	21.1	8.0	2.2

Source: The results of the survey.

Table 3: The reasons of rental market underdevelopment in Poland

	Agree	No opinion	Don't Agree
Factors decreasing the comfort of being a tenant			
Tenants are too much constrained in arranging apartment	56.8	30.2	12.9
Landlords are inspecting the apartment too often	53.3	34.4	12.2
Tenants are not well protected against rent increases	56.2	31.0	12.7
Tenants are not well protected against eviction	56.7	31.1	12.1
Rents are too high in comparison to mortgage installment	53.9	33.3	12.7
The offer of dwellings to rent is too scarce to meet preferences	46.8	35.9	17.3
Factors decreasing the attractiveness of investing in rental housing			
Low culture tenants	62.6	28.9	8.6
Excessive rent control	50.3	37.2	12.4
Excessive protection of tenants against eviction	40.3	43.6	16.1
Low rate of return	39.4	47.3	13.3
Low demand	44.0	41.6	14.4

Source: Calculations on the basis of the results of the survey.

Table 4: Benchmark parameterization

<i>Demographics</i>		
Number of cohorts	J	81
Number of working cohorts	\tilde{J}	45
<i>Individual income process</i>		
Age profile of productivity	z_j	Kolasa (2012)
Persistence of idiosyncratic productivity process	ρ	0.97
Variance of idiosyncratic productivity process	σ_e^2	0.03
Pension replacement rates	C	[0.75 0.68 0.60 0.53 0.45]'
<i>Preferences</i>		
Discount factor	β	0.98
Risk aversion	η	2.00
Share of non-housing consumption in utility	θ	0.75
Utility loss from renting	ϑ	0.85
Bequest preference	κ	10
<i>Technology and housing market</i>		
Openness of the economy	ξ	0.0075
Capital share in production function	α	0.30
Depreciation rate, capital	δ	0.08
Depreciation rate, owned housing	δ_o	0.015
Depreciation rate, rented housing	δ_r	0.025
Transaction cost of selling	ϕ_1	0.05
Transaction cost of buying	ϕ_2	0.05
Minimum down-payment ratio	γ	0.20
Mortgage rate spread	ψ^m	0.015
<i>Taxes</i>		
Labor income tax	τ_w	0.347
Capital income tax	τ_a	0.19
Mortgage subsidy	τ_m	0.10
Tax on imputed rent	τ_o	0
Tax on renting revenue	τ_r	0.19
Share of gov. spending in GDP	G/Y	0.15

Table 5: The structure of the housing sector, the model vs. the data for Poland

Variable	Model	Data	Source
Real interest rate (%)	3.8	3.9	1998-2016 average, Eurostat
Rent over housing price (%)	6.3	6	2007-2015 average, Laszek et al. (2016)
Av. size of owned house (sq. meter)	51.2	63.7	Population and Housing Census 2011, CSO
Frac. of homeowners (%)	84.3	83.5	2014, Eurostat SILC
Frac. of private market tenants (%)	9.6	4.3	2014, Eurostat SILC
Share of mortgage debt in GDP (%)	40.2	37.2	end of 2016, Eurostat (total household debt)

Table 6: The structure of the housing sector: benchmark vs. reformed market

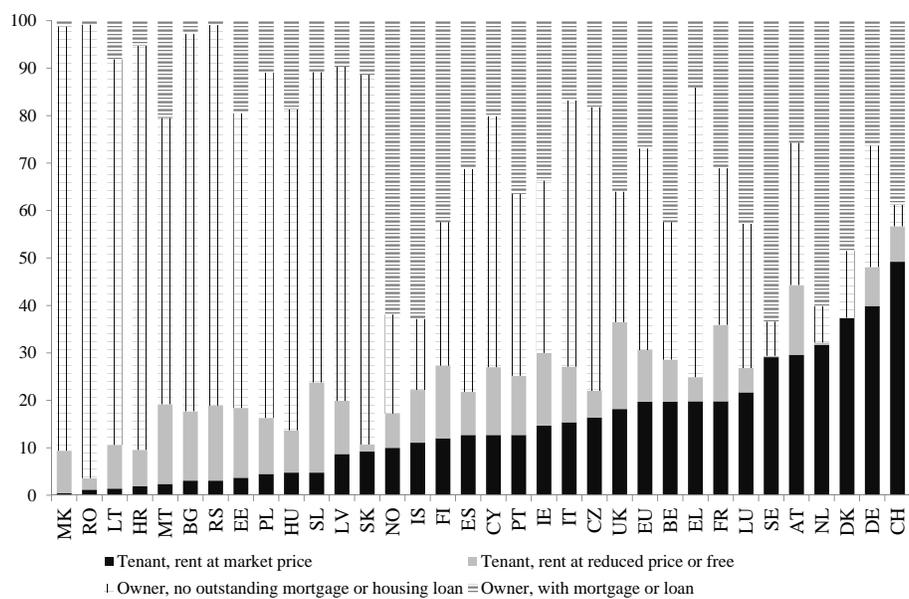
Scenario	Benchmark	reform 1	reform 2	reform 3	Full reform
Description	no reform	higher standards	bad tenant risk	tax reform	three together
Model parameters assumptions					
Disutility of renting (ϑ)	0.850	0.950	0.850	0.850	0.950
Depreciation rate of rented apartment (δ_r)	0.025	0.025	0.015	0.025	0.015
Tax deduction on mortgage rate (τ_m)	0.100	0.100	0.100	0	0
Tax on income from renting (τ_r)	0.085	0.085	0.085	0	0
Disadvantage of renting (% of house value per year)					
Buying from savings (see eq. 13)	2.1	2.0	1.0	1.7	0.7
Buying with mortgage (see eq. 14)	0.4	0.3	-0.7	-0.5	-1.5
Housing tenure structure among households (HH)					
Frac. of homeowners (%)	84.3	80.7	77.8	79.6	60.4
Frac. of tenants (%)	9.6	12.7	17.4	14.2	35.4
Frac. of HH 'living with parents' (%)	6.1	6.5	4.8	6.1	4.3
Living conditions					
Av. size of occupied house (sq.m.)	48.0	47.8	47.4	47.8	47.6
Av. size of owned house size (sq.m.)	51.2	52.0	52.6	52.4	56.0
Av. size of rented house size (sq.m.)	20.0	20.2	20.8	20.4	32.4
Life-cycle statistics					
Av. age of first house purchase	28.0	29.1	30.6	30.1	37.9
Frac. of HH buying house over lifespan (%)	96.6	95.4	94.3	95.7	87.1
Mortgage market					
Frac. of HH with debt (%)	20.0	17.8	16.4	16.0	4.6
Av. debt per homeowner (PLN, th)	138	145	153	148	187
Share of mortgage debt in GDP (%)	40.2	37.2	36.2	34.4	12.5

Table 7: Welfare gain of rental market reform

Scenario		reform 1	reform 2	reform 3	Full reform
Productivity (e)	share	higher standards	bad tenant risk	tax reform	three together
in thousand PLN: ω_1					
0.37	13.6	11.2	13.4	7.0	27.8
0.56	22.2	10.8	12.6	6.1	26.3
0.86	28.4	7.5	8.1	2.4	19.2
1.32	22.2	4.0	3.7	-0.5	10.4
2.03	13.6	1.8	2.1	-0.5	4.1
% of expected lifespan income: ω_2					
0.37	13.6	0.94	1.12	0.61	2.22
0.56	22.2	0.74	0.87	0.42	1.79
0.86	28.4	0.43	0.46	0.14	1.09
1.32	22.2	0.17	0.16	-0.02	0.44
2.03	13.6	0.05	0.06	-0.02	0.12

Notes: Welfare gains for the youngest cohort in comparison to the benchmark economy.

Figure 1: The structure of housing tenure status in European countries in 2015.



Source: Eurostat.

Figure 2: Survival probability and average income by age

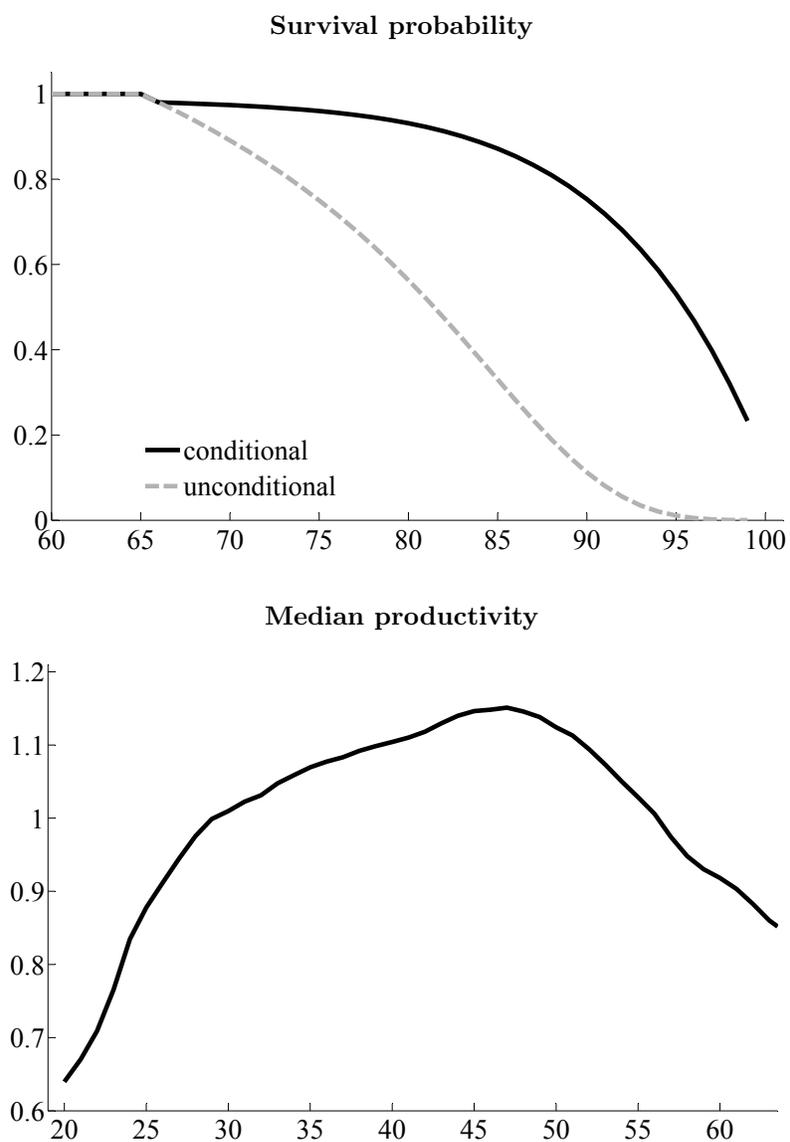
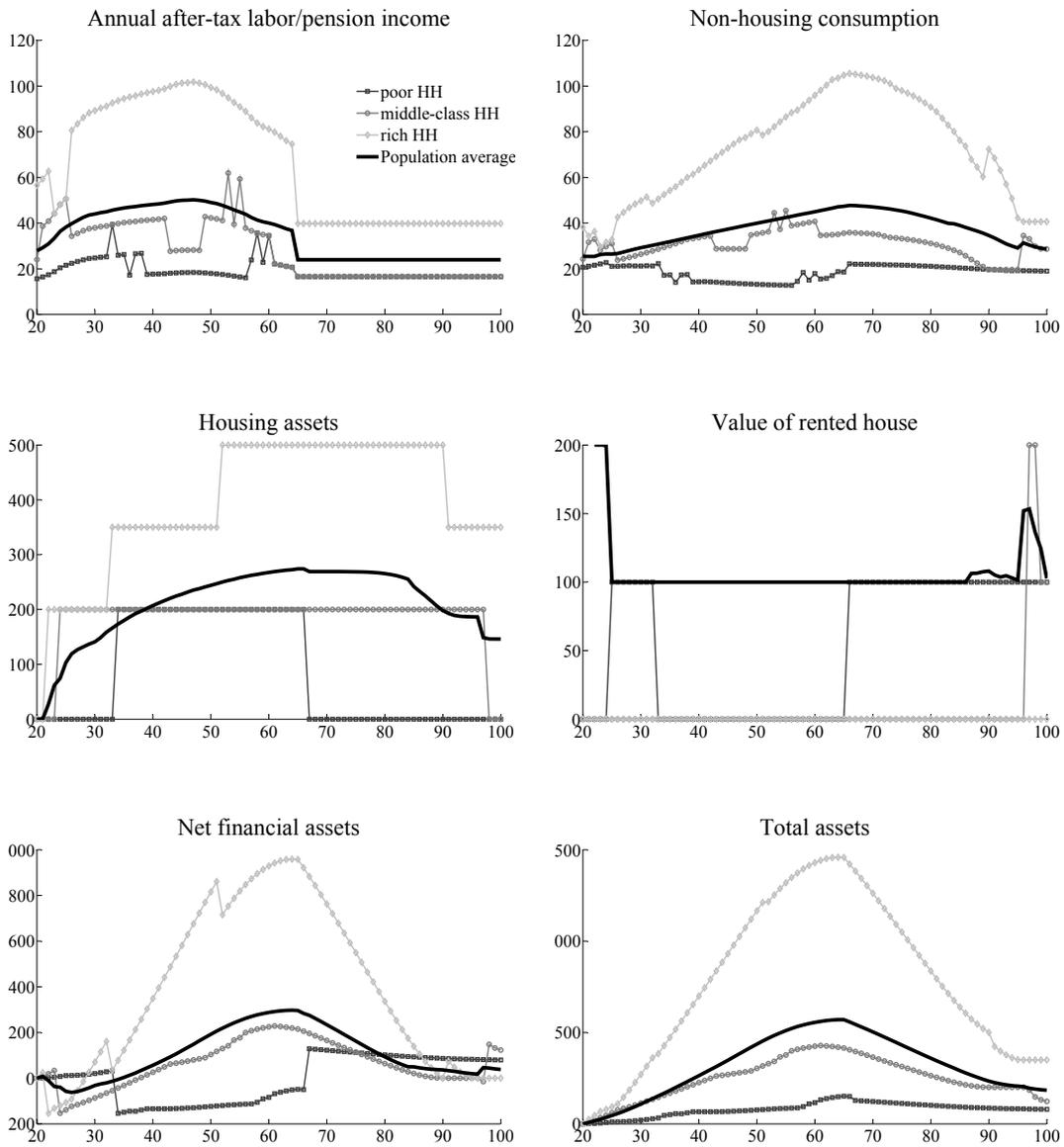
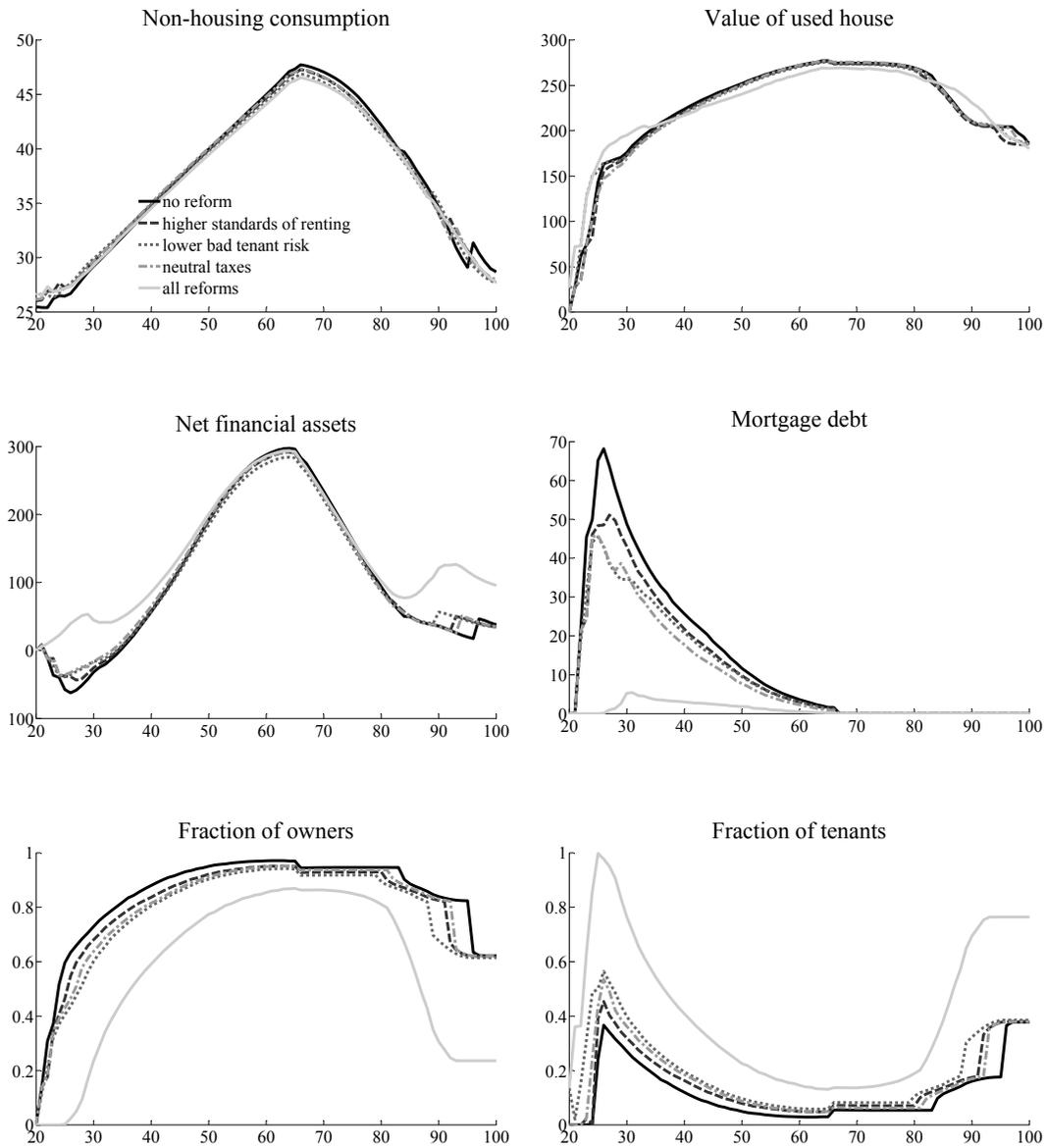


Figure 3: Life cycle path in baseline scenario



Notes: All values are expressed in th. PLN.

Figure 4: Comparison of benchmark and alternative scenarios



Notes: Average values for each age cohort. All values, but the fractions, are expressed in th. PLN.