

## Article

# Serious Mortgage Arrears among Immigrant Descendant and Native Participants in a Low-Income Public Starter Mortgage Program: Evidence from Norway

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**Abstract:** Although low-income homeownership programs serving vulnerable families at the lower end of the income distribution have been the focus of housing policy in many countries over the past 50 years, little is known about the post-origination experiences of immigrant families participating in these programs. Notably absent from the extant literature are studies examining the sustainability of homeownership among immigrant homebuyers and their susceptibility to falling behind on payments and experiencing mortgage defaults, evictions, or short sales. Utilizing data from 8263 families participating in Norway's Starter Mortgage Program (Startlån) during the first three calendar years after mortgage origination, we examine the extent to which serious mortgage arrears varies by immigrant background. Two primary questions shape our research: (1) What is the incidence of serious mortgage arrears among Western, Eastern European, and non-Western immigrant homeowners relative to ethnic Norwegians participating in a public low-income homeownership program? and (2) What pre- and post-origination characteristics of applicants and households, mortgage terms at the time of origination, and experiences of household financial vulnerability or economic shocks predict heterogeneity in serious mortgage arrears by immigrant backgrounds? We found that 6.1% of ethnic Norwegian, 6.2% of Western, 4.9% of non-Western, and 3.2% of Eastern European immigrant homeowners participating in the Starter Mortgage Program were in serious mortgage arrears at least once during the first three calendar years after mortgage origination. Results from our negative binomial regression analyses suggest that program participants who were sole owners, with larger families, and higher debt were more likely to experience serious mortgage arrears; these effects were accentuated for ethnic Norwegians. Additionally, mortgage terms at the time of origination produced differential effects by immigrant background. Compared to Western and Eastern European immigrant homeowners, ethnic Norwegians were more likely to have experienced serious mortgage arrears if they purchased a single-family home, had larger LTV and DTI ratios, or if the Startlån share of their mortgages was higher. Non-Western immigrant mortgagors were more likely to make late mortgage payments if they had larger LTV ratios, interest-only mortgage servicing, or if they were more reliant on Startlån funds to finance their mortgages; however, this risk was reduced if they had fixed-rate mortgages. Financial vulnerability in terms of higher debt or fewer assets also increased the risk of serious mortgage arrears for ethnic Norwegians and non-Western immigrant homeowners, while increases in real wealth reduced that risk for all immigrant mortgagor groups.



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## 1. Introduction

Low-income homeownership programs serving vulnerable families at the lower end of the income spectrum have been the focus of housing policy in many countries over the

past 50 years [1–9]. However, lingering concerns about the long-term sustainability of low-income homeownership remain given the deleterious effects of mortgage delinquencies, foreclosure, or short sales on vulnerable families and their children [8–13]. After the collapse of the housing markets in North America and Europe during the Global Financial Crisis, considerable attention was redirected toward the sustainability of low-income homeownership, e.g., [7,8,14,15]. However, few studies to date have examined how the sustainability of homeownership, particularly in terms of serious mortgage arrears, varies by ethnicity, immigration status, or country of origin [16–19].

In this paper, we analyze heterogeneity in mortgage arrears by immigrant background<sup>1</sup> through the lens of a public starter mortgage program in Norway. Norway offers an interesting case study as it combines a strong culture of homeownership for all, relatively unregulated housing markets minus the presence of predatory lending practices found in the United States and other countries, high levels of formal banking and mortgage market transparency, and a comprehensive cradle-to-grave welfare state juxtaposed against a rapid increase in immigration during the past several decades [20–22]. Unlike previous studies that track serious mortgage arrears over short periods of time or only have borrower characteristics at the time of mortgage origination, we document monthly mortgage payments during the first three calendar years after a home purchase.

Utilizing data from 8263 families participating in Norway's Starter Mortgage Program, we examine the extent to which serious mortgage arrears, defined as a mortgage payment that was 90 days or more late, varies by immigrant background. Two primary questions shape our research: (1) What is the incidence of serious mortgage arrears among Western, Eastern European, and non-Western immigrant homeowners relative to ethnic Norwegians participating in a public low-income homeownership program? and (2) What pre- and post-origination characteristics of applicants and households, mortgage terms at the time of origination, and experiences of household financial vulnerability or economic shocks predict heterogeneity in serious mortgage arrears by immigrant background?

Prior studies on mortgage delinquencies have tended to focus on the U.S. experience; for recent reviews, see [23–25]. Moreover, there has been limited attention given to how immigrant homeowners fare post-purchase [16–19]. As a result, this paper makes a number of contributions to the extant literature. First, it provides a different policy context within which to examine serious mortgage arrears. Despite its identification as a generous welfare state and a homeownership society, Norway's full recourse policies on all loans including mortgages and limited options for vulnerable families in the private rental or social housing markets make it difficult for those who struggle to sustain homeownership. Second, the longitudinal data used in this study allow us to document the extent of 90-day mortgage arrears during the early years of homeownership and assess how changes in household composition and financial situations contribute to any payment difficulties experienced by vulnerable families. Third, we use negative binomial regression modeling<sup>2</sup> to estimate variations in the influence of pre- and post-purchase household characteristics, mortgage terms at the time of origination, and household financial vulnerability and economic shocks on serious mortgage arrears during each of the early years of homeownership. Fourth, we are the first study in Norway and among a handful of studies to date that examines the heterogeneity in serious mortgage arrears by country background with a focus on differences in mortgage delinquencies between mortgage holders with ethnic Norwegian, Western, Eastern European, and non-Western country background, respectively.

Our paper begins with a summary of the theoretical and empirical literature on mortgage delinquencies focusing primarily on the literature pertaining to immigrant experiences of serious mortgage arrears. Next, we provide a brief overview of housing policy in Norway, a description of the housing market in Norway, and details about the country's Starter Mortgage Program. This is followed by a discussion of data and methods utilized to examine variations in 90-day mortgage arrears among immigrant and ethnic Norwegian Starter Mortgage Program participants. Next, we present the key results of our analyses predicting the risk of 90-day serious mortgage arrears by homeowner country background. We con-

clude with a discussion of the policy implications of our analyses and the extent to which the Starter Mortgage Program supports sustainable homeownership among vulnerable families, particularly immigrant families.

## 2. Mortgage Arrears among Vulnerable and Immigrant Homeowners

Individual- and household-level factors that mitigate mortgage arrears among vulnerable homebuyers have been reviewed extensively and underscore the role of gender, age, disability status, family size, income, and the number of co-applicants at the time of mortgage origination with younger, sole applicant, and lower-income households most likely to default; see [23–28] for comprehensive reviews of this literature. Prior empirical and theoretical studies have focused on identifying why and when homebuyers decide to default on their mortgages. The theoretical literature, e.g., [24–34], has placed emphasis on predicting strategic defaults—deliberate decisions by borrowers to walk away from mortgage obligations when they are not constrained by recourse laws. Previous studies suggest that negative home equity and adverse life events—job loss, illness, relocation, or marital dissolution—are the primary triggers associated with mortgage delinquencies or decisions to make strategic defaults, e.g., [24–36]. However, Tian et. al. and Farrell et al. found that the effects of such adverse life events were mitigated when homeowners had emergency savings held in reserve, received extended unemployment, or had access to other social welfare benefits [35,36].

Contemporary patterns in mortgage arrears have been linked to factors such as high loan-to-value (LTV > 80%) or debt-to-income (DTI > 43%) ratios, high credit card debt, and the extraction of home equity through various refinancing mechanisms [37–40]. Moreover, the terms and conditions at the time of mortgage origination, especially the increased use of low or no down payment loans, adjustable-rate loans with balloon payments, and interest-only loans, have been identified as additional triggers of mortgage defaults [40–42] since these typically have been coupled with predatory lending practices reported in the United States, United Kingdom, and Canada. Moreover, McCann and O'Malley found that the use of more exotic mortgage products created a segment of mortgage holders easily distressed by economic crises, which, in turn, triggered short-term responses from mortgage lenders, such as temporary interest-only periods to stem rising defaults [42]. However, such quick-fix approaches did not provide longer-term, sustainable solutions.

An area that remains understudied in the literature on mortgage arrears, delinquencies, and defaults is the extent to which these deleterious homeownership outcomes vary by ethnicity, immigrant status, or country background. Studies by Arestei and Gallo [16] in Italy and Gutierrez and Domenech [18] in Spain report that households headed by immigrants had a higher probability of arrears and subsequent evictions triggered by unexpected adverse events. Delinquency rates were also higher for immigrant households whose heads were young, unemployed, or suffering from more adverse economic shocks [16]. Lin, Liu, and Xie found that among immigrant households in the United States, delinquency rates were higher for those who were more recent arrivals [17]. They also reported that delinquency rates were the same for native-born households and immigrants who had resided in the U.S. for more than 20 years. However, second-generation immigrants were not more likely to be delinquent in their mortgage payments than those from third or higher generations. Pfeiffer, Wong, Ong & de la Cruz-Viesca [43] found that limited English language proficiency and cultural barriers were associated with higher rates of predatory financing, making it difficult for immigrant homeowners to refinance or modify loans when they ran into financial difficulties. Further, Pfeiffer and colleagues note that immigrant homeowners who were struggling, especially poor immigrants of color, tended to seek out emotional and financial support from co-ethnics before using formal mortgage mitigation services. Their actions reflected both unfamiliarity with existing lending practices in the United States as well as distrust of mainstream banking institutions among some immigrant groups [43] (p. 321). In one of the few studies examining patterns in mortgage arrears by county background, Anacker reported significant differences in mortgage delinquency rates

among Hmong, Laotian, Cambodian, Chinese, Japanese, and Pakistani households in the United States with the latter three groups experiencing lower rates of seriously delinquent mortgages [19]. *Do these delinquencies translate into higher rates of foreclosure?* There is some evidence that suggests that they might. In an earlier study, Kochar, Gonzalez-Barrera, and Docterman found that “a 10 percentage point increase in the share of immigrants in the population was associated with an increase of 0.6 percentage points in the foreclosure rate” [44] (p. 29). However, Lee and Greenlee reported that foreclosure risk in immigrant gateway metropolitan areas in the United States was mediated by race, nativity, and class with higher levels of Asian concentration lowering foreclosure risk and concentrated Latino neighborhoods experiencing mixed results [45]. Additionally, the heightened vulnerability of immigrant homeowners may be fostered by government policies that encourage homeownership even among recent arrivals. Simone and Walks noted how state policies encouraging homeownership among immigrants produced highly leveraged households residing in spatially segregated neighborhoods in Canada’s largest metropolitan housing markets [46] (p. 296).

### 3. Homeownership and the Housing Market in Norway

In Norway, as in other countries touting the homeownership ethos, homeownership is widely considered the preferred tenure, and buying a home is viewed as both a rite of passage for reaching adulthood and a tangible symbol of attaining middle-class status; for details see, [21,41,47–52]. However, the political and historical backdrop for Norway’s strong emphasis on homeownership is distinct from other countries in five critical areas. First, efforts to expand low-income homeownership in Norway operate within the context of a comprehensive cradle-to-grave welfare state that shields vulnerable households from extreme financial precarity and buffers the adverse effects of economic shocks. At the same time, however, housing is regarded as a private matter and one that people are expected to resolve on their own without government assistance. Local municipalities are obliged to assist disadvantaged persons who for economic, social, health, or other reasons need help securing adequate housing [53] and are similarly mandated by law to provide temporary emergency shelter for those in need [54]. Nonetheless, housing appropriately has been labeled “the wobbly pillar” of the Norwegian welfare state [47] because of its reliance on private transactions in a relatively unregulated housing market and government assistance targeted for vulnerable groups only [21,48–52].

Second, the historical origins underlying the prominence of homeownership in Norway emanate from the post-World War II dominance of the Labour Party and its concern for the dignity of workers. Party officials were extremely critical of predatory and exploitative property owners who dominated the rental market during the first half of the 20th century. “Every family should own their own home” became a slogan on the Labour Party platform from the mid-1950s onwards [51] (p. 9). Consequently, while other European countries established large social housing rental sectors in the decades after World War II [6,12], Norwegian housing policy aimed to make homeownership attainable for low- and moderate-income households [21,48]. Over time, this homeownership ethos became more widely engrained as both bureaucrats and policymakers across the political spectrum adopted the belief that homeownership confers economic and social benefits far beyond rental housing, especially for children [55].

Third, the rental market, in contrast, plays a secondary and residual role in Norway as renting is regarded as an intermediate step between the parental home and homeownership or between owned homes. Despite occasional rhetoric attesting to the contrary, developing a comprehensive rental sector has never been high on the political agenda [56]. The rental market is comprised of a relatively unregulated private rental market dominated by small-scale private property owners, and a social housing sector with strict socio-medical selection criteria that at only 5% of the total housing stock is quite small compared to other Northern European countries. Overall, the rental sector does not cater to the evolving needs of families during the various stages of a housing career, and tenure security is a main

concern [57]. This makes it particularly challenging for families with children to secure stable and decent rental housing.

Fourth, unlike the United States, Norway does not have laws explicitly outlawing discrimination in the housing market (e.g., the Fair Housing Act of 1968) and mortgage lending (e.g., the Equal Credit Opportunity Act of 1974). Nonetheless, the Equality and Anti-Discrimination Act serves to “promote equality and prevent discrimination on the basis of gender, pregnancy, leave in connection with childbirth or adoption, care responsibilities, ethnicity, religion, belief, disability, sexual orientation, gender identity, gender expression, age or other significant characteristics of a person”, and protects “all sectors of society” [58]. This equality of opportunity is extended in the financial sector with nearly 100% of all citizens and legal residents over the age of 15 holding a bank account [59], underscoring the ties between being banked and accessing many services in Norway, including the Tax Authority and the Norwegian Work and Welfare Agency.

Fifth, although Norway is quite liberal in providing access to mortgage financing, the mortgage lending market remains highly regulated by the Ministry of Finance. The predatory lending practices that burgeoned across North America and parts of the European Union during the past 20 years are not an issue in Norway [60]. Since 2008, the Norwegian Consumer Protection Agency (finansportalen.no) has hosted a website providing potential borrowers with detailed mortgage information [61]. Lending institutions in Norway are obligated by law to submit timely information on the nominal and effective interest rates for their mortgage products, including all fees as well as any other mortgage terms, applicant or property requirements, repayment requirements, maximum loan amounts, loan-to-value ratio, and same-bank service requirements, among others. This public disclosure makes it easier for consumers to compare mortgage products across banks to identify the best offer and minimizes the risk of encountering undisclosed fees or surprise terms and conditions.

In response to rising debt-to-income levels, a maximum loan-to-value ratio of 85% was introduced by the Financial Supervisory Authority of Norway in 2011. In 2015, additional regulation of banks’ lending practices followed, including a cap on the debt-to-income ratio at 5 times the value of all loans; a 5-percentage point interest rate increase stress test for mortgages (reduced to 3 percentage points, or 7% interest rate in total, in 2023); and mandatory principal payments for all mortgages with LTV ratios greater than 70% (reduced to 60% in 2017) [62]. Unlike the United States, a period of interest-only servicing is meant to provide temporary relief from full mortgage payments during the first year of homeownership and was commonly offered by banks until the onset of the financial crisis in 2007. Banks may also offer periods of interest-only servicing for mortgages with LTV ratios above 60% under the new lending regulation due to “unforeseeable circumstances that temporarily decrease the borrower’s ability to pay” [62]. Finally, given regulatory oversight of mortgage lending in Norway, adjustable-rate mortgages are not considered predatory. Nine out of ten mortgages originated in Norway are adjustable-rate mortgages with rate changes following the trajectory of interest rate changes in the central bank [63].

As a result of this sustained emphasis on homeownership over time and access to mortgage financing, homeownership rates are quite high in Norway. Overall, 82% of all inhabitants reside in a dwelling owned by someone in their household [64]. There are, however, systematic differences by immigrant background. While the share of persons of non-immigrant background who reside in owner-occupied units is 86%, it is only 62% among people with a Western immigrant background, and 58% among people with a Non-Western immigrant background. Further, within these groups, there are vast differences, with immigrants from Sri Lanka, Pakistan, and Vietnam—groups that have lived in Norway for a long time—having homeownership rates on par with non-immigrants [65]. In general, homeownership rates among persons with immigrant backgrounds vary by income, education, time since immigration, family type, and degree of urbanization. Moreover, the primary drivers of immigration to Norway also play a key role as refugees have lower homeownership rates than immigrants who arrived either for family reunification or work in construction, skilled trades, or services [66]<sup>3</sup>. Nonetheless, even among immi-



grants, there are large country-of-origin differences—partially associated with time since immigration but also reflective of immigrant status, with refugees typically experiencing greater financial precarity [67]. Although there is a dearth of studies examining ethnic discrimination of homeowners in Norway, e.g., discriminatory practices in mortgage lending or among real estate agents, several studies have demonstrated discrimination in the rental market, particularly against immigrants of African origin [68–72]. Others note how cultural norms related to housing and finance, particularly among Muslim immigrants, shape homeownership patterns in Norway, e.g., [73,74]. In particular, research focusing on homeownership among Muslim immigrants in Norway suggests lower tendencies to borrow any money, particularly loans that carry interest, although this varies by country background with immigrants from Pakistan and Turkey more likely to hold loans relative to immigrants from Morocco or Somalia [73].

#### 4. The Starter Mortgage Program

The Starter Mortgage Program (Startlån) is a public homeownership program administered by Norway's municipalities<sup>4</sup> on behalf of the Norwegian State Housing Bank (NSHB). Its introduction in 2003 reflected an overall shift in Norwegian housing policy from supporting growth in the general housing supply to targeted support for disadvantaged households [53]. Since its inception, Startlån has been a means-tested tool for promoting homeownership among households that cannot secure sufficient mortgage financing from a private lender<sup>5</sup>. According to program guidelines<sup>6</sup>, its beneficiaries include young first-time buyers, families with children, single parents, disabled persons, refugees, holders of a residence permit on humanitarian grounds, and other financially disadvantaged households. As of December 2022, over 155,000 Startlån mortgages have been originated by local municipalities [75]. Although the NSHB's statistics are not stratified by immigrant background, our raw data on applications during the period between 2004 and 2012 show that 68% of all Starter Program mortgages were awarded to Norwegian applicants, 8% were awarded to applicants of Western immigrant background, 9% were awarded to applicants of Eastern European immigrant background, and 15% were awarded to applicants of non-Western immigrant background [75–77]. However, the share of Starter Program mortgages awarded to Norwegians declined somewhat during this period, from 75% in 2004 to 64% in 2012, and the share awarded to applicants of non-Norwegian background increased accordingly [75–77]. In the same period, the overall share of the Norwegian population of immigrant background increased from 7.6% to 13.1% [78].

The Starter Mortgage Program and products are distinguished from regular mortgages in three ways. First, although applicants are subject to a thorough pre-purchase financial assessment, starter mortgages are exempt from some underwriting guidelines and mortgage regulations issued by the Financial Supervisory Authority of Norway, allowing municipalities the discretion to permit higher debt-to-income and loan-to-value ratios than regular banks as well as periods of interest-only servicing. Nevertheless, all applicants are made aware of the financial risks associated with taking out a starter mortgage, and municipalities are not absolved from the “duty to dissuade” borrowers from taking on excessive debt (*frarådningsplikt*) [79]<sup>7</sup>. Second, interest rates for starter mortgages are set centrally by the Norwegian State Housing Bank and do not reflect borrowers' higher risk profiles. Rather, the program has historically offered below-market-rate mortgages to all approved applicants<sup>8</sup>. Third, starter mortgages are not securitized but held by individual municipalities<sup>9</sup>. While this potentially exposes municipalities to considerable housing market risk in the event of an economic downturn, it also gives them the incentive to monitor repayments more closely and connect mortgagors to both pre-purchase homeownership readiness activities as well as post-purchase, add-on services such as housing allowances, financial advisory services, and emergency cash assistance to sustain homeownership [53]. Moreover, municipalities can exercise considerable discretion in mitigating temporary repayment glitches through the use of periodic interest-only servicing and other mortgage modifications. The transmission of “soft” information in the application process, ongo-

ing contact between mortgagors and lenders, as well as add-on services post-purchase, have been demonstrated to lower the probability of mortgage delinquency and default among lower-income homebuyers in the United States [80–82]. Recent reports from the Norwegian State Housing Bank suggest that to date, losses in the Starter Mortgage Program remain low [22,83,84], ranging from 0.03 to 0.06% of end-of-year outstanding debt [84] and comparable to commercial bank losses in total loans [85].

## 5. Data and Methods

### 5.1. Data Sources and Matching

Our study is based on a novel and unique data set that is compiled from three different sources: mortgage origination data from the Norwegian State Housing Bank, mortgage servicing data from two private mortgage servicing firms, and register data from several population databases maintained by Statistics Norway. The mortgage application data include borrower background characteristics as well as loan characteristics. The mortgage servicing data detail individual repayment histories, including exact dates of payments due and completed, and installments and interest amounts due and paid. Finally, the register data from Statistics Norway contain longitudinal records of individual and household characteristics such as income and income sources, savings, indebtedness, participation in various social welfare programs, country background, and educational attainment<sup>10</sup>.

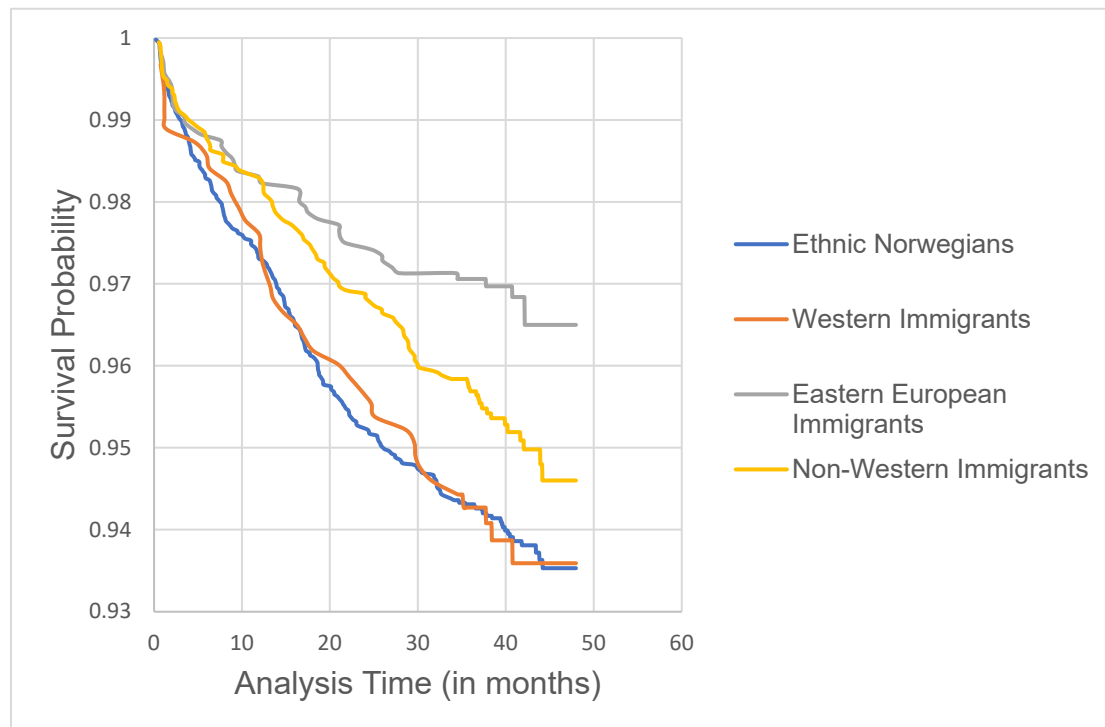
The three data sources were merged using a unique project-generated, individual-level identifier that ensures exact matching. In addition, data from the State Housing Bank and the mortgage servicing firms were matched on mortgage origination dates, mortgage amounts, and amounts of any municipal downpayment grants to ensure consistency across data sources [86]<sup>11</sup>. We restrict the data to home purchasers between the ages of 20 and 60 who did not own a home at the time of application and for whom we have complete repayment records<sup>12</sup>. The completeness requirement reduces our sample substantially for the earliest cohorts<sup>13</sup> and may introduce bias if there are systematic differences in mortgage repayment behavior across cohorts. Further, we only have access to repayment trajectories for mortgages that were active at the time of data extraction, i.e., in April 2016 (October 2015 for one municipality). This may admittedly introduce survival bias into our sample, i.e., mortgages that have survived until the date of data extraction may be systematically different from loans that were either prepaid or foreclosed on earlier dates. Indeed, the incidence of prepayment in the starter mortgage program is substantial—the average holding period was 6.6 years in 2017, which is the earliest figure available [75]. However, given that 63% of our data are from 2011 and 2012, i.e., with holding periods between four and five years at the time of data extraction, we consider survival bias to be a minor problem. Our final sample includes 8263 mortgages originated between 2006 and 2012 from 116 different municipalities with repayment histories that are traced 36 months after the mortgage origination year<sup>14</sup>.

### 5.2. Serious Mortgage Arrears—Outcome Measure

Our outcome measure enumerates the incidence of being 90 days past due on any mortgage payment, enabling comparisons with results from prior studies from the United States and Europe, e.g., [16–19]. We measure mortgage arrears as the number of times being late within the first three calendar years post-origination, i.e., for a mortgage issued in 2012, we trace the repayment history through 2015. Figure 1 shows the Kaplan–Meier survival curves for the analysis sample stratified by immigrant background.

Figure 1 shows that the fastest and sharpest experience of mortgage arrears occurred among ethnic Norwegians and those of Western immigrant backgrounds. After nearly 48 months of homeownership, about 6.5% of homeowners from these two groups made at least one 90-day late payment. Eastern European and non-Western immigrant homeowners experienced similar patterns in mortgage arrears through the first 18 months of homeownership post-purchase, with approximately 2.5% of homeowners from both groups making a 90-day past-due payment by that time. After that, the slope for non-Western homeowners

becomes slightly sharper, and by the end of our observation period, about 5.4% had made a 90-day late payment. In contrast, only 3.5% of Eastern European homeowners had a 90-day late payment after nearly 48 months of homeownership. Among all mortgage holders in Norway during the same time period as the study, as well as through 2020, 90-day serious mortgage arrears averaged between 0.5 and 1.1% [87].



**Figure 1.** Kaplan–Meier Survival Curves for Serious Mortgage Arrears during First Three Calendar Years after Mortgage Origination Stratified by Immigrant Background. Source: Estimates derived by authors.

Compared to all mortgage holders in Norway, serious mortgage arrears were approximately 6 times higher for ethnic Norwegian and Western mortgagors, about 3 times higher for Eastern European homeowners, and about 5 times higher for non-Western homeowners; see the discussion in [87]. Yet, for all mortgage holders in Norway, incidences of serious mortgage arrears rarely result in foreclosures or forced short sales. Comparable data for all Starter Mortgage Program loans at the national level suggest that approximately 2% of loans originated in the program were ever sent to collection, 0.5% were remanded to the courts in forced sales petitions, and 5% were executed as forced sales [75,87].

The sample sizes and shares of starter mortgage holders who were never and ever 90 days past due, respectively, are shown by immigrant background and origination cohort in Table 1. Overall, just over 6% of program participants of ethnic Norwegian and Western immigrant backgrounds were in arrears at least once during the first three calendar years after mortgage origination. For mortgage holders of Eastern European and non-Western immigrant backgrounds, the corresponding shares were lower at 3.2% and 4.9%, respectively. When stratified by year of mortgage origination, the incidence of ever-delinquent payments is generally higher in the 2006–2009 cohorts and lower in the 2010–2012 cohorts. While this holds for all four groups, differences in late mortgage payments across country backgrounds exhibit the same pattern for individual mortgage origination cohorts as in the aggregate.



**Table 1.** Unadjusted mortgage delinquency rates for ever being 90 days past due from origination through the first three calendar years post-purchase by immigrant background and mortgage origination cohort.

	Total	2006	2007	2008	2009	2010	2011	2012
<b>Ethnic Norwegians</b>								
N	4163	105	167	231	389	699	1006	1566
Share never late	93.9%	94.3%	87.4%	91.8%	90.5%	94.3%	95.2%	94.7%
Share late at least once	6.1%	5.7%	12.6%	8.2%	9.5%	5.7%	4.8%	5.3%
<b>Western Immigrants</b>								
N	628	8	15	21	37	110	176	261
Share never late	93.8%	87.5%	73.3%	100.0%	89.2%	93.6%	92.6%	96.2%
Share late at least once	6.2%	12.5%	26.7%	0.0%	10.8%	6.4%	7.4%	3.8%
<b>Eastern European Immigrants</b>								
N	1359	7	23	55	104	261	377	532
Share never late	96.8%	100.0%	100.0%	92.7%	95.2%	97.3%	96.8%	97.0%
Share late at least once	3.2%	0.0%	0.0%	7.3%	4.8%	2.7%	3.2%	3.0%
<b>Non-Western Immigrants</b>								
N	2113	38	69	137	187	412	521	749
Share never late	95.1%	92.1%	92.8%	93.4%	94.1%	96.1%	95.6%	95.2%
Share late at least once	4.9%	7.9%	7.2%	6.6%	5.9%	3.9%	4.4%	4.8%

Since borrowers in our sample may have more than one incident of ever being 90 days past due, we show the distribution of the outcome variable by country background in Table 2. Among those experiencing serious mortgage arrears, 43% made only one 90-day late payment, 36% made between 2 and 4 late payments, and 21% made five or more from origination and until the end of calendar Year 3. Comparing across country backgrounds, the share who made only one late payment was 39% among mortgage holders of ethnic Norwegian background, 44% among Western, 49% among non-Western, and 57% among Eastern European mortgagors of immigrant backgrounds. At the other end of the scale, the share who made five or more 90-day late payments during the first three calendar years post-origination was 23% for ethnic Norwegians and 21% for Western and non-Western mortgage holders, while it was only 7% among Eastern European mortgage holders.

**Table 2.** The cumulative number of 90-day late payments from mortgage origination through calendar Year 3 by full sample and immigrant background.

	Number of 90-Day Late Payments			Total
	1	2–4	5 or More	
<b>Full sample</b>				
N	190	159	91	440
Share	43%	36%	21%	
<b>Ethnic Norwegians</b>				
N	98	98	58	254
Share	39%	39%	23%	
<b>Western Immigrants</b>				
N	17	14	8	39
Share	44%	36%	21%	
<b>Eastern European Immigrants</b>				
N	25	16	3	44
Share	57%	36%	7%	
<b>Non-Western Immigrants</b>				
N	50	31	22	103
Share	49%	30%	21%	

NOTE: Estimates calculated by authors.

### 5.3. Empirical Model Predicting Serious Mortgage Arrears

Our empirical model predicting 90-day mortgage arrears utilizes a wide range of individual and household financial, socioeconomic, and demographic explanatory factors that the literature continues to associate with mortgage delinquency. The Starter Mortgage Program application data provides individual and household information measured at the time of application, including the *age of the primary applicant* (measured in years), a dummy variable for *primary applicant gender* (female = 1; male = 0), the presence of a *co-applicant* (yes = 1; no = 0), and the *number of children residing in the household*. Administrative data maintained by Statistics Norway provide additional individual characteristics including the *disability status* of the primary applicant (disabled = 1; not disabled = 0) and two dummy variables indicating the *educational attainment of the primary applicant* (completed university degree, education level missing; high school or less = 0) of the main applicant at the time of application.

The data also allow us to examine the influence of mortgage terms and conditions at the time of origination on subsequent mortgage arrears and is drawn primarily from the application and loan servicer payment histories for Starter Mortgage Program participants. These mortgage indicators include a dummy variable indicating the *purchase of a single-home family dwelling* (yes = 1; no = 0), the *share of the total mortgage financing that is derived from the Starter Mortgage Program* (ranges from 0 to 100 percent), the *loan-to-value (LTV) ratio* for the purchased property, the *debt-to-income (DTI) ratio* for the purchased property, a dummy variable indicating whether the *mortgagor received a fixed-rate mortgage* [88] (yes = 1; no = 0)<sup>15</sup>, the *amount of any municipal downpayment grant received* scaled in terms of 1000 2012 Norwegian kroner (NOK), and a dummy variable indicating *interest-only debt servicing at origination* (yes = 1; no = 0). In 2012, the value of the U.S. dollar was equivalent to 5.817 NOK [86].

We use register data to examine the influence of household financial vulnerability and economic shocks on mortgage arrears. Equivalized household income [89]<sup>16</sup>, scaled in terms of 1000 2012 NOK and adjusted for household size and composition, *Household interest payments as a share of household income* was calculated as an indicator of overall indebtedness capturing total debt burden, including non-housing debt. *Household welfare benefits* reflect the share of total household income received from Norwegian social welfare programs<sup>17</sup>. All three variables are averaged across years  $t_0$  (origination year) and  $t + 1$ .

Control variables representing economic shocks include *spells of joblessness* and *spells of medical leave*. Both indicators are measured using register data in terms of months from origination through the first three years post-mortgage origination<sup>18</sup>. They enable us to estimate when and for how long after mortgage origination such spells occur in order to see if the timing and length of spells matter beyond their effects through income. The *mortgage origination cohort* controls include year-of-origination dummy variables indicating the year of home purchase and ranges from 2006 to 2012.

The descriptive statistics for all indicators used in our empirical analyses are shown in Table 3 by late payment status and immigrant background. Overall, the differences in the sample characteristics across never- and ever-late payment statuses are small. However, borrowers who are always current on their mortgage payments are slightly less likely to be sole applicants and have fewer children than mortgage holders who were ever behind. Never-late mortgage holders also have slightly higher levels of education, on average, and the share with missing information on educational attainment is lower. When it comes to mortgage terms, we see higher shares of fixed-rate mortgages, higher downpayment grant amounts, lower shares of interest-only servicing, and lower fractions living in single-family dwellings for the group of mortgage holders without any late payments relative to those who had at least one late payment. Finally, we note that the financial situation over time for the never-late mortgage holders is better than for the ever-late mortgage holders: income is higher, the share of income derived from various welfare programs is lower, and the debt servicing burden (interest paid as a fraction of total income) is somewhat lower. Further, the share of mortgage holders that experience a post-origination jobless spell or medical leave is lower for the never-late group.

**Table 3.** Descriptive statistics for the analysis sample by country background.

	Ethnic Norwegians				Western Immigrants				Eastern European Immigrants				Non-Western Immigrants			
	Never Late through t + 3		Late at Least Once through t + 3		Never Late through t + 3		Late at Least Once through t + 3		Never Late through t + 3		Late at Least Once through t + 3		Never Late through t + 3		Late at Least Once through t + 3	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
<i>Applicant and Household Characteristics</i>																
Main applicant is female	0.54	0.50	0.48	0.50	0.51	0.50	0.51	0.51	0.47	0.50	0.45	0.50	0.46	0.50	0.49	0.50
Age of main applicant	35.37	10.33	35.49	10.06	34.89	9.28	36.50	9.71	35.80	7.83	34.55	7.39	36.94	8.45	35.78	8.58
Has co-applicant	0.26	0.44	0.21	0.41	0.39	0.49	0.31	0.47	0.67	0.47	0.61	0.49	0.46	0.50	0.48	0.50
Number of children at application	0.51	0.83	0.72	0.98	0.56	0.86	0.69	0.89	0.84	0.95	1.18	1.15	1.04	1.24	1.12	1.35
Main applicant is disabled	0.22	0.42	0.18	0.38	0.14	0.35	0.13	0.34	0.01	0.11	0.00	0.00	0.07	0.26	0.05	0.22
Educational attainment of main applicant (ref = high school degree or less)																
Education level is missing	0.01	0.09	0.00	0.06	0.06	0.23	0.10	0.31	0.15	0.36	0.34	0.48	0.09	0.29	0.18	0.39
University/college degree	0.26	0.44	0.17	0.37	0.33	0.47	0.33	0.48	0.32	0.47	0.23	0.42	0.31	0.46	0.21	0.41
<i>Mortgage Terms at Time of Origination</i>																
Purchased home is a single-family home (ref = no)	0.24	0.43	0.35	0.48	0.27	0.44	0.31	0.47	0.26	0.44	0.27	0.45	0.10	0.30	0.14	0.34
Startlån loan as share of total mortgage	57.28	38.98	61.84	38.66	47.96	37.74	43.39	36.63	43.14	35.03	43.38	35.57	66.77	38.57	66.33	37.72
Loan-to-value ratio for purchased property	90.85	15.86	92.77	14.44	93.98	12.73	93.32	11.37	96.59	7.78	97.72	5.60	92.79	12.18	96.79	8.09
Debt-to-income ratio for purchased property	3.66	1.32	3.75	1.58	3.62	1.20	3.82	1.22	3.43	1.04	3.04	1.26	3.67	1.13	3.60	1.22
Fixed-rate mortgage/FRM (ref = no)	0.19	0.39	0.16	0.36	0.20	0.40	0.13	0.34	0.15	0.35	0.09	0.29	0.26	0.44	0.12	0.32
Downpayment grant amount (in 1000 2012 NOK)	66.00	158.51	60.31	137.10	41.38	122.89	51.52	115.67	17.65	90.66	6.86	45.50	61.42	170.99	33.10	107.51
Interest-only servicing at origination (ref = no)	0.09	0.28	0.14	0.35	0.05	0.21	0.18	0.39	0.04	0.19	0.07	0.25	0.04	0.19	0.07	0.25

Table 3. Cont.

	Ethnic Norwegians				Western Immigrants				Eastern European Immigrants				Non-Western Immigrants			
	Never Late through t + 3		Late at Least Once through t + 3		Never Late through t + 3		Late at Least Once through t + 3		Never Late through t + 3		Late at Least Once through t + 3		Never Late through t + 3		Late at Least Once through t + 3	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
<b>Household Financial Vulnerability and Economic Shocks</b>																
Average equivalized household income in year t0 and t + 1 (in 1000 2012 NOK)	372.04	135.71	349.99	133.86	407.46	135.08	358.76	118.81	378.68	106.60	326.48	87.58	348.79	123.29	331.74	101.76
Average interest payments as a share of household income in year t0 and t + 1	11.20	4.58	12.94	6.35	10.60	4.35	14.44	10.97	9.49	4.25	9.91	3.74	9.83	4.91	12.69	6.38
Average welfare benefits as a share of household income in year t0 and t + 1	32.06	39.14	37.01	37.49	21.18	33.66	25.24	33.10	8.88	15.69	13.30	21.84	20.06	27.12	22.57	27.49
Total number of months jobless from origination through t + 3	9.97	13.39	14.24	14.76	8.34	12.78	14.23	14.87	7.56	10.81	13.07	12.77	9.39	12.33	12.23	13.32
Total number of months on medical leave from origination through t + 2 *	1.84	4.01	2.51	4.43	1.63	3.60	3.25	5.44	2.03	4.09	2.93	4.54	2.06	4.09	3.25	4.98
<b>Mortgage Origination Cohort</b>																
2006	0.03	0.16	0.02	0.15	0.01	0.11	0.03	0.16	0.01	0.07			0.02	0.13	0.03	0.17
2007	0.04	0.19	0.08	0.28	0.02	0.14	0.10	0.31	0.02	0.13			0.03	0.18	0.05	0.22
2008	0.05	0.23	0.07	0.26	0.04	0.19			0.04	0.19	0.09	0.29	0.06	0.24	0.09	0.28
2009	0.09	0.29	0.15	0.35	0.06	0.23	0.10	0.31	0.08	0.26	0.11	0.32	0.09	0.28	0.11	0.31
2010	0.17	0.37	0.16	0.36	0.17	0.38	0.18	0.39	0.19	0.39	0.16	0.37	0.20	0.40	0.16	0.36
2011	0.25	0.43	0.19	0.39	0.28	0.45	0.33	0.48	0.28	0.45	0.27	0.45	0.25	0.43	0.22	0.42
2012	0.38	0.49	0.33	0.47	0.43	0.49	0.26	0.44	0.39	0.49	0.36	0.49	0.35	0.48	0.35	0.48
N	3909		254		589		39		1315		44		2010		103	

NOTE: \* We only have information on medical leaves through Year 2 post-origination.

In addition, there are distinct differences in the level across immigrant groups. The share having a co-applicant is much lower among ethnic Norwegians than among the three immigrant groups, while the share who are disabled is much higher. Education levels are more divergent among non-Norwegians as all three groups have both a higher share with higher education and also higher shares with missing education information than ethnic Norwegians. Eastern European and non-Western mortgage holders have more children than the other two country groups. With regard to mortgage terms and financial vulnerability, we see that non-Western mortgage holders are much less likely to buy a single-family home than the other three groups. All three non-Norwegian immigrant groups receive lower amounts of downpayment grants and a lower share of their incomes is derived from welfare benefits. Finally, Eastern European and non-Western mortgage holders have a much lower incidence of interest-only mortgage servicing at origination.

#### 5.4. Analytical Approach

The non-negative integer nature of our dependent variable—the number of times a mortgage holder is 90 days or more late on their mortgage payments within the first three calendar years post-origination—lends itself to count data modeling [90]. While Poisson regression is the most commonly used regression framework for count data, our outcome variable displays obvious signs of overdispersion as the sample variance is between 7.7 and 10.6 times greater than the sample mean for the four country background groups in our sample. Therefore, we use negative binomial (NB) regression modeling instead since this analytical technique explicitly accounts for overdispersion in data [90].

The negative binomial distribution is characterized by two parameters,  $\mu$  and  $\alpha$ , where the mean is equal to  $\mu$ ,  $\Gamma(\cdot)$  is the gamma distribution, and  $\alpha$  is the overdispersion parameter

$$\Pr(Y = y|\mu, \alpha) = \frac{\Gamma(y + \alpha^{-1})}{y!\Gamma(\alpha^{-1})} \left( \frac{\alpha^{-1}}{\alpha^{-1} + \mu} \right)^{\alpha^{-1}} \left( \frac{\mu}{\alpha^{-1} + \mu} \right)^y$$

When the dispersion parameter  $\alpha$  is equal to zero, the negative binomial distribution collapses to the Poisson distribution, which is characterized by the mean being equal to the variance.

In the negative binomial model, the mean  $\mu$  is parameterized as

$$\mu_i = E(y_i|x_i) = \exp(x_i\beta)$$

and the variance equals

$$\text{Var}(y_i|x_i) = \mu_i(1 + \alpha\mu_i)$$

While we follow all mortgage holders for three calendar years post-mortgage origination, we need to adjust for differences in exposure time, i.e., the period during which delinquent payments can occur. These differences arise because mortgages originate at different points in time over the course of a year. For example, a mortgage originated in January will have a full year longer exposure time than a mortgage originated in December of the same year. In addition, the observation period ends in October 2015 for one municipality such that the exposure time for the 2012 mortgage origination cohort must be adjusted accordingly.

The regular negative binomial regression model treats all observations as independent, and while accounting for overdispersion, it does not allow for any clustering or dependence across observations. However, our data are grouped because the Starter Mortgage Program is operated at the municipal level.<sup>19</sup> As a result, mortgage holders are subject to local unobserved management and administrative practices that may affect the outcome. We account for the grouped structure of the data by letting the dispersion parameter  $\alpha$  be constant within, but vary across, municipalities using a random effects negative binomial (RENB) model, i.e.,  $\alpha_m \neq \alpha_n$ , where the subscript refers to the municipality. More specifically, the inverse of the dispersion (variance divided by the mean) is assumed to be beta-distributed



with parameters (a, b) that are estimated along with the  $\beta$ -coefficients in the model; see [90] (p. 361). The joint statistical significance of the two extra parameters (a, b) is effectively a test of the RENB model against the standard NB model with constant dispersion parameter  $\alpha$  across locations.<sup>20</sup>

Consequently, our estimating equation for individual  $i$  of ethnic group  $j$  in municipality  $m$ , with correction for the unequal length of exposure  $E_{ijm}$ <sup>21</sup>, is equal to

$$\text{Countlate90}_{ijm} = E_{ijm} \exp\left(\beta_{0j} + \beta_{1j}x_{1ijm} + \beta_{2j}x_{2ijm} + \beta_{3j}x_{3ijm} + \dots + \beta_{kj}x_{kijm} + u_{jm} + \varepsilon_{ijm}\right)$$

where the error term  $u_{jm}$  is a random effect for ethnic group  $j$  in municipality  $m$ .

The (multiple) occurrence(s) of mortgage delinquency *late90* during the first three calendar years post-mortgage origination is modeled as a function of the aforementioned control variables related to the applicant and household characteristics, mortgage terms at the time of origination, household financial vulnerability and economic shocks, and mortgage origination cohort.

## 6. Results

The results of our negative binomial regression model are summarized in Table 4. We first estimated RENB models for all four ethnic groups, allowing the dispersion parameter to vary across municipalities. The likelihood ratio (LR) test of the RENB model against the pooled NB model, however, rejects the RENB model for our three immigrant-origin groups but not for ethnic Norwegians ( $\text{Chi}^2 = 24.6$  and  $p\text{-value} = 0.000$  displayed in the bottom two lines in Table 4). Therefore, we estimated pooled NB models for the three Western, Eastern European, and non-Western immigrant groups. Table 4 thus shows results for the RENB model for ethnic Norwegians (column 1), and for the NB model for the remaining three immigrant groups (columns 2–4).

We transformed (exponentiated) the estimated coefficients to display the incidence rate ratios (IRRs), which have a more intuitive interpretation. IRRs represent the impact of independent variables in terms of a percentage change in the outcome variable—in this case, the observed number of late payments. A one-unit increase in any given independent variable changes the expected number of late payments by a factor equal to the IRR when all other variables are held constant. An IRR below 1 implies that the expected number of late payments will decrease, while an IRR above 1 indicates that the expected number of late payments will increase when the independent variable increases.

Overall, the model seems to perform well. The null hypothesis that all coefficients are simultaneously equal to zero is soundly refuted for all four model specifications as indicated by the high  $\text{Chi}^2$  statistics and correspondingly low  $p$ -values in the bottom part of Table 4.

Most estimated coefficients for our control variables conform to a priori expectations based on extant theory and the empirical literature. Applicant and household characteristics were most predictive of late mortgage payments made by ethnic Norwegian homeowners. Ethnic Norwegian mortgage holders who were female, disabled, or held a college degree had significantly fewer late payments post-mortgage origination<sup>22</sup>. Disability status decreases the expected rate of making late mortgage payments by nearly 47%, which is probably related to the predictability of future income, which makes it easier to tailor the mortgage amount and terms to each mortgagor's financial situation<sup>23</sup>. On the other hand, ethnic Norwegian mortgage holders who have more children over the course of these early years of homeownership have 24% higher expected late payments, likely reflecting the increase in financial obligations associated with growing family size and potentially the loss in work hours for one or more of the wage earners in the family. Having a co-applicant significantly reduced the expected incidence of late mortgage payments—by about 65%—for mortgage holders of Western and non-Western immigrant backgrounds.

**Table 4.** Negative binomial regressions predicting the number of 90-day late payments through Year 3 after mortgage origination by country background <sup>a</sup>.

	Ethnic Norwegians		Western Immigrants		Eastern European Immigrants		Non-Western Immigrants	
	IRR		IRR		IRR		IRR	
<b><i>Applicant and Household Characteristics</i></b>								
Main applicant is female	0.673	**	0.844		0.763		1.265	
Age of main applicant	0.998		1.018		0.958		0.969	
Has co-applicant	0.731		0.349	*	0.740		0.353	***
Number of children at time of application	1.244	**	1.397		1.198		1.195	
Main applicant is disabled	0.533	**	0.525		0.000	***	1.701	
Educational attainment of main applicant (ref = high school degree or less)								
Education level is missing <sup>b</sup>	0.502		49.600	***	2.416		1.259	
University/college degree	0.634	**	1.327		0.790		0.606	
<b><i>Mortgage Terms at Time of Origination</i></b>								
Purchased home is a single-family home (ref = no)	1.511	**	1.589		0.690		0.779	
Startlån loan as share of total mortgage	1.005	*	0.986	*	0.995		1.007	**
Loan-to-value ratio for purchased property	1.018	*	0.995		1.051		1.174	***
Debt-to-income ratio for purchased property	1.006		1.121		0.666	*	0.596	***
Fixed-rate mortgage/FRM (ref = no)	0.841		0.272	*	0.883		0.332	**
Municipal downpayment grant amount (in 1000 2012 NOK) <sup>b</sup>	1.001		1.004		1.000		1.006	***
Interest-only servicing at origination (ref = no)	1.313		2.743		2.309		5.755	*
<b><i>Household Financial Vulnerability and Economic Shocks</i></b>								
Average equivalized household income in year t0 and t + 1 (in 1000 2012 NOK) <sup>c</sup>	1.000		0.996		0.995	*	0.998	
Average interest payments as a share of household income in year t0 and t + 1	1.049	***	1.008		1.000		1.163	***
Average welfare benefits as a share of household income in year t0 and t + 1	1.006		1.002		1.005		1.008	
Total number of months jobless from origination through t + 3	1.009		1.023		1.037	**	0.990	
Total number of months on medical leave from origination through t + 2 <sup>d</sup>	1.021		1.061		1.029		1.041	

Table 4. Cont.

	Ethnic Norwegians		Western Immigrants		Eastern European Immigrants		Non-Western Immigrants	
	IRR		IRR		IRR		IRR	
/ln_r	0.594	*						
/ln_s	1.939	***						
/lnalpha			2.647	***	2.882	***	3.322	***
N	4163		628		1359		2113	
Log-likelihood	-1419.3		-201.4		-239.0		-577.2	
Chi <sup>2</sup>	127.4		6736.7		3058.1		1224.2	
p	0.000		0.000		0.000		0.000	
LR test vs. pooled model:								
Chi <sup>2</sup>	24.6							
Prob ≥ Chi <sup>2</sup>	0.000							

**NOTE:**<sup>a</sup> Random effects negative binomial regression for ethnic Norwegians; negative binomial regressions for other immigrant groups with clustered robust standard errors at the municipality level (borough for Oslo). All regressions include dummy variables for year of origination (not shown). <sup>b</sup> The high IRR on education missing for Western immigrant mortgagors is associated with sparse cell counts of individuals who made late payments on the right hand tail of the distribution who were also missing educational attainment information. We ran analyses that eliminated or collapsed the extreme values in the distribution as robustness checks and found that the IRRs for each indicator were unchanged. <sup>c</sup> The municipal downpayment grant amount and income are denoted in 1000 2012 NOK. Household equivalized income takes into account a household's size and composition and, therefore, is comparable across different households. The equivalized income is calculated by dividing the household's total income by its equivalent size, in which the first adult is given weight 1, all additional persons aged 14 or over are given weight 0.5, and all children under the age of 14 are given weight 0.3; see [89]. <sup>d</sup> Data for medical leave are not available for Year 3. \*  $p < 0.05$ ; \*\*  $p < 0.01$ ; \*\*\*  $p < 0.001$ .

Turning to the mortgage terms at the time of origination, we found large variations by immigrant background both in terms of the estimated IRRs and their significance with the model's fit being much better for ethnic Norwegians and non-Western mortgage holders than for the other two groups. Among ethnic Norwegian mortgage holders, the purchase of a single-family home increased the expected rate of late payment by 51%. Moreover, for each additional percentage share of the mortgage derived from the Starter Mortgage Program or percentage increase in the LTV, the expected rates of late mortgage payments increased by approximately 1 and 1.8%, respectively. Among immigrant groups, non-Western mortgagors experienced about a 1% increase in the expected number of late mortgage payments with each additional percentage share of the mortgage from the Starter Mortgage Program and a 17.4% increase in the expected number of late payments with each percentage point increase in the LTV. However, contrary to a priori expectations, a one percentage point increase in the DTI ratio lowered the expected number of late mortgage payments by 33 and 40%, respectively, for the Eastern European and non-Western mortgagors. Holding a fixed-rate mortgage had the expected effect of reducing the incidence of late payments by 73% for Western and 67% for non-Western mortgage holders. Increasing amounts of municipal downpayment grants were only associated with increased rates (about 1%) of late mortgage payments among non-Western mortgagors. Moreover, we see interesting results pertaining to interest-only debt servicing. While the concept of interest-only servicing may lead one to believe that it will decrease mortgage delinquency since it actually *lowers* monthly mortgage payments, our results speak to the contrary. Starting out with interest-only servicing increases the expected number of 90-day late payments for all groups, but the IRR is statistically significant only for non-Western mortgage holders whose expected rate of making late payments increased by nearly 5.8 times, when all other variables were held constant. Therefore, while starting out with interest-only servicing implies lower monthly payments, these mortgage holders encounter difficulties adjusting to the higher monthly payments once this period expires<sup>24</sup>.

Finally, we examine the effects of household financial vulnerability and economic shocks. As expected, more financial vulnerability is associated with more late mortgage payments. Higher debt exposure, as indicated by a one percentage point increase in interest payments as a share of total household income at the time of origination or in subsequent years, increases the expected incidence of late payments between 5 and 16%, respectively, for ethnic Norwegian and non-Western homeowners. Experiencing a spell of unemployment post-origination increased the expected number of late payments for Eastern European mortgagors by 3.7% for each additional month of unemployment. Yet a one percentage point increase in household income was associated with nearly a 1% reduction in the expected number of late mortgage payments, but only for Eastern European mortgagors.

In order to explore the influence of household assets on subsequent mortgage arrears, we conducted supplemental analyses for a subset of our Starter Mortgage Program sample who had asset data for the mortgage origination year. The descriptive statistics are presented in Table 5. We note the considerable variation in the number of household assets held by mortgagors by country background and within the country group between mortgagors who never made a late mortgage payment and those who did. Household real wealth was lower for those who ever made a late mortgage payment and was the lowest for Eastern European mortgagors. While savings and other financial assets were low across all four groups, they were lowest among Western mortgagors.

**Table 5.** Descriptive statistics for household financial assets by country background.

	Never Late through t + 3		Late at Least Once through t + 3	
	Mean	Std. Dev.	Mean	Std. Dev.
<b>Ethnic Norwegians</b>				
Household real gross wealth t0	158.29	84.27	155.15	77.77
Household bank deposits t0	6.25	8.48	3.36	7.70
Household other financial assets t0	1.81	6.55	1.17	2.83
N	2888		130	
	2010	614	29	
	2011	899	39	
	2012	1375	62	
<b>Western Immigrants</b>				
Household real gross wealth t0	171.82	89.47	158.93	89.80
Household bank deposits t0	5.98	7.28	1.61	3.44
Household other financial assets t0	1.46	3.28	1.38	3.67
N	490		24	
	2010	97	7	
	2011	160	10	
	2012	233	7	
<b>Eastern European Immigrants</b>				
Household real gross wealth t0	177.80	99.95	94.16	86.78
Household bank deposits t0	6.09	11.03	3.95	7.28
Household other financial assets t0	1.48	5.89	0.73	0.99
N	1103		26	
	2010	242	6	
	2011	358	7	
	2012	503	13	
<b>Non-Western Immigrants</b>				
Household real gross wealth t0	170.22	96.28	161.83	81.51
Household bank deposits t0	6.32	8.82	2.73	4.34
Household other financial assets t0	1.90	5.04	1.55	2.04
N	1547		60	
	2010	383	12	
	2011	476	17	
	2012	688	31	

**NOTE:** All variables measured in 10,000 2012 NOK on 31 December of origination year (t0).

Table 6 presents the results of the NB regression models incorporating the household assets indicators for a subset of our Starter Mortgage Program mortgagors. As was the case in Table 4, the results from the likelihood ratio (LR) test of the RENB model against the pooled NB model reject the RENB model for our three country groups but not for ethnic Norwegians. Note that in the regressions including asset variables that are measured at the end of the origination year t0, the dependent variable enumerates the number of 90 days late payments after the origination year, i.e., from year t + 1 through t + 3. Table 6 thus shows the results for the RENB model for ethnic Norwegians (column 1) and for the NB model for mortgage holders of Western, Eastern European, and non-Western immigrant descent (columns 2–4). In general, results from the base model presented in Table 4 were replicated here. The empirical model best-predicted mortgage arrears for ethnic Norwegian and non-Western immigrant mortgagors. Additionally, interest-only servicing at the time



of mortgage origination significantly increased the incidence of mortgage arrears for all three immigrant background groups (range 3.9 to 5.9 times). One of the new significant predictors to emerge in Table 6 highlights the influence of illness on the incidence of late mortgage payments. The expected rate of late payments increased by 4.5, 10.6, and 11.2% for each additional month that a mortgagor of ethnic Norwegian, Western, or non-Western background, respectively, was on medical leave.

When it comes to the influence of financial assets on late mortgage payments, the estimated IRRs overall display the expected direction, although they are not necessarily all statistically significant. Higher real household wealth substantially reduced the incidence of mortgage arrears for Western, Eastern European, and non-Western mortgagors—for each 10,000 NOK increase in wealth, there was a 1–1.5% reduction in the expected number of late payments. Households holding bank deposits also had a significantly lower incidence of mortgage arrears. Ethnic Norwegian and non-Western mortgagors had approximately 5% and 7% fewer expected late payments for each 10,000 2012 NOK increase in the value of bank deposits. Other financial assets also display the expected effect; however, the IRRs are not significantly different from 1. Hence, while we do find that liquid assets are more important than real assets for averting late payments for both ethnic Norwegian and non-Western mortgage holders, for Western and Eastern European mortgage holders, only real assets seem to matter to avert late payments.

**Table 6.** Negative Binomial Regressions Predicting the Number of 90-Day Late Mortgage Payments through Year 3 Post-Origination including Household Assets and Debts by Country Background <sup>a</sup>.

	Ethnic Norwegians IRR		Western Immigrants IRR		Eastern European Immigrants IRR		Non-Western Immigrants IRR	
<b><i>Applicant and Household Characteristics</i></b>								
Main applicant is female	0.634	*	1.578		1.034		1.014	
Age of main applicant	1.000		1.022		0.960		0.961	
Has co-applicant	0.862		2.550		1.435		0.282	**
Number of children at time of application	1.342	**	0.651		0.750		1.610	**
Main applicant is disabled	0.388	*	0.755		0.000	***	0.904	
Educational attainment of main applicant (ref = high school degree or less)								
Education level is missing <sup>b</sup>	0.000		27.938	**	1.548		2.104	
University/college degree	0.542	*	3.579		0.594		0.833	
<b><i>Mortgage Terms at Time of Origination</i></b>								
Purchased home is a single-family home (ref = no)	1.533	*	2.762	*	0.752		0.764	
Startlån loan as share of total mortgage	1.009	**	0.992		0.999		1.004	
Loan-to-value ratio for purchased property	1.016		0.998		1.145		1.206	***
Debt-to-income ratio for purchased property	1.045		1.383		0.709		0.605	***
Fixed-rate mortgage/FRM (ref = no)	0.795		0.693		1.021		0.407	
Municipal downpayment grant amount (in 1000 2012 NOK) <sup>c</sup>	1.001		1.004		1.008		1.009	***
Interest-only servicing at origination (ref = no)	1.028		5.888	*	3.955	*	5.150	*
<b><i>Household Financial Vulnerability and Economic Shocks</i></b>								
Average equivalized household income in year t0 and t + 1 (in 1000 2012 NOK) <sup>c</sup>	1.001		0.994		0.994		0.998	
Average interest payments as share of household income in year t0 and t + 1	1.055	***	1.017		0.999		1.149	*
Average welfare benefits as share of household income in year t0 and t + 1	1.006		0.996		0.999		1.004	
Total number of month jobless from origination through t + 3	1.006		1.025		1.053	*	0.981	
Total number of months on medical leave from origination through t + 2 <sup>d</sup>	1.045	*	1.106	*	0.972		1.112	*
<b><i>Household Assets</i></b>								
Household real wealth t0 (in 10,000 2012 NOK)	0.999		0.994	*	0.985	***	0.993	*
Household other financial assets t0 (in 10,000 2012 NOK)	0.974		1.111		0.872		0.990	
Household bank deposits t0 (in 10,000 2012 NOK)	0.947	**	0.658		0.964		0.930	**

Table 6. Cont.

	Ethnic Norwegians IRR		Western Immigrants IRR		Eastern European Immigrants IRR		Non-Western Immigrants IRR	
/ln_r	0.836							
/ln_s	2.376	**						
/lnalpha			2.149	**	2.426	***	3.569	***
N	3018		514		1129		1607	
Log-likelihood	−762.3		−123.1		−133.0		−358.6	
Chi <sup>2</sup>	95.6		205.1		3821.8		1445.5	
p	0.000		0.000		0.000		0.000	
LR test vs. pooled model:								
Chi <sup>2</sup>	4.35							
Prob ≥ Chi <sup>2</sup>	0.019							

<sup>a</sup> Random effects negative binomial regression for ethnic Norwegians; negative binomial regressions for other immigrant groups with clustered robust standard errors at the municipality level (borough for Oslo). All regressions include dummy variables for year of origination (not shown). <sup>b</sup> The high IRR on education missing for Western immigrant mortgagors is associated with sparse cell counts of individuals who made late payments on the right hand tail of the distribution who were also missing educational attainment information. We ran analyses that eliminated or collapsed the extreme values in the distribution as robustness checks and found that the IRRs for each indicator were unchanged. <sup>c</sup> The municipal downpayment grant amount and income are denoted in 1000 2012 NOK. Household equivalized income takes into account a household's size and composition, and therefore is comparable across different households. The equivalized income is calculated by dividing the household's total income by its equivalent size, in which the first adult is given weight 1, all additional persons aged 14 or over are given weight 0.5, and all children under the age of 14 are given weight 0.3, see [89]. <sup>d</sup> Data for medical leave are not available for Year 3. \*  $p < 0.05$ ; \*\*  $p < 0.01$ ; \*\*\*  $p < 0.001$ .

## 7. Policy Discussion and Implications

Our study utilizes data examining serious mortgage arrears for a group of vulnerable homeowners who purchased homes as part of the Starter Mortgage Program in Norway during the period from 2006 to 2012 whose mortgage histories were tracked three years post-origination through 2015—a period just prior to a major change in low-income homeownership program eligibility criteria in the country. The findings suggest that homeowners participating in the program were able to sustain homeownership during the first several years after mortgage origination. Nonetheless, approximately 6% of the homeowners in our sample of program participants experienced at least one episode of serious mortgage arrears during the first three years of homeownership. However, the experience of mortgage arrears varied by ethnic and country background. Surprisingly, ethnic Norwegians and Western homeowners, who typically are more advantaged in Norwegian society, experienced the highest rate of mortgage arrears (>6%). In contrast, Eastern European homeowners had the lowest rate (3.2%) of mortgage arrears, and non-Western homeowners fell between the two extremes at 4.9%.

Why serious mortgage arrears are lower for Eastern European and non-Western homeowners warrants further exploration, but we believe these variations may partially reflect differences in the ethos surrounding homeownership with some groups conveying strong cultural norms dissuading mortgage delinquency and default [27,28]. Further, the Starter Mortgage Program may apply more stringent screening criteria for some groups of applicants, such as immigrants and refugees, at the time of loan application—groups that are disproportionately represented in the Eastern European and non-Western homeowner groups in this study [63]. Moreover, as found in previous studies, immigrant mortgage holders may also use connections and financial networks within their own group communities to avoid delinquent payments [42,43,72–74]. In contrast to prior studies [43–46] that suggest higher mortgage delinquency rates among immigrant homeowners are tied to structural or cultural barriers, such as language barriers, lack of familiarity with the availability of (free) services, or perceived stigma of admitting to financial difficulties, we found that Eastern European and non-Western immigrant mortgagors in the study were significantly less likely to be in mortgage arrears than their ethnic Norwegian and Western counterparts despite encountering these barriers in Norway. We speculate that exposure to such barriers may lead immigrant homeowners to become more self-reliant, especially when encountering issues that they may be capable of addressing. For example, with a disproportionate number of workers concentrated in construction or other skilled trades, particularly among Eastern European immigrants, we expect that homeowners who are able to make needed home repairs and upgrades can mitigate unexpected housing costs and increase home values. Although we do not have direct evidence from the data available to us in this study, we speculate that immigrant mortgagors may have clear cultural understandings as to what does and does not constitute “success” as they build their lives and livelihoods in Norway. This may include avoiding the use of government funding that is clearly identified as targeted toward the most disadvantaged. Additionally, for some Muslim immigrants, there would be an avoidance of interest-bearing mortgage servicing and a preference for seeking Halal (no-interest) loans [73,74]. Increasing financial precarity, higher levels of household debt, lower wealth or bank deposits post-mortgage origination elevated the risk of falling into serious arrears [8–11,13], most notably for ethnic Norwegian and non-Western homeowners; this is consistent with previous studies of mortgage defaults [16,18]. Additionally, the applicant and household characteristics, mortgage terms at the time of origination, and patterns in joblessness and poor health produced inconsistent effects on the mortgage payment histories across country backgrounds. We found that mortgage terms and conditions at the time of origination were most influential on the repayment histories of ethnic Norwegian and non-Western mortgagors. What makes these two groups particularly vulnerable to experiencing mortgage arrears relative to the other immigrant groups once other characteristics are controlled? We speculate that once families experience multiple vulnerabilities simultaneously (i.e., larger family size, higher

pre-existing debt, need for larger Startlån loans or municipal grants), that already sets the stage for more unstable payment histories. This instability may be further exacerbated by any further and unanticipated economic shocks to the household such as the loss of employment or extended medical leaves because of illness [28–36].

As noted by Tian and colleagues [35], we also found that the presence of savings or other assets served as buffers to mitigate against any mortgage arrears. This suggests the need to encourage the accumulation of emergency savings, preferably during pre-purchase counseling and homeownership readiness activities [35,82]. This is particularly important for vulnerable homeowners, such as our immigrant mortgagors, who may lack the generational wealth accumulated by other more advantaged groups in Norwegian society. These activities could be coupled with post-purchase counseling on topics including how to manage unexpected expenses, repairs, or economic shocks during the early years of homeownership—issues about which vulnerable homeowners may have limited exposure or knowledge.

Of particular importance, especially after controlling for household assets, interest-only servicing had a deleterious influence on the likelihood of falling into mortgage arrears for all three immigrant groups. This finding is consistent with previous studies underscoring the perils associated with interest-only loans [23,38–42]. While interest-only loans are not predatory loans in Norway as they are in many other countries, the resultant low monthly payments at the onset of the mortgage appear to trigger difficulties in meeting higher monthly mortgage payments once the interest-only grace period expires. This suggests the need to engage in pre- and post-purchase counseling to ensure that borrowers are fully aware of the need to prepare for significant increases in mortgage payments associated with these types of loans. It also suggests the need to consider other mortgage products, such as fixed-rate mortgages, to mitigate risk and provide homeowners with more consistent levels of debt and mortgage payments. Indeed, the use of fixed-rate mortgages in the Starter Mortgage Program has increased widely since 2014, which reduces the risk of mortgage default among program participants.

There are several powerful policy lessons to be learned from Norway's Starter Mortgage Program that may be applicable in other contexts. First, the program serves an important niche in the housing market by serving specific target populations such as immigrant families experiencing housing insecurity. Second, the program corresponds to the national government's mandate to mitigate housing precarity by keeping vulnerable families stably housed despite constraints imposed by the limited supply of social housing or private rental housing available. Third, our findings suggest that the program has been successful in providing opportunities for immigrant families to purchase homes and sustain homeownership, which can address the significant homeownership gap that persists between native Norwegians and immigrants, especially those who are more recent arrivals to the country.

Future research needs to examine the post-origination experiences of Starter Mortgage Program participants who entered the program after 2012 when eligibility criteria were changed to focus on the most disadvantaged households. We suspect that while the factors affecting mortgage arrears would be similar for more recent program participants, the incidence of mortgage arrears could potentially be higher for participants who were more disadvantaged. Moreover, future work should focus on documenting the experiences of subpopulations within these larger immigrant groups. Building upon previous smaller qualitative or mixed methods studies [43,68–74], longitudinal work is also needed to help us to better understand how the sustainability of homeownership varies across immigrant subpopulations, how sustainability changes over time, and how supportive services and programs may best be tailored to address the diverse needs of mortgagors from both native and immigrant backgrounds.

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and K.A.; writing-review and editing, A.M.S. and K.A.; visualization, A.M.S. and K.A., supervision, K.A.; project administration, K.A. and A.M.S.; funding acquisition, K.A. and A.M.S. All authors have read and agreed to the published version of the manuscript.

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## Notes

- <sup>1</sup> Given the relatively small samples sizes for immigrants from most countries, we have aggregated immigrant groups into larger regional categories using conventions employed by Statistics Norway [20]. Immigrant background pertains to all who have at least one foreign-born grandparent. Although this is notably a liberal definition of immigrant status, restricting the definition to all who are born abroad or who have at least one foreign-born parent changes the sample slightly only for Western immigrants, as most persons with Eastern European or non-Western background are immigrants or descendants (second generation). The choice of immigrant definition does not affect our results. For all official statistics, Statistics Norway maintains the definition of immigrant status as foreign-born, or native-born descendant of two foreign-born parents. “Western” includes countries in the EU/EEA outside of Eastern Europe, USA, Canada, Australia and New Zealand. “Eastern European” includes immigrants from EU/EEA countries in Eastern Europe. “Non-Western” includes countries in Asia, Africa, Latin America, Oceania except Australia and New Zealand, and Europe except the EU/EEA.
- <sup>2</sup> We first ran negative binomial models with random effects employed at the municipal (for Oslo borough) level, which corresponds to the administrative level at which the Starter Mortgage Program operates. The random effects negative binomial model was rejected for all groups but ethnic Norwegians, hence the standard negative binomial model was employed for the remaining three groups. See the modeling section for more details.
- <sup>3</sup> According to Statistics Norway [66], large fractions of immigrant men in Norway, especially from Eastern Europe, are employed in construction or other skilled trades; women are often employed in services such as cleaning, child care and elder care.
- <sup>4</sup> As of 1 January 2021, there are 356 municipalities in Norway, but during our study period 2005–2014, the number was 428.
- <sup>5</sup> In addition to home purchase, the starter mortgage may also be used for rebuilding/renovation, refinancing and construction. About 75% of the mortgages are used for home purchases. Our study focuses only on mortgages for first home purchases.
- <sup>6</sup> Effective for mortgages originated before 1 April 2014. Current guidelines do not list any particular beneficiaries, but state that the program should assist persons who have long-term problems accessing mortgage financing and have exhausted their potential to save for a downpayment. Exemptions from the latter may be granted for families with minor children and/or with particular social or health challenges, and for residents in public housing units.
- <sup>7</sup> The duty to dissuade is articulated in 46§47 [53]. Note that the applicant may still take out the loan even though they are advised against it.
- <sup>8</sup> The interest rate setting procedure for the State Housing Bank loan programs mimics those of e.g., the State Educational Loan Fund (student loans) and The Norwegian Public Service Pension Fund (mortgages for public sector employees). In addition, municipalities are allowed a 0.25 percentage point mark-up to cover their administrative costs.

- 9 Municipalities are fiscally responsible for the first 25% of any realized losses while the central government will absorb any additional losses.
- 10 Register data were not available for all mortgagors, and 61.8% of the cleaned sample was matched successfully.
- 11 We allow for minor discrepancies in the date and amount matching: matching is successful if the individual level ID matches and the dates are within 31 days of each other, grant amounts are within 5000 NOK of each other, and the loan amounts are within 40,000 NOK of each other across the two data sources. 1 USD = 5.817 2012 NOK [86].
- 12 We also trim the house price distribution by dropping observations with the 1% lowest and highest home price values.
- 13 Unfortunately, the mortgage servicing firm assumed this task after 2006 in many municipalities, and the past payment histories for previously issued mortgages were not available.
- 14 Note that the observation period differs between 36 and 48 months, depending on the month of mortgage origination. Hence, numerous observations are censored between 36 and 48 months.
- 15 Less than 10% of mortgages in Norway are fixed rate mortgages; see Statistical Table 5 [63].
- 16 Household equivalized income takes into account a household's size and composition, and therefore is comparable across different households. The equivalized income is calculated by dividing the household's total income by its equivalent size, in which the first adult is given weight 1, all additional persons aged 14 or over are given weight 0.5, and all children under the age of 14 are given weight 0.3, see [89].
- 17 The annual income figures are highly serially correlated. We therefore average for years  $t_0$  (origination year) and  $t + 1$ , as income figures are available only through 2013.
- 18 Information on medical leave is only available through year  $t + 2$  for all observations.
- 19 In Oslo, at the borough level.
- 20 For the standard negative binomial model, the dispersion parameter  $\alpha$  is estimated along with the coefficient vector  $\beta$ .
- 21 The respective coefficients on  $E_{ijm}$  are constrained to be equal to 1.
- 22 Although we acknowledge that mortgagors whose educational attainment is unknown have significantly higher expected 90-day delinquency among Western mortgage holders, and among Eastern European mortgage holders those with disability status have significantly fewer expected 90-days late payments. Note, however, that there very few observations with these characteristics in the respective country groups.
- 23 In previous estimations of our models, we employed calendar year fixed effects to control for climatic events that could affect utility costs, home repairs and maintenance required as well as other unmeasured user costs of owning. However, these were never significant.
- 24 Note that we have experimented with including variables to capture abrupt changes in the payment due from one month to the next, however, the estimated coefficients were never statistically significant. This indicates that the negative effect of interest-only debt servicing may not be immediate but rather lagged, or it may be cumulative or compounded over time, and in any case not necessarily tied to the precise point in time when the payment hike occurs.

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