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PHILADELPHIA

Working Papers
RESEARCH DEPARTMENT

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WP 22-01

PUBLISHED
January 2022

REVISED
April 2025

FRB CFI PHILADELPHIA

ISSN: 1962-5361

DOI: https://doi.org/10.21799/frbp.wp.2022.01

Democratic Political Economy of Financial Regulation*

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February 22, 2025

Abstract

This paper offers a simple theory of inefficiently lax financial regulation arising as an outcome of a democratic political process. Lax financial regulation encourages some banks to issue risky residential mortgages. In the event of an adverse aggregate housing shock, these banks fail. When banks do not fully internalize the losses from such failures (due to limited liability), they offer mortgages at less than actuarially fair interest rates. This opens the door to homeownership for young, low net-worth individuals. In turn, the additional demand from these new home-buyers drives up house prices. This leads to a non-trivial distribution of gains and losses from lax regulation among households. On the one hand, renters and individuals with large non-housing wealth suffer from the fragility of the banking system. On the other hand, some young middle-wealth households are able to get a mortgage and buy a house, and current (old) homeowners benefit from the increase in the price of their houses. When these latter two groups, who benefit from the lax regulation, constitute a majority of the voting population, then regulatory failure can be an outcome of the democratic political process. We find empirical support for this mechanism in the voting patterns in U.S. Congress, where members from districts with higher homeownership rates or lower income inequality (larger middle class) tended to vote for lax mortgage regulation prior to the Great Financial Crisis.

*We thank Dirk Krueger (editor), James MacGee, Simona Cociuba, James Vickery, anonymous referees, and seminar participants at the University of Western Ontario, the Bank of Canada, the Spring 2019 Midwest Macro Meeting, 2019 Society for Economic Dynamics meeting, 2023 BEROC Annual conference, and 2024 SAET meeting for their helpful comments and suggestions. The views expressed here are those of the authors and do not necessarily reflect those of the Federal Reserve Bank of Philadelphia, the Federal Reserve System, or the Bank of Canada.

1 Introduction

Many have argued that the "bubble" in the housing market, whose burst led to the Great Financial Crisis (GFC) of 2007–2008, was fueled by "irresponsible" lending practices of mortgage lenders (e.g., Acharya et al., 2011; Brunnermeier, 2009; Dell'Ariccia, Igan, and Laeven, 2012; Mian and Sufi, 2009). This excessive risk-taking by lenders (banks) was permitted by the regulatory environment of the early 2000s (see, for example, Bernanke (2010) and Zingales (2008)). In this paper, we point out that the democratic political process may lead to inefficiently lax banking regulation, which results in loose lending standards on mortgage loans and inflates a house-price "bubble." This occurs when the beneficiaries of such policy — existing homeowners, who benefit from the increased house prices, and wealth-poor home-buyers, who benefit from lower mortgage interest rates — outnumber its opponents — wealthy buyers and renters, who are exposed to the fragility of the financial system.

The economic mechanism underlying the political considerations is an intuitive one. Loose financial regulation permits some banks to adopt a "gambling" strategy of specializing in *risky* residential mortgages.[1] In the event of an adverse aggregate housing shock, these banks fail. Since these banks do not fully internalize the losses from such failures (due to limited liability), they offer mortgages at less than actuarially fair interest rates. This opens a door to homeownership for some young individuals with low net worth. In turn, the additional demand from these new home-buyers drives up house prices. All of this leads to a non-trivial distribution of gains and losses among households from lax regulation. On the one hand, renters and individuals with large non-housing wealth suffer from the fragility of the banking system induced by the lax regulation. On the other hand, some middle-income young households are able to get a mortgage and buy a house, thus benefiting from the lax regulation. Furthermore, the current (old) homeowners benefit from the increase in the price of their houses. If the latter two groups constitute a majority of the population, then regulatory failure can be an outcome of a democratic political process.

To capture this key mechanism, we present a parsimonious two-period model populated by overlapping generations of heterogeneous households. In the first period, initial old people are endowed with houses, while initial young are endowed with heterogeneous wealth. The young derive utility from owning a house and are thus interested in buying a house from the initial old or from the newly constructed stock. Construction technology is subject to decreasing returns to scale. Young households can finance a house purchase using their initial wealth and by taking on defaultable non-recourse mortgages from banks (or foreign investors). We abstract from idiosyncratic uncertainty, so the only source of mortgage defaults in the second period is a possible adverse realization of an aggregate house-value shock. Thus, mortgage portfolios are subject to aggregate risk. Limited liability on the side of the bankers generates a moral hazard — banks may be willing to issue risky mortgages at below actuarially fair interest rates, since

[1] This is viable if depositors are fully protected by deposit insurance, uninformed, or have no other investment options.

the bankers do not (fully) internalize the losses in the event of the adverse housing shock.[2] We abstract from the obvious misallocation of risk generated by such bank behavior by ignoring the risk-aversion of domestic depositors. We focus instead on the (mis)-allocation of investment. If banks lower their lending standards (i.e., issue mortgages at excessively low interest rates), the inflow of new borrowers (home-buyers) leads to higher home prices and a (possibly inefficient) construction boom. Thus, even in the absence of risk aversion, the model yields a meaningful moral hazard in banking, which needs prudential regulation to address it.[3] Prudential regulation in the model takes the form of a risk-weighted capital requirement.[4] We will refer to the level of regulation that achieves efficient allocation (i.e., the solution to the social planner's problem) as the efficient regulation.

The key finding of the paper is that the efficient level of regulation is likely *not* to be an outcome of a democratic process, and that a lax regulation is likely to be adopted instead. We offer sufficient conditions under which the laissez-faire equilibrium is preferred to the one under efficient regulation by a *majority* of agents in the economy. This majority is composed of two distinct groups — middle-wealth young buyers, who benefit from resulting lax lending standards and are thus able to finance purchasing a home, and old homeowners, who benefit from the increased house prices bid up by the additional buyers.

While this key finding is rather intuitive, it is worth noting that it demands some key ingredients from the model. For example, we would not get our main result without a decreasing returns-to-scale construction industry. If the stock of houses is fixed, then the only beneficiaries of lax regulation are the old homeowners, as the house price increase in equilibrium of that model absorbs all of the gains from lax lending standards and the pool of equilibrium home-buyers remains unchanged. Linear construction technology, in contrast, would preclude house prices from rising in response to lax banking regulation, thus eliminating any gains from lax regulation to the old homeowners and concentrating the benefits from such regulation to poorer young home-buyers only. Our model is thus a minimal environment needed to generate the *coalition* of young (poor home-buyers) and old (home-sellers) that favors lax regulation.

Our model further highlights the importance of wealth inequality for the analysis of the effects of financial regulation and the distribution of welfare benefits of any such regulation.[5] The implications of (an increase in) inequality are surprisingly rich. On the one hand, an increase in wealth inequality

[2] The ability of such banks to coexist with safe banks relies on the inability of (at least some) depositors to observe banks' balance sheets (or on deposit insurance making depositors immune to costs of bank failure).

[3] Another potentially important consideration we are abstracting from in our benchmark model is the dead-weight loss of a bank failure (though we do consider it in Section 7.3). Thus, (preventing) the misallocation of investment is the sole reason for banking regulation in our model.

[4] Of course, this simple form of regulation is meant as a stand-in for all manner of possible banking regulation, including branching restrictions in the US emphasized in Favara and Imbs (2015), as well as facilitation of securitization and implicit guarantees offered by Government Sponsored Enterprises, highlighted by Jeske, Krueger, and Mitman (2013).

[5] Given the stark nature of our almost single-period model, we do not make a distinction between income and wealth heterogeneity.

may lead to a larger share of prospective "subprime" borrowers, who can afford a house only under lax regulation and thus support deregulation. On the other hand, if an increase in inequality yields more young people who have no hope of ever buying a house, then that leads to an increase in support for strict financial regulation, which protects renters' meager savings. In this case, a coalition of "ends against the middle" (e.g., Epple and Romano, 1996a) arises, and greater inequality leads to weaker political support for deregulation.

We thus emphasize the importance of the "middle class" as proponents of deregulation. The marginal ("subprime") home-buyers are not the only young households benefiting from an inefficiently lax regulation. Infra-marginal ("prime") borrowers also take advantage of the low mortgage interest rates induced by deregulation and take on more debt.[6] Therefore, when housing becomes less affordable for the middle class due to stagnant income relative to house prices, politicians may face greater pressure to extend mortgage credit. This is consistent with the narrative proposed by Rajan (2010) and Calomiris and Haber (2014) that the economic decline of the American middle class influenced government policy toward subprime mortgage credit expansion.

We provide suggestive evidence of our mechanisms from U.S. congressional voting data. Following Mian, Sufi, and Trebbi (2013), we analyze six major mortgage-related bills introduced in the House of Representatives during 2003–2007. We find that representatives were more likely to co-sponsor or vote in favor of bills that proposed to relax mortgage regulation if they were from districts with higher home ownership rates or lower inequality of household income. From the point of view of our theory, this is consistent with politicians representing the interests of their constituents because those who already own homes and those in the middle of the income distribution (rather than those at the bottom or top) are the ones who would gain the most from lax regulation. To our knowledge, we are the first to document the relationship between politicians' voting behavior on mortgage-related legislation and constituency interests, as measured by income inequality and home-ownership statistics of their districts.

The political failure at the heart of our analysis is not so much a story of missing policy instruments as it is a result of relatively dispersed gains from lax regulation (a small increase in the house price benefiting every single homeseller and a small increase in mortgage mispricing benefiting many middle-income homebuyers) and relatively concentrated losses (of households with large deposits in the banking system). Banking regulation in our model is a sufficient instrument to induce "correct" pricing of mortgages and preclude an inefficient housing bubble. But our key finding is that such effective policy may be defeated in a democratic vote. Arranging a compensation scheme that would generate popular support for efficient regulation is theoretically possible but highly unrealistic — such a scheme would have to pay *some*

[6] In our model, deregulation yields not only an extension of more subprime mortgages but also increased mortgage debt in the prime segment, consistent with the key point of Adelino, Schoar, and Severino (2016), Foote, Loewenstein, and Willen (2020), and Albanesi, DeGiorgi, and Nosal (2022).

households not to buy a house, but only households with specific levels of wealth, as subsidizing all non-buyers would be wasteful and require excessive taxation to finance. Similarly, middle-income homebuyers benefiting from the mortgage "subsidy" in the unregulated economy would need to be targeted with a transfer in order to get their support for the efficient policy (and again, providing a transfer to all mortgage holders would be excessively costly).

It is worth noting that the political forces at play in the model are largely unaffected by the presence of deposit insurance. While deposit insurance eliminates the losses on deposits, it shifts the losses on mortgages in the bad aggregate state from depositors onto tax-payers.[7] The resulting distribution of policy preferences across the income distribution thus remains largely unchanged. The poorest young households, who can never afford a house, suffer from the additional tax burden under lax regulation without getting any of the benefit of subsidized mortgages. The richest young households bear the brunt of the additional tax burden, and thus also prefer tight regulation. And it is still the middle-wealth young who benefit from deregulation, as greater availability and more favorable pricing of mortgages more than compensates them for the extra tax burden. And the old home-owners still benefit from the higher house prices in the unregulated economy.

We further highlight the robustness of the basic mechanism by extending the model to include rental markets. If owner-occupied units can simply be converted to rentals, then rental rates and house prices move together, and this extension has little effect on the political forces. Lower-wealth home-buyers strictly prefer deregulation (since they strictly prefer owning a house, even at the inflated price, and also benefit from access to mispriced mortgages) while renters are strongly against it (since they suffer from inflated rents in addition to the risk of financial losses on deposits). On the other hand, when markets for owner-occupied and rental properties are fully segmented, the poorest renters may benefit from deregulation, since greater level of home-ownership lowers the demand for rental units and results in cheaper rents. This alternative assumption thus alters our "ends-against-the-middle" result, but it may make political failure even more likely by enlarging the popular support for inefficient deregulation.

The rest of the paper is organized as follows. The next subsection discusses related literature. Section 2 presents the model environment. Section 3 presents individual agents' problems and defines the economic equilibrium for a given set of policies (regulation). Section 4 characterizes two key benchmarks — the laissez-faire equilibrium and the socially efficient allocation — and analyzes the effects of financial regulation on economic equilibrium. Section 5 highlights the key finding of the paper and analyzes political economy aspects of the model. Section 6 presents supporting empirical evidence from the voting patterns in the U.S. Congress. Section 7 discusses the robustness of our results to relaxing some of the

[7]This statement assumes that the deposit insurance is financed (ex-post) by taxes. If the deposit insurance is financed (ex-ante) via insurance premia paid by banks, then the burden of mortgage losses remains on bank depositors, and the distribution of political support for (i.e., winners and losers from) banking regulation is entirely unaffected.

simplifying assumptions of the model. Section 8 concludes. All proofs are relegated to Appendix C.

1.1 Related Literature

This paper contributes to the growing literature on the political economy of the mortgage crisis and the housing boom that preceded it. Key early papers in this literature (Mian, Sufi, and Trebbi, 2010, 2013; Igan, Mishra, and Tressel, 2012) were empirical and focused primarily on the effects of lobbying by financial institutions (though often taking into account constituents' preferences as well).[8] We instead abstract from the political involvement of financial firms and focus on formalizing a specific economic mechanism in a democratic political setting and on characterizing explicitly which voters stood to gain from lax regulation. Our theory of constituency interest is empirically supported by congressional voting behavior. Although we confirm the findings of previous studies that politicians respond to campaign contributions from special interest groups, controlling for campaign contributions does not substantially alter the relationship between our measures of constituency interests — home-ownership and inequality — and politicians' voting behavior.

The paper closest in spirit to ours is Sheedy (2018), which shows that popular political pressure may lead to excessively loose monetary policy, inflating an asset price bubble and making the economy susceptible to financial crises. Two key distinctions between our papers are the policy in question (prudential versus monetary) and the nature of household heterogeneity (wealth inequality versus solely generational differences).[9] Due to lack of wealth heterogeneity in Sheedy (2018) and the resulting lack of the extensive margin of homeownership, all young and middle-aged voters vote as one in that model, and the nature of the political conflict is purely intergenerational. In contrast, we emphasize the importance of wealth heterogeneity among young prospective home-buyers and the political tension within a cohort between different parts of that wealth distribution.[10] Jeske, Krueger, and Mitman (2013) do incorporate wealth inequality in the model and explicitly identify winners and losers from an alternative policy (an implicit mortgage subsidy), but their analysis lacks the house price channel, which we argue is critically important, and they do not explicitly consider the political economy behind the policy choice.[11]

It is worth pointing out that this critical house price channel and the tension between homeowners

[8] A notable exception is Bolton and Rosenthal (2002), who theoretically analyze not only ex-post but also ex-ante implications of political intervention in debt enforcement.

[9] Tressel and Verdier (2014) also focus on the politics behind prudential regulation, but the political tension they focus on is that between bankers, entrepreneurs, and (uninformed) investors. In contrast, our analysis and that of Sheedy (2018) focus on the distribution of gains and losses among households and do not give banks a voice in the democratic process.

[10] As we discuss in detail in Section 5.3, this tension often generates the "ends-against-the-middle" feature, familiar from the literature on public education in the presence of a private option (Barzel, 1973; Epple and Romano, 1996a,b; Fernandez and Rogerson, 1995).

[11] Kiyotaki, Michaelides, and Nikolov (2011) also explicitly analyze winners and losers, but from an exogenous change in the economic environment rather than policy.

and renters are also present in the analysis of the political economy of local building restrictions (Ortalo-Magné and Prat, 2014; Parkhomenko, 2023). Gete and Zecchetto (2018) consider the effect of regulation on both house prices and rents, but in their model the two necessarily move in opposite directions, which implies that renters in their model support lax regulation. In contrast, our reasoning suggests that renters are hurt by lax regulation. Elenev, Landvoigt, and Van Nieuwerburgh (2016) consider the distribution of benefits from lax regulation across the wealth distribution, but largely abstract from the impact on the incumbent homeowners, who constitute a key part of the coalition supporting the deregulation.

Our paper is also clearly related to the ample literature on regulatory failure (ranging from rational, as in Brusco and Castiglionesi (2007), to failures driven by time-inconsistency of policy makers, as in Chari and Kehoe (2008) for example, to failures arising from the policy maker's own moral hazard, as in D'Erasmo, Livshits, and Schoors (2024)). Unlike the latter, we abstract from the agency problem of the regulator, and focus instead on the possible *democratic* political roots of regulatory failure.

2 Environment

We formulate a parsimonious almost-static model built to highlight the key economic mechanism. The model economy lasts for two periods. In the first period, it is populated by measure H_O of old people who own houses, and measure 1 of young people, who live for two periods.[12] Besides these individuals, the economy has foreign investors, who live for two periods, and construction firms, who operate in the first period. All agents in the economy are risk-neutral. Besides houses, which do not depreciate, there is a single perishable consumption good per period.

2.1 Households

Individuals consume perishable goods when old, and derive utility u from homeownership. Young households receive idiosyncratic income $w \in \mathbb{R}_+$ (of perishable goods) in the beginning of the first period, which is drawn from the continuous distribution $F(.)$.[13] We assume that F is strictly increasing over the support of the distribution (i.e., that there are no gaps in the distribution of wealth). We denote the aggregate endowment of young households by $W := \int w dF(w)$. The endowment can be spent on purchasing a house or invested in a bank. Households have no other investment technology.[14]

[12] Initial old individuals who do not own a home do not interact with the rest of the economy and are thus left out of the model.

[13] This can be thought of as random endowment of efficiency units of labor, which is inelastically supplied to goods-producing and construction sectors.

[14] We thus assume that households' supply of deposits does not respond to interest rates. Alternatively, this feature can be derived from a model of intertemporal consumption choice under Cobb-Douglas preferences, as long as the endowment

2.2 Banks and Foreign Investors

There is a continuum of foreign investors who can freely enter the domestic financial sector. These investors are risk-neutral and have access to the international capital market, where the risk-free rate of return is $\bar{r} = 0$. These investors may choose to open a bank in our economy, in which case they can accept deposits from domestic households, but they are then subject to any domestic banking regulation. Alternatively, they can invest (foreign) funds into the domestic mortgage market without opening a bank (we will refer to this as a "private equity" investor). Or they may choose to stay out of the domestic financial markets altogether.

2.3 Houses

There are H_O units of housing at the beginning of period 1. We will denote the measure of houses built in period 1 by I. Thus, the total measure of housing units traded in period 1 is $H = H_O + I$. We will assume $H_O \in [0, 1)$, so that the existing stock is not enough to accommodate all the young households. (This assumption makes sure that houses are not free in period 1.) Houses are subject to an aggregate valuation shock in the second period. (We are abstracting from idiosyncratic house-valuation shocks because only the aggregate shock is capable of affecting lenders with diversified mortgage portfolios.) The house value (price) in period 2 is either high, v, with probability p, or low, 0, with probability $(1 - p)$.[15] This exogenous future price shock is the simplest way to generate risky mortgages in the model.

2.4 Construction

New houses are produced by measure 1 of competitive construction firms with identical decreasing returns-to-scale production functions. The firms are owned by old households.[16] The cost of producing I units of housing is $k(I)$, which is strictly increasing, strictly convex, and differentiable, and satisfies $k(0) = k'(0) = 0$.

arrives only in the first period of life (as in D'Erasmo, Livshits, and Schoors (2024)). Importantly, this assumption of non-responsiveness of depositors to banks' riskiness is supported by new empirical evidence in Correia, Luck, and Verner (2024).

[15]The latter is more than a normalization, as this implies zero recovery for the lenders in the event of a foreclosure. Appendix B presents an extension of our model with strictly positive value of houses in the adverse state. That extension yields both safe and risky mortgages and offers not only a robustness check but also a more clear interpretation of some of the assumptions we impose on the model.

[16]Alternatively, we can assume that the construction firms are foreign-owned.

2.5 Investments and Financial Markets

Households can finance their house purchases by issuing mortgages. Mortgages are non-recourse, which immediately implies that they will be repaid in equilibrium only if the value of the house (weakly) exceeds the face value of the mortgage. All "underwater" mortgages are defaulted on. The mortgage interest rates are endogenous and reflect the implied risk of default.

Banks can invest in two types of assets: safe projects with deterministic rate of return $\bar{r} = 0$, and mortgages, which are defaultable. We will denote bank j's investments in the safe assets by s_j, and investments in mortgages by m_j. The bank's balance sheet can be put simply as $s_j + m_j = e_j + d_j$, where e_j is the bank's equity and d_j is the amount of deposits in bank j.

Note that the households in this economy cannot invest in the safe (foreign) assets directly. The banks are households' only savings outlet, which means that the aggregate supply of deposits is affected by the housing and mortgage markets, rather than by the rate of return on deposits.[17] Furthermore, we assume that households are unable to observe banks' balance sheets.

2.6 Regulation

A regulatory authority can impose capital requirements on banks operating in the economy. (By "operating" we mean accepting deposits.) We assume that this capital requirement is risk-weighted, and that the regulator observes the asset allocation of a bank. A capital requirement prescribes that bank(er)s must own fraction $\alpha \in [0, 1]$ of the bank's risky investments in mortgages,

$$e_j \geq \alpha m_j, \tag{1}$$

where e_j is bank j's equity and m_j is the bank's risky mortgage investments. We are thus assuming that investments in safe assets have a risk weight of 0 in banking regulation.

3 Economic Equilibrium

This section spells out individual agents' problems and defines the economic equilibrium of the model for any given regulation. We first present the optimization problems faced by individual agents in the economy, taking net interest rates on deposits (i) and on mortgages (r), as well as house prices (q), as given. Recall that the net rate of return on safe assets has been normalized to 0. Households further take as given the fraction of deposits τ that are lost in the event of the adverse aggregate house-valuation

[17] This can be thought of as a result of a tax-financed deposit insurance, which is discussed in Section 7.4.2.

shock. We then define the economic equilibrium, which determines the market-clearing values of these prices for any given policy. Since houses are worth 0 in the second period in the adverse aggregate state and mortgages are assumed to be non-recourse, all mortgages are necessarily risky. Rather than explicitly expressing the mortgage default decision, we save on notation by taking as given that mortgages are not repaid in the adverse aggregate state.

3.1 Banks' Problem

On the liability side, a banker (a foreign investor who chooses to open a bank) selects the level of equity (capital) in the bank $e \in \mathbb{R}_+$ and the amount of deposits d it accepts. She then chooses how to allocate these funds between investments in the safe assets, s, and risky mortgage loans, m. Mortgage loans are risky in the sense that they are not paid back in the second period in the adverse aggregate state of houses being worthless, which occurs with probability $(1-p)$.

The (foreign) investors' profit maximization problem is as follows.

Problem 1. *Taking interest rates r and i as given, an investor solves*

$$\begin{aligned} \max_{(d,e,m,s)\in\mathbb{R}^4_+} & \left\{(1-p)\max\left\{s-(1+i)d,0\right\}+p\left[(1+r)m+s-(1+i)d\right]-e\right\} \\ \text{subject to} \quad & m+s=d+e, \\ \text{and} \quad & e \geq \alpha m \quad \text{if} \quad d>0. \end{aligned}$$

Since the investor's problem is linear, any competitive equilibrium has to yield zero expected profits in the financial sector. For the same reason, we can restrict attention to equilibria where individual banks and investors completely specialize — they invest either only in mortgages or only in safe assets.

Lemma 1. *For any equilibrium of our economy in which individual banks (and investors) purchase both mortgages and safe assets, there is an outcome-equivalent equilibrium in which individual banks (investors) specialize.*

Thus, without loss of generality, we will focus on the case where banks specialize in holding a single type of asset. We will refer to banks holding only safe assets as "safe banks," and we will refer to banks purchasing (risky) mortgages as "mortgage banks." Note that a "private equity investor" is basically just a mortgage bank that does not accept deposits (and thus is not subject to any banking regulation).

3.2 Construction Firms' Problem

The construction firm's problem is

Problem 2. *Taking house price q as given, a construction firm solves*

$$\pi := \max_{I \in \mathbb{R}_+} \left\{ qI - k(I) \right\}.$$

3.3 Households' Problem

Young households choose whether to buy a house (this binary decision is denoted by $h \in \{0, 1\}$), and what size mortgage to undertake to finance the purchase. Their problem is then simply

Problem 3. *Taking house price q, interest rates r and i, fraction of deposit at risk τ, and their own wealth w as given, households solve*

$$\max_{h \in \{0,1\}, (d,m) \in \mathbb{R}^2_+} \left\{ uh + (1-p)c_L + pc_H \right\}$$

$$\text{subject to} \quad d + qh = w + m, \tag{2}$$

$$c_L = (1+i)(1-\tau)d, \tag{3}$$

$$c_H = (1+i)d + vh - (1+r)m,$$

$$(1+r)m \leq vh, \tag{4}$$

where v is the house price in the second period in the absence of the adverse aggregate housing shock.

Note that constraint (3) incorporates (partial) loss of deposits due to failure of mortgage banks, and that constraint (4) is the endogenous borrowing constraint in our environment.

Old households' problem is trivial — they simply consume proceeds from the sale of their houses (q) and the profits of construction firms (π). Old homeowners consume

$$c_o = q + \pi,$$

while old non-owners consume $c_n = \pi$.

3.4 Equilibrium Definition

For any given regulation, the equilibrium in this economy is characterized by the house price q in the first period, interest rates i on deposits and r on mortgages, the measure I of houses constructed, and policy functions of bankers and households (functions of individual wealth), such that policy functions solve individuals' maximization problems and all markets clear. In formally defining the equilibrium, we will save on notation by calling on Lemma 1 to allow us to separate financial firms into "mortgage banks" with total deposits D_M and total assets M_M, "safe banks" with total deposits D_S, and "private equity investors" holding M_P worth of mortgages. This means that the fraction of deposits at risk is simply the fraction of households' deposits placed in the mortgage banks: $\tau = \frac{D_M}{D_M + D_S}$.

Definition 1. *A competitive equilibrium in this economy consists of prices* (q, i, r)*, household policy functions* $\big(h(w), m(w), d(w)\big)$*, housing output I of the representative construction firm, banking allocation* (D_M, M_M, D_S, M_P)*, and share* τ *of household deposits held in "mortgage banks," such that*

1. *Households' policy functions solve their maximization Problem 3.*
2. *Investors' allocation solve their maximization Problem 1.*
3. *Construction firms' allocation solves their maximization Problem 2.*
4. *Markets clear:*
   - *(a) Housing market clears:* $H_O + I = \int h(w)dF(w)$.
   - *(b) Mortgage market clears:* $M_M + M_P = \int m(w)dF(w)$.
   - *(c) Deposit market clears:* $\int d(w)dF(w) = D_M + D_S$.

We will denote the total deposits in the economy by $D = D_M + D_S$, the total mortgage debt by $M = M_M + M_P$, and the total housing stock by $H = H_O + I$. We omit the market clearing in the safe assets market as the linear safe technology and the open-economy nature of the environment simply imply the safe interest rate of $\bar{r} = 0$.

4 Economic Outcomes

In this section we present the key economic insights from our model, which we then use as input into the political economy model. In order to do so, we begin by describing two key benchmarks — the laissez-faire equilibrium and the socially-efficient allocation — and then explicitly characterize the effects of financial regulation on equilibrium outcomes.

4.1 Preliminary Results

We begin by establishing a few basic points regarding the economic equilibria in this model before proceeding to establish the key results. The first two lemmata lay out key points regarding housing supply and demand, respectively. The next two lemmata expose key features of the financial sector in equilibrium. And the last two lemmata provide basic insights into the effects of banking regulation.

Lemma 2. *Since $H_O < 1$, there is a strictly positive level of construction in equilibrium, and the equilibrium house price is equal to the marginal cost of building a house:*

$$q = k'(I) \tag{5}$$

Lemma 3. *Young households with wealth below $\underline{w}$ cannot afford to buy a house, where*

$$\underline{w} \coloneqq q - \frac{v}{1+r}. \tag{6}$$

Note that the threshold $\underline{w}$ may be negative in equilibrium, in which case, every young household can afford to buy a house. The expression $q - \frac{v}{1+r}$ can be thought of as the "private user cost" of a house, and the lemma simply states that a young home-buyer has to be wealthy enough to afford that user cost.[18]

Lemma 4. *For any equilibrium of our economy, there is an outcome-equivalent equilibrium in which individual banks and investors specialize and banks (which accept deposits) hold just the minimum amount of equity required by regulation.*

This lemma builds on Lemma 1 and allows us to separate mortgage banks, which hold the minimum required equity, from private-equity investors issuing mortgages.

Lemma 5. *Bankers make zero expected profits in all activities operating in equilibrium and non-positive profits on activities that are not operating:*

1. *The expected rate of return to the owners of a mortgage bank does not exceed $\bar{r} = 0$, and is equal to 0 if there are mortgage banks in equilibrium:*

$$p\big[(1+r) - (1+i)(1-\alpha)\big] - \alpha \leq 0, \qquad \textit{with equality if } D_M > 0. \tag{7}$$

2. *The expected return to the owners of a safe bank does not exceed $\bar{r} = 0$, and is equal to 0 if there are safe banks in equilibrium:*

$$i \geq 0, \qquad \textit{with equality if } D_S > 0. \tag{8}$$

3. *The expected return to investing own wealth does not exceed $\bar{r} = 0$, and is equal to 0 if there is any private-equity investment in mortgages in equilibrium:*

$$p(1+r) - 1 \leq 0, \qquad \textit{with equality if } M_P > 0. \tag{9}$$

[18] The *social* (marginal) "user cost" of an additional house is $k'(I) - pv$.

Note that at most two types of investment firms (activities) are present in any equilibrium (i.e., $D_S D_M M_P = 0$ in equilibrium).

In what follows, it will be convenient to refer to the actuarially fair interest rate on mortgages (from the foreign investors' perspective) as $r^* := \frac{1}{p} - 1$.

Lemma 6. *As long as $\alpha < 1$, the equilibrium features some mortgage banks ($D_M > 0$), there is a strictly positive probability of bank failure ($\tau > 0$), and the mortgage interest rates satisfy $r = \alpha r^* + (1 - \alpha) i$ with $i \in [0, r^*]$.*

That means that the only way to preclude the possibility of a bank failure is to prohibit channeling *any* of the households' deposits into mortgages by setting $\alpha = 1$. That extreme policy simply rules out what we call "mortgage banks," i.e., banks that accept deposits and invest in nothing but mortgages.

Lemma 7. *The extreme regulation $\alpha = 1$ shuts down mortgage banks ($D_M = 0$), prevents all bank failures ($\tau = 0$), and results in interest rates $i = 0$ and $r = r^*$ on deposits and mortgages, respectively.*

4.2 Laissez-Faire Equilibrium

Unregulated banking equilibrium necessarily features zero-equity mortgage banks, which simply funnel households' deposits into mortgages. The competition among these banks implies that the interest rate i promised on deposits is the same as the interest rate r charged on mortgages.

Lemma 8. *In any laissez-faire equilibrium (i.e., whenever $\alpha = 0$), mortgage banks are active but hold no equity ($M_M = D_M > 0$). Thus, $\tau > 0$ and $i = r$ in any laissez-faire equilibrium.*

Using this basic insight, we can characterize the banking equilibrium in the absence of financial regulation.

Proposition 1. *The laissez-faire banking equilibrium takes one of three possible forms:*

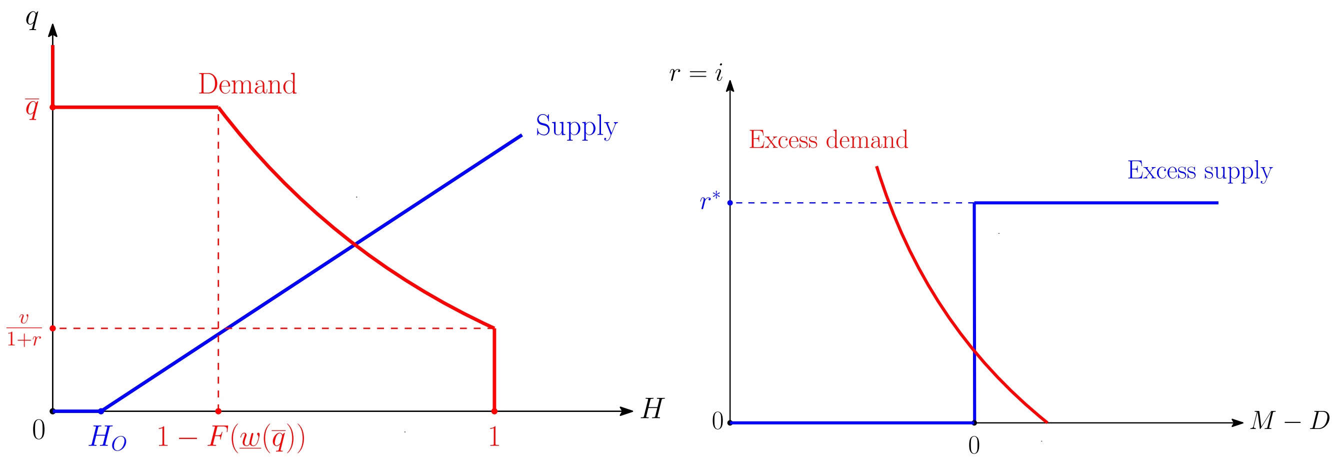
1. *Current-account surplus ($D > M$): Household deposits exceed mortgages in equilibrium and some of these deposits are placed in safe banks and invested in safe assets (abroad). In this equilibrium, $i = r = 0$ and $0 < \tau < 1$.*

2. *Current-account balance ($D = M$): The amount deposited by households is exactly equal to the amount of mortgages issued. Zero-equity mortgage banks are the only activity in the banking sector. Thus, $\tau = 1$, while $0 \le i = r \le r^*$.*

3. *Current-account deficit ($D < M$): Household deposits are insufficient to finance all of the mortgages. Some mortgages are issued by (foreign) investors who do not accept deposits. In this case, $i = r = r^*$ and $\tau = 1$.*

The current-account surplus equilibrium has both mortgage banks and safe banks operating (with households unable to tell them apart). Private-equity investors are inactive in this equilibrium. In contrast, current-account deficit equilibrium has no safe banks, but the private-equity investors do issue mortgages. Lastly, neither safe banks nor private-equity investors find it worthwhile to operate in a current-account balance equilibrium.

We now turn to the determination of the level of interest rates in (and the type of) equilibrium, along with the house price. This economic equilibrium is pinned down by market clearing in housing and financial markets, which is illustrated in Figure 1.



(a) Housing market (b) Financial market

Figure 1: Laissez-Faire Equilibrium

In the housing market, the supply (beyond the H_O units supplied inelastically by the old) is driven entirely by the construction sector and is fully characterized in Lemma 2. Simply equating the house price q to the marginal cost of building a house $k'(I)$ yields the mapping $I^S(q)$ from the house price to the construction level:

$$k'\left(I^S(q)\right) = q.$$

We have thus characterized the level of housing supply as $H_O + I^S(q)$. The demand for houses is determined in large part by the ability of young households to afford a house, characterized in Lemma 3. The other key consideration is the maximum "willingness to pay" for a house, $\overline{q}$, which reflects the utility of ownership, the present value of the house's resale value next period, and the possible financial benefits of taking out a mortgage and of investing own wealth outside of the banking system:[19]

$$\overline{q} := \frac{1}{1+r}\left[\frac{u}{1-\tau(1-p)} + v\right]. \tag{10}$$

[19]Please see Appendix A for a more detailed discussion and the derivation of this expression.

As long as the house price is strictly below the households' maximum willingness to pay $\overline{q}$, every young household who can afford a house buys one. Thus, the housing demand for $q < \overline{q}$ is given by $1 - F(\underline{w}(q))$, where $\underline{w}(q)$ is given by equation (6). Of course, the demand for houses cannot exceed 1, so the demand curve is vertical for prices below $\frac{v}{1+r}$ because every young household buys a house at those prices. At the other end, the demand curve is horizontal at $q = \overline{q}$ because young households are indifferent between buying a house at the price $\overline{q}$ and not buying a house.

While the housing supply is unaffected by interest rates, the housing demand curve shifts down whenever the mortgage interest rate r increases. An increase in r lowers both households' willingness to pay for a house and their ability to afford one. Thus, a higher mortgage interest rate translates into a lower house price and a lower quantity of transactions in the housing market (thus lowering the demand for mortgages in the financial market).

The financial market is represented on the right panel of Figure 1, which incorporates the equilibrium condition $i = r$. The "excess demand" for mortgages (which we define as the difference between mortgage demand from the households M and their supply of deposits D) is driven primarily by the housing market equilibrium and the amount of housing purchases. As we have just argued, this equilibrium quantity of housing transactions is monotonically decreasing in interest rates. Thus, the excess demand for mortgages $M - D = qH - W$ is decreasing in the r (i.e., the demand curve is downward-sloping).[20] The "excess supply" of mortgages, which is the net position of the foreign investors (bankers), is 0 as long the interest rates are strictly between 0 and r^*. If interest rates fell below 0, the foreign investors would borrow infinite amounts from domestic households and invest the funds in safe foreign assets. If interest rates were above the actuarially fair mortgage rate r^*, these investors would borrow abroad and offer to supply an infinite amount of mortgages. Thus, the excess supply curve turns horizontal at $i = r = 0$ and $i = r = r^*$. This excess supply curve can be seen as an illustration of Proposition 1.

4.3 Efficient Allocation

In order to establish the benchmark for policy analysis, we characterize the efficient allocation. Our notion of efficiency amounts to maximizing the utilitarian social objective (the sum of households' utilities) subject to the resource constraint and the (foreign) investors' participation constraint. We formulate the social planner's problem as a choice of consumption, housing investment, and state-contingent asset position in period 1. These state-contingent securities are traded in the world financial market with risk-free interest rate $\overline{r} = 0$, and there prices simply reflect the probability of the respective (aggregate) states. I.e., this is the problem of a country's social planner who has access to the world financial market.

[20] The expression for $M - D$ can be obtained by simply aggregating the budget constraint (2) across all young households.

Problem 4. *The utilitarian social planner solves*

$$\max_{I,C_O,A_L,A_H} \left\{C_O + u(H_O + I) + (1-p)C_L + pC_H\right\}$$
$$\text{subject to} \quad C_O + (1-p)A_L + pA_H = W - k(I),$$
$$C_L = A_L,$$
$$C_H = v(H_O + I) + A_H,$$
$$1 - H_O \geq I \geq 0, \quad C_O \geq 0, \quad C_L \geq 0, \quad C_H \geq 0,$$

where C_O is the consumption of the initial old households, A_L and A_H are the planner's holdings of state-contingent securities paying 1 in period 2 in the event that the house value is low or high, respectively, and the prices of these securities in period 1 are $(1-p)$ and p, respectively.

This social planner's problem is essentially an optimal housing investment problem with transferable utility (subject to non-negative consumption constraints).[21] This is well illustrated by simply plugging in the resource constraints of Problem 4 into the objective function, which yields:

$$\max_I \left\{W - k(I) + (u + pv)(H_O + I)\right\}. \tag{11}$$

The solution to this modified problem simply equates the marginal value of an extra house to the marginal cost of building one. More formally, define I^* to be the level of construction that equates the marginal cost to marginal benefit:

$$k'(I^*) = u + pv. \tag{12}$$

This level of construction is the solution to the social planner's problem, unless the economy simply does not need that many houses or cannot afford it even after pledging the future (resale) value of the house along with the non-housing wealth (i.e., after setting all of the non-housing consumption to 0). We formalize these notions of need and affordability with the following assumptions:

Assumption 1. *There are enough young households to absorb the level of construction I^*, along with the stock of existing houses. That is, $1 - H_O \geq I^*$.*

Assumption 2. *The total resources that the social planner can pledge are sufficient to finance the efficient level of construction I^*. That is, $W + pv(H_O + I^*) \geq k(I^*)$.*

Proposition 2. *Under Assumptions 1 and 2, the socially optimal level of construction is I^*, defined in (12).*

[21]The linearity of the social objective function implies that the optimal level of housing in the problem above remains the same when the planner puts lower (or no) weight on the consumption of the initial old households.

If Assumption 2 is violated, the solution to the social planner's problem is simply to set all non-housing consumption to 0 and to build as many houses as the economy can afford (given by $W + pv(H_O + I) = k(I)$). We think that Assumption 2 is a very mild one and will impose it for the rest of the paper.

Note that neither the laissez-faire allocation nor the one obtained under the most restrictive regulation ($\alpha = 1$) is necessarily efficient. The regulated allocation may have an inefficiently low level of construction (and, thus, of homeownership). This inefficiency arises from the inability of poorer young households to afford a house and the lack of redistribution of wealth in the decentralized economy, and is exacerbated by the indivisibility of the housing units. In contrast, the laissez-faire allocation may result in *over*-construction due to the moral hazard in banking that we are emphasizing. Low mortgage interest rates (lower than actuarially-fair rate r^*) can offer a path to homeownership to too many young households, leading to an inefficient boom in house prices and construction. Note however that this housing boom need not be inefficient in general, as it may be undoing the inefficiently low level of construction in the fully regulated equilibrium.

The basic insight of Proposition 2 extends to the more general notion of efficiency, that of Pareto efficiency. More specifically, excess construction cannot be part of a Pareto optimal allocation.

Proposition 3. *No allocation with $I > I^*$ is Pareto efficient.*

To see that, consider the following improvement on the excess-construction allocation: Reduce construction by one house (thus saving $k'(I)$ units of good in the first period) and invest the savings into v units of the state-contingent asset paying in the high aggregate state (the price of which is p) and the remaining $(k'(I) - pv)$ into the risk-free asset. The former investment exactly compensates for the loss of resale value of the extra house, while the latter more than compensates any individual for the loss of utility of homeownership, since in the excess-construction allocation $k'(I) - pv > k'(I^*) - pv = u$. Non-negativity of consumption constraints prevents us from making a similar argument for improving over some allocations with $I < I^*$. Yet, the key messages that I^* is the natural efficiency benchmark and that over-construction (building more than I^*) is not efficient extend from the simple utilitarian objective to the wider notion of Pareto efficiency.

4.4 Inefficiency of the Laissez-Faire Equilibrium

We can now turn to the question of whether the laissez-faire equilibrium allocation is efficient, or whether there is room for financial regulation to improve efficiency. The condition for efficiency of an equilibrium allocation is very natural and intuitive. Recall that the equilibrium house price is always equal to the marginal cost of building a house, $q = k'(I)$, under any financial regulation. Proposition 2 thus implies that the equilibrium level of construction is inefficiently high whenever the equilibrium house price q

exceeds what we will call the fundamental value of the house, $u + pv$. We will call such an equilibrium a housing bubble. In the remainder of this subsection, we offer sufficient conditions for such a housing bubble to occur. That is, we present conditions under which financial regulation that restricts mortgages (thus limiting construction in equilibrium) can improve efficiency (and aggregate welfare).

For ease of analysis, we restrict attention to economies where the laissez-faire equilibrium is a current-account surplus (and as we will establish later, so are equilibria under financial regulation).[22] An easy way to guarantee the current-account surplus is to make sure that the total wealth (supply of deposits) in the economy exceeds the largest possible demand for mortgages.

Assumption 3. *The aggregate wealth of young households is large enough to exceed the largest possible demand for mortgages. That is,* $W > \frac{u}{p} + v$.

Note that Assumption 3 immediately implies Assumption 2.

Lemma 9. *Under Assumption 3, the laissez-faire equilibrium is a current-account surplus and the equilibrium interest rates are* $i = r = 0$.

Assumption 3 thus implies that the mortgage interest rate in the laissez-faire equilibrium does not reflect the risk of default. This immediately implies that young households are willing to pay more for a house than its fundamental value (equation (10) guarantees that $\overline{q} > u + pv$). However, in order to make sure that the equilibrium price of a house exceeds the fundamental value, we need to make sure that enough of these young households can afford to buy a house. Thus, the second condition needed to guarantee excess construction in equilibrium concerns the *distribution* of the wealth of young households.

Assumption 4. $F\big(u - (1-p)v\big) < 1 - H_O - I^*$.

Note that I^*, given by equation (12), is uniquely pinned down by model parameters. The assumption requires simply that the demand for houses exceeds the supply when the price is equal to the fundamental value. Given that mortgage interest rate $r = 0$, the housing demand at $q = u + pv$ is $1 - F(\underline{w}(u + pv)) = 1 - F(u - (1-p)v))$. The housing supply at that price is $H_O + I^*$.

We are now ready to state the sufficient conditions for an inefficient housing bubble:

Proposition 4. *If Assumptions 3 and 4 are satisfied, then the laissez-faire equilibrium allocation is inefficient — the equilibrium amount of housing construction exceeds the efficient level.*

[22] As we show later, financial regulation leads to an increase in the mortgage interest rate in current-account surplus economies, thus suppressing housing demand. In economies where the laissez-faire equilibrium is a current-account deficit or a current-account balance, imposing financial regulation may actually *lower* the mortgage interest rate (see Appendix D for the characterization of equilibrium and the effects of regulation in that economy). This counter-intuitive force implies that effects of financial regulation on the overall mortgage demand, the house price, and the equilibrium level of construction are ambiguous when the economy does not start out in a current-account surplus.

In this laissez-faire equilibrium, lax lending standards (mortgage interest rates that do not fully reflect the risk of default) lead to inefficiently high levels of housing construction, as too many young households buy a house. This result comes about when the total supply of deposits exceeds the total demand for risky mortgages, since in that case the mortgages are (mis)priced by the gambling unregulated banks and not by foreign investors. A straightforward extension of our model that allows for safe, as well as risky, mortgages (by setting the price of house in the adverse aggregate state to $v_L > 0$ — see Appendix B) highlights that the relevant condition is that deposits exceed only the *risky portion* of the mortgages (which can be thought of as just the risky tranches of mortgage-backed securities).

Since the laissez-faire equilibrium features an inefficient housing bubble, imposing restrictions in the mortgage market is efficiency-improving. With this in mind, we now turn to financial regulation.

4.5 Effects of Banking Regulation

By forcing banks to back mortgage investments with equity, financial regulation can limit the mispricing of mortgage debt that underlies the inefficient housing boom described in the previous subsection. It is worth reiterating that since everyone in our economy is risk-neutral and there is no dead-weight loss associated with bank failures, the role of banking regulation in our model is quite distinct from the usual prudential concern. The welfare (efficiency) impact of the policy is driven by housing market outcomes, not by changes in the probability or severity of bank failures. In this subsection, we characterize the effects of banking regulation on economic equilibrium outcomes and point out the winners and losers from such regulation.

Speaking of winners and losers, we choose to focus on the environment where young people strictly prefer buying a house to not buying one, i.e., where access to the mortgage market is strictly beneficial. As we show later, this implies that young households always prefer regulation that allows them to buy a house to one that precludes them from being able to afford it. A sufficient condition for that is:

Assumption 5. $F(u) > 1 - H_O - I^*$.

This assumption on the distribution of wealth among the young ensures that the equilibrium house price is "interior" (see Figure 1).

Proposition 5. *If Assumptions 3 and 5 hold, then* $q < \overline{q}$ *for all* α.

Under Assumption 3, increasing the capital requirement α leads to a higher equilibrium mortgage interest rate r (as we establish in Lemma 10 below), and thus lowers the house price q and the level of construction I (see Proposition 6). The regulation also lowers the share τ of deposits in risky banks. As a result, banking regulation benefits two groups of young households: renters, who benefit from higher expected return on their deposits, and wealthy home-buyers, who benefit in addition from the lower house price. In contrast, less wealthy home-buyers suffer from the decrease in "mortgage subsidy" and some lose the ability to purchase a house altogether. Of course, initial old homeowners suffer from the decrease in the price they receive for their houses.

To formalize these arguments, we begin with establishing some basic economic effects of the banking regulation.

Lemma 10. *Under Assumption 3, the equilibrium is current-account surplus and the equilibrium interest rates are* $i = 0$ *and* $r = \alpha r^*$.

This result comes directly from Lemma 9 and the (mortgage) bankers' problem. The following result is of a more technical nature and allows us to simplify the exposition:

Lemma 11. *Under Assumption 3, for any equilibrium of our economy in which households take out mortgages of various sizes, there is an outcome-equivalent equilibrium in which all home-buyers take out the largest possible mortgage* $\left(m = \frac{v}{1+r}\right)$.

Moreover, this maximum leverage equilibrium is the only possible equilibrium under Assumption 3 whenever $\alpha < 1$. This result is quite intuitive — the expected interest rate that households receive on their deposits exceeds the expected interest rate they pay on their mortgages, whenever equilibrium is a current-account surplus. This is particularly easy to see in the laissez-faire case, where the promised interest rates on both deposits and mortgages are at 0, but while the mortgages are repaid only in the good aggregate state, the deposits yield partial repayment (a fraction $(1 - \tau) = 1 - M/D$) even in the adverse state. Hence, we will simply characterize the maximum leverage equilibrium in the rest of the section.

The best way to illustrate why the house price is decreasing in regulation is to turn to the left panel of Figure 1 and to note that, while the supply of housing is unaffected by banking regulation, the demand curve shifts down when regulation tightens (α increases). We apply Assumption 5 to make sure that the equilibrium is an "interior" one (i.e., $q < \overline{q}$), which implies that the demand for houses is simply $1 - F(\underline{w}) = 1 - F\left(q - \frac{v}{1+r}\right)$. And since interest rate r is increasing in α, the regulation decreases the demand for houses by increasing the threshold wealth level $\underline{w}$ needed to afford a house. We formalize all of this in the following proposition:

Proposition 6. *Under Assumptions 3 and 5, the equilibrium house price* q *and the level of construction* I *are decreasing in banking regulation parameter* α*, the fraction of deposits at risk* τ *is strictly decreasing in* α*, and the threshold wealth level for house affordability* $\underline{w}$ *is strictly increasing in* α.

One immediate corollary of Proposition 6, which is important for establishing (the distribution of) benefits of regulation, is the observation that the expected rate of return on deposits is increasing in the tightness of regulation α.

The lower level of construction due to regulation need not be an efficiency improvement in general, as the laissez-faire level of construction may be inefficiently low. But under Assumption 4, some degree of financial regulation is efficiency-improving. In contrast, under Assumption 5, maximum regulation leads to under-provision of houses (relative to the utilitarian social optimum).

Proposition 7. *If Assumptions 3 and 5 hold, then the equilibrium with maximum regulation ($\alpha = 1$) has an inefficiently low level of construction.*

Notably though, the basic political-economy mechanism (i.e., the distribution of winners and losers from financial regulation) is the same, regardless of whether the regulation is efficiency-enhancing. For example, the initial old homeowners prefer higher house prices, regardless of whether that price exceeds the fundamental value of the house or not. We turn to a more detailed discussion of gains and losses from financial regulation in the next section.

5 Political Economy

The key question of this paper is what gives rise to insufficient financial regulation, which in turn leads to an inefficient housing boom. In order to answer that question, we begin by identifying who benefits from lax regulation. We then offer sufficient conditions for the complete lack of regulation to defeat the socially efficient level of regulation in a simple majority vote.

5.1 Winners and Losers

Under the assumptions of our model, lax banking regulation, which leads to looser lending standards, benefits two groups of households — relatively poor young home-buyers, who benefit from depressed mortgage interest rates (including the marginal home-buyers, who would not be able to finance a house under tight lending standards), and old home-sellers, who enjoy the higher house prices induced by the additional housing demand. These observations follow directly from Proposition 6, which guarantees that both the house price and the fraction of young households buying a house are higher under lax regulation. There are also two groups that are harmed by lax regulation — wealth-poor renters, who receive lower expected return on their deposits, and relatively wealthy home-buyers, for whom losses from the lower expected return on deposits outweigh the gains from mispriced mortgages.[23]

[23]By assuming that households are risk-neutral, we are abstracting from the additional cost of the deposits becoming risky under lax banking regulation. But the key insights carry over to a more general environment with risk-averse households. Old homeowners and marginal home-buyers still prefer loose regulation, while renters-depositors and wealthy home-buyers suffer even more from the lack of regulation, as their deposits become more risky.

In order to formalize these statements in Proposition 8, it is helpful to define some conceptual notation. First of all, we will make explicit that the equilibrium values of variables are dependent on the chosen policy level. For example, we will use $\underline{w}(\alpha)$ to refer to the wealth level of a marginal home-buyer when the banking regulation parameter is set at α. Note that Proposition 6 implies that, under Assumptions 3 and 5, $q(\alpha)$, $I(\alpha)$, and $\tau(\alpha)$ are decreasing in α, while $\underline{w}(\alpha)$ and $r(\alpha)$ are increasing in α. It will be convenient to define the expected rate of return on deposits $\tilde{i}(\alpha)$. Since the promised interest rate $i = 0$ in equilibrium (under Assumption 3), the expected realized rate is $1 + \tilde{i}(\alpha) = 1 - (1-p)\tau(\alpha)$, which is increasing in α. We will additionally define $U(w;\alpha)$ — the expected utility level of a young household with wealth w obtained in equilibrium with regulation parameter α. In any maximum-leverage equilibrium, the expression for this indirect utility is simply

$$U(w;\alpha) = \begin{cases} w\big(1+\tilde{i}(\alpha)\big), & \text{for } w < \underline{w}(\alpha), \\ u + \big(w - \underline{w}(\alpha)\big)\big(1+\tilde{i}(\alpha)\big), & \text{for } w \geq \underline{w}(\alpha). \end{cases} \tag{13}$$

This mapping, unlike the other policy-to-equilibrium mappings, need not be monotone in α. Young households at the bottom of the wealth distribution benefit from tighter regulation as it increases the expected rate of return $\tilde{i}(\alpha)$ on their savings. The same goes for the richest young households, with w high enough that the improvements in the expected return on deposits outweigh the decline in mortgage subsidy reflected in equation (13) by an increased value of $\underline{w}(\alpha)$. But things are a lot more complicated, and interesting, in the middle of the wealth distribution.

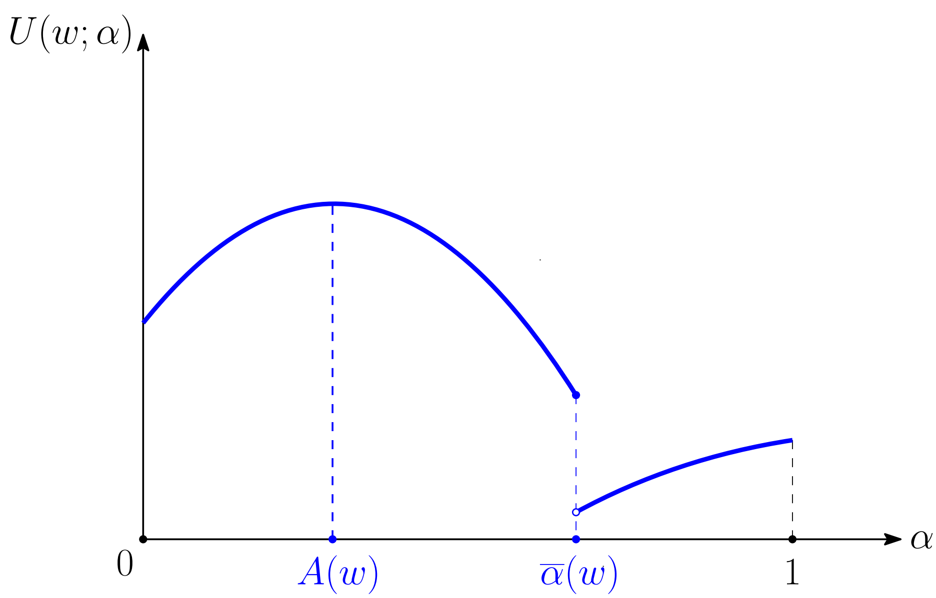


Figure 2: Indirect Utility

We illustrate this relationship between the level of regulation and the indirect utility of a middle-wealth young household in Figure 2. Consider a young household with wealth w such that the household is able to buy a house under lax regulation, but unable to do so under tight regulation. That is, there exists an interior level of regulation $\alpha \in (0, 1)$ such that $w = \underline{w}(\alpha)$. In Figure 2, we denote this level of regulation, at which the young household with wealth w is penniless after buying a house, by $\overline{\alpha}(w)$. Since this young household is unable to purchase a house when regulation is tighter than $\overline{\alpha}(w)$, their indirect utility is increasing in α for $\alpha > \overline{\alpha}(w)$, as we have already established that renters-depositors benefit from tighter regulation. But critically, the indirect utility of this young household is discontinuous at $\overline{\alpha}(w)$. Under Assumption 5, households strictly prefer buying a house to renting, and being excluded from the mortgage market (which is what happens when α exceeds $\overline{\alpha}(w)$) is harmful to the household's utility. This point is formalized in Corollary 1 below. The shape of the indirect utility is harder to pin down to the left of $\overline{\alpha}(w)$. As can be seen from the second item of equation (13), the indirect utility is decreasing just to the left of $\overline{\alpha}(w)$. Locally, tighter regulation reduces the mortgage advance more than it reduces the price of the house, thus leaving the young household with lower savings. As we move away from the threshold $\overline{\alpha}(w)$ towards zero regulation, the rate of return on these savings becomes more important and marginal tightening of regulation may actually be utility-improving for the household. We denote the level of regulation that yields that highest utility to a young household with wealth w by $A(w)$:

$$A(w) := \underset{\alpha \in [0,1]}{\text{argmax}}\, U(w; \alpha). \tag{14}$$

The following proposition summarizes the set of winners and losers from regulation:

Proposition 8. *Consider two levels of banking regulation α and α', where $\alpha' > \alpha$. Then, under Assumptions 3 and 5,*

$$U(w;\alpha') - U(w;\alpha) \begin{cases} > 0, & \text{for } w < \underline{w}(\alpha), \\ < 0, & \text{for } w \in \left[\underline{w}(\alpha), \overline{w}(\alpha,\alpha')\right), \\ = 0, & \text{for } w = \overline{w}(\alpha,\alpha'), \\ > 0, & \text{for } w > \overline{w}(\alpha,\alpha'), \end{cases}$$

where

$$\overline{w}(\alpha,\alpha') := \frac{\underline{w}(\alpha')\big(1+\tilde{i}(\alpha')\big) - \underline{w}(\alpha)\big(1+\tilde{i}(\alpha)\big)}{\tilde{i}(\alpha') - \tilde{i}(\alpha)} \tag{15}$$

is the wealth level of the young house-buyer indifferent between the two policies.

As we have already discussed, the poorest young households, who cannot afford a house even under the lax regulation α, prefer stricter banking regulation. Marginal ("new") home-buyers and home-buyers with few deposits in the banking system prefer lax regulation, as they benefit from the implied favorable interest rates on their mortgage. For home-buyers with wealth $w \in [\underline{w}(\alpha), \overline{w}(\alpha, \alpha'))$, the decline in the mortgage interest rate coming from lax regulation is more than sufficient to offset the increase in the price of a house and the decline in the expected rate of return on deposits. The cut-off wealth $\overline{w}(\alpha, \alpha')$ identifies the young household who has just enough deposits in the banking system that the impact on the expected deposit rate and the house price cancels out the decline in the interest rate on their mortgage, making them indifferent between the two levels of regulation. Note that $\overline{w}(\alpha, \alpha') > \underline{w}(\alpha') > \underline{w}(\alpha)$, which means that not only "new" home-buyers prefer lax regulation, but also some relatively wealth-poor households who are able to buy a house under either regulation.

An important corollary of Proposition 8 is that a young household who can afford a house under some policy α would never prefer a policy that excludes them from buying a house.

Corollary 1. *Under Assumptions 3 and 5, if there exists α such that $w \geq \underline{w}(\alpha)$, then $w \geq \underline{w}(\alpha')$ for any $\alpha' \in A(w)$.*

5.2 Political Failure

We have established that there are two groups of voters who favor lax regulation — initial-old home-sellers, who benefit from higher house prices, and marginal home-buyers, who benefit from lax lending standards (and low mortgage interest rates). We now offer a set of sufficient conditions (on parameters of our model) for what we call "political failure" — the situation when socially efficient financial regulation is defeated in a simple majority vote by a complete lack of regulation (leading to an inefficient housing bubble).

The purpose of this exercise is to establish that this dramatic regulatory failure is possible in equilibrium, rather than to point out when it is likely to happen. With that in mind, we opt for strong, but easy to interpret, conditions and do not attempt to make them as general as possible. In particular, we maintain Assumptions 3 and 5, as well as Assumption 4 (which implies Assumption 1). Note that Assumption 4 implies that $q(0) > u + pv$, i.e., the laissez-faire house price exceeds the fundamental value of the house. In contrast, Assumption 5 implies that the house price under the maximum regulation is below the fundamental value: $q(1) < u + pv$. Therefore, there exists an intermediate level of regulation $\alpha^* \in (0, 1)$, which delivers the socially efficient outcome, i.e., such that $q(\alpha^*) = u + pv$.

To demonstrate that this efficient regulation can be defeated in a majority vote, we impose two additional conditions. The first condition guarantees that every young household can (and does) buy a house in the laissez-faire equilibrium:

Condition 1. $k'(1 - H_O) \leq v$.

This simply states that the price of the house, when everyone buys a house, does not exceed the mortgage advance, when the mortgage interest rate is 0, as it is in the laissez-faire equilibrium under Assumption 3. The second condition guarantees that the coalition of old home-sellers and of young households excluded from homeownership under efficient regulation constitutes a majority of voters:

Condition 2. $1 - I^* \geq \frac{1+H_O}{2}$.

Note that the $1 - I^*$ is the sum of the measure of young households unable to buy a house under the efficient regulation, $(1 - (H_O + I^*))$, and the measure of old homeowners, H_O. With that, we now have sufficient conditions for what we call "political failure:"

Proposition 9. *If Assumptions 3, 4, and 5 and Conditions 1 and 2 are satisfied, then* $\alpha = 0$ *wins over* $\alpha = \alpha^*$ *in a simple majority vote.*

More generally, the efficient regulation $\alpha = \alpha^*$ loses to any lax regulation $\alpha \leq \tilde{\alpha}$, where $\tilde{\alpha}$ solves $k'(1 - H_O) = \frac{v}{1+\tilde{\alpha}r^*}$. Any such lax regulation gains the support of the entire coalition of old homeowners and the "excluded" young, plus at least some votes from young home-buyers who can barely afford their house under the efficient regulation and who benefit from the de facto mortgage subsidy arising under lax regulation. Formally, these are young households with wealth in the interval $(\underline{w}(\alpha^*), \overline{w}(\alpha, \alpha^*))$.

Recall that any allocation with over-provision of housing $(I > I^*)$ is not just inefficient from the utilitarian social planner's perspective — it is also Pareto inefficient. Thus, the outcome of the democratic process described in Proposition 9 is an allocation where everyone's utility can be improved upon. Of course, that does not mean that a Pareto improvement had been rejected by a majority of voters. The voters were permitted to choose only the level of a specific policy tool, namely the banking regulation. They were not permitted to bundle this regulation with an additional redistributive policy, which would have allowed for the Pareto improvement over the current allocation. Specifically, going from no regulation to $\alpha = \alpha^*$ (an improvement from the utilitarian social planner's standpoint) generates more losers than winners, and the winners lack the ability to compensate the losers without additional policy instruments being introduced. Note, however, that the redistribution scheme needed to generate popular support for the efficient allocation is rather complex and unrealistic — such a scheme would have to pay *some* households not to buy a house, but only households with specific levels of wealth, as subsidizing all non-buyers would be wasteful and require excessive taxation to finance. Similarly, middle-income homebuyers benefiting from the mortgage "subsidy" in the unregulated economy would need to be targeted with a transfer in order to get their support for the efficient policy (and again, providing a transfer to all mortgage holders would be excessively costly).

The drastic nature of the sufficient conditions above, while illustrative of the possibility of the political failure, does obscure an interesting aspect of the voting behavior in a more general setting. Specifically, Condition 1 ensures that every young household buys a house under lax regulation. The voting behavior among the young is then simply characterized by a single cutoff — those with wealth below $\overline{w}(0, \alpha*)$ vote for deregulation, while those with wealth above this threshold vote for efficient regulation. In the following subsection, we relax this assumption and point out that in the more general case, there is a group of wealth-poor young voters who join with the wealthiest young in their support of stricter banking regulation.

5.3 Ends Against the Middle

The nature of policy preferences among young households in our framework often features a key non-monotonicity in wealth. Whenever the poorest young cannot afford a house under either of the competing policies, they join with their wealthiest cohorts in supporting a stricter regulation, which yields a higher expected rate of return on their deposits. At the same time, some middle-wealth young vote for lax regulation. This "ends against the middle" property is similar to the political economy of a public education in the presence of a private option (Barzel, 1973; Epple and Romano, 1996a,b; Fernandez and Rogerson, 1995). But unlike the public education case, where middle-income voters were favoring socially efficient policies, in our setting, middle-income voters are the ones undermining efficient regulation.

The "ends against the middle" feature is well illustrated by considering the preferred policy of young households as a function of their wealth, defined in equation (14). The properties of this policy bliss point as a function of wealth are illustrated in Figure 3 and the following proposition:

Proposition 10. *Suppose that Assumptions 3 and 5 hold. The preferred policy mapping has the following properties:*

- $A(w) = 1$ *for* $w < \underline{w}(0)$,
- $A(w) = 0$ *for* $w = \underline{w}(0)$,
- $A(w)$ *is increasing in* w *for* $w > \underline{w}(0)$.[24]

The non-monotonicity of the preferred policy as a function of wealth, established in Proposition 10, suggests that the simple intuition derived from the standard median-voter theorem does not apply along the wealth distribution. Specifically, the median-wealth voter's preferred policy need not be the outcome of a majority voting equilibrium, even adjusting for the old home-sellers' share of the vote. Formalizing

[24]That is, for any (w, w', α, α') such that $\underline{w}(0) \leq w < w'$, $\alpha \in A(w)$, and $\alpha' \in A(w')$, we have $\alpha \leq \alpha'$. This is stronger than the "strong set order" that is commonly used when comparing solution sets (e.g., Milgrom and Shannon (1994)).

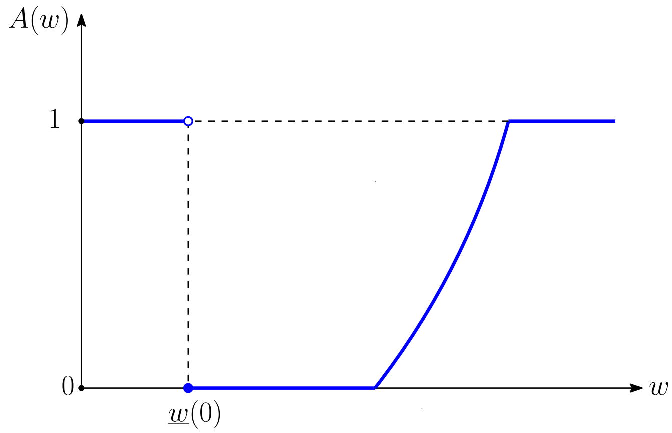


Figure 3: Preferred Policy

this statement requires a couple of definitions. When talking of the "outcome of a majority voting equilibrium," we refer to the standard notion of a Condorcet winner:[25]

Definition 2. *A policy α is a Condorcet winner if, for all $\alpha' \in [0,1]$,*

$$\int \mathbb{1}_{U(w;\alpha)\geq U(w;\alpha')} dF(w) + \mathbb{1}_{q(\alpha)\geq q(\alpha')} H_O \geq \frac{1+H_O}{2}.$$

In fact, even the concept of the median-wealth voter is less than straightforward in our environment. Besides young voters with heterogeneous wealth levels, there are also old homeowners who all vote as a single bloc. Given that these old voters tend to side with the relatively wealth-poor young against the wealth-rich young (as in Proposition 9), we define the "adjusted median" wealth $\widehat{w}$ as the one solving

$$F(\widehat{w}) + H_O = \frac{1+H_O}{2}.$$

This concept of adjusted median wealth is rather natural and somewhat informative. The following proposition illustrates a point familiar from the "ends-against-the-middle" papers: that the Condorcet winning policy is shifted away from the (adjusted) median-wealth voter's preferred policy toward that preferred by the "ends."

[25]Note that a Condorcet winner may not exist in our setting. One way to restore existence of equilibrium is by introducing orthogonal ideological preferences, as in Lindbeck and Weibull (1987), leading to the so-called probabilistic voting. In that augmented environment, the equilibrium outcome is a solution to a social planner's problem (as shown in Lindbeck and Weibull (1987)). If the idiosyncratic ideological preferences are identically distributed across all ages and wealth levels, then this social planner's problem is similar to the one described in Section 4.3 and the probabilistic voting equilibrium picks the efficient level of regulation α^*. However, if old and/or middle-wealth individuals are less ideologically polarized (have a lower dispersion of the orthogonal idiosyncratic preferences), then these voters get greater weight in the pseudo-social planner's problem than the more polarized young voters at the extremes of the wealth distribution, and the equilibrium outcome may thus feature an inefficiently low level of regulation.

Proposition 11. *Suppose that Assumptions 3 and 5 hold and that $\widehat{w} > \underline{w}(0)$. If α is a Condorcet winner, then $\alpha \geq \min A(\widehat{w})$. Moreover, if $1 \in A(\widehat{w})$, then $\alpha = 1$ is a Condorcet winner.*

However, due to the potential non-monotonicity of the policy preferences, $A(\widehat{w})$ is not necessarily a natural candidate for a majority voting equilibrium outcome. A young household with the adjusted median wealth $\widehat{w}$ need not be a median voter in terms of policy preferences. A more relevant alternative, and the one we call the "median voter," is a young voter with the median preferred policy. We denote the wealth of the median voter by w_m. Utilizing Proposition 10, we can define w_m as the solution of

$$H_O + F(w_m) - F\big(\underline{w}(0)\big) = \frac{1 + H_O}{2}.$$

This "median voter's wealth" is to the right of the "adjusted median wealth," i.e., $w_m \geq \widehat{w}$. Yet, the Condorcet winning policy still lands (weakly) to the right of the median preferred policy:

Proposition 12. *If Assumptions 3 and 5 hold, then*

- *If α is a Condorcet winner, then $\alpha \geq \min A(w_m)$.*
- *If $0 \in A(w_m)$, then $\alpha = 0$ is a Condorcet winner.*
- *If $1 \in A(w_m)$, then $\alpha = 1$ is a Condorcet winner.*

The reason for this "drift" of the winning policy to the right of the median preferred policy is the endogeneity of the threshold level of wealth that enables young households to buy a house, $\underline{w}(\alpha)$. If the median preferred policy features a positive level of regulation that excludes some people from buying a house, then these relatively wealth-poor households "switch sides" and join with the wealthiest in supporting yet more regulation. To see this, let $\alpha_m := \min A(w_m)$. Young households who lose the ability to buy a house under regulation α_m (those with wealth $w \in [\underline{w}(0), \underline{w}(\alpha_m))$) would vote for any α to the right of α_m in a bilateral choice against α_m, even though these households' preferred policies are to the left of α_m.

Contrasting Propositions 11 and 12 with Proposition 9 highlights the importance of the "ends-against-the-middle" mechanism for studying the effects of wealth inequality in this environment. The analysis in Section 5.2 (where Condition 1 rules out the "ends-against-the-middle" mechanism) suggests that increased wealth inequality increases the mass of (wealth poor) supporters of financial deregulation. However, if an increase in wealth inequality leads to more people not being able to afford a house, then such an increase in inequality would actually weaken the political support for deregulation. As shown in Section 6, the prediction of this "ends-against-the-middle" mechanism is empirically supported.

6 Evidence from Congressional Votes on Deregulation

In this section, we provide evidence that our theory of popular support for financial deregulation is empirically relevant. Our theory identifies two distinct groups who benefit from deregulation — existing home owners and households in the middle of the wealth distribution. Moreover, the coalition of "ends-against-the-middle" implies that greater wealth inequality reduces the share of the middle wealth group and leads to weaker political support for deregulation. Based on this theory, we examine how the share of home owners and levels of income inequality in a congressional district shape U.S. House members' positions on mortgage regulation.[26]

6.1 Key Mortgage Legislations

There were a very large number of bills in the U.S. Congress related to mortgage lending during the expansion of subprime credit. We analyze the six major bills considered by Mian, Sufi, and Trebbi (2013) for which the competing interests are reasonably well defined. Although these bills proposed significant changes to mortgage regulation, only one of them eventually became a law. We describe these bills only briefly here. See Mian, Sufi, and Trebbi (2013) for further details.

Table 1: List of Mortgage Related Bills Analyzed

Number	Name	Measure of Support	Regulation
H.R. 1276	American Dream Downpayment Act of 2003	Co-sponsorship	Lax
H.R. 1295	Responsible Lending Act of 2005	Co-sponsorship	Lax
H.R. 1182	Prohibit Predatory Lending Act of 2005	Co-sponsorship	Tight
H.R. 3915	Mortgage Reform and Anti-Predatory Lending Act of 2007	Co-sponsorship Passage vote	Tight
H.R. 1461	Federal Housing Finance Reform Act of 2005	Co-sponsorship Passage vote	Lax
H.R. 1427	Federal Housing Finance Reform Act of 2007	Co-sponsorship Passage vote	Tight

The American Dream Downpayment Act of 2003, which was signed into law, provides downpayment assistance to low-income first-time homebuyers and increases the loan limit for some mortgages insured

[26]In mapping our model predictions to the data, we assume that (i) home-ownership rate measures the relative size of *incumbent* homeowners (i.e., H_O), (ii) income inequality measure captures *within* cohort inequality and is not driven solely by a generation gap, and (iii) that landlords either live outside the district or simply do not benefit from lax regulation (as is explicitly assumed in Section 7.2).

by the Federal Housing Administration. It aimed to increase minority home ownership, and we classify it as legislation that weakens mortgage regulation.

The Responsible Lending Act of 2005 would have weakened regulation on so-called "predatory" lending practices by replacing state laws on consumer protection with weaker federal regulations. Although predatory lending practices include measures to take advantage of borrowers unfairly (e.g., charging unnecessary fees), they generally make borrowing easier and extend credit to those who would not have access to it otherwise. Therefore, we classify it as legislation that weakens mortgage regulation.

In contrast, the Prohibit Predatory Lending Act of 2005 and Mortgage Reform and Anti-Predatory Lending Act of 2007 were designed to reduce predatory lending by, for example, preventing lenders from extending credit to individuals who do not have the ability to repay. Thus, these two bills are considered to be tightening mortgage regulations.

In response to the major accounting violations and corporate mismanagement at the Government Sponsored Enterprises (GSEs) in 2003, the two versions of the Federal Housing Finance Reform Act were introduced to create a new independent regulator that has supervisory and regulatory authority over the GSEs. However, there were important differences between the two bills, and the 2005 bill was considered too weak on regulation. For example, the Bush administration opposed the 2005 bill on the grounds that it "fails to include key elements that are essential to protect the safety and soundness of the housing finance system,"[27] while it supported the 2007 bill because it "does include elements that are essential for proper regulatory oversight of the housing GSEs."[28] We follow these judgements in our analysis.

Table 1 summarizes the six bills considered. We measure congresspersons' support for each bill based on whether they are listed as co-sponsors and whether they voted in favor of the bill.[29] For the first three bills, however, we only analyze co-sponsorship patterns because H.R. 1276 was passed without objection while H.R. 1295 and 1182 were not voted upon in the House. In order to obtain clear empirical patterns, we analyze all six bills pooled together.[30] Since half of the bills (H.R. 1182, 3915, and 1427) proposed to strengthen regulation, we consider not co-sponsoring or voting against those bills being equivalent to supporting deregulation (i.e., co-sponsoring or voting in favor of the other half). Across 435 congressional districts over 9 measures of support, there are total 3,915 observations.

[27]See "Statement of Administration Policy: H.R. 1461 - Federal Housing Finance Reform Act of 2005," available at https://www.presidency.ucsb.edu/node/273350

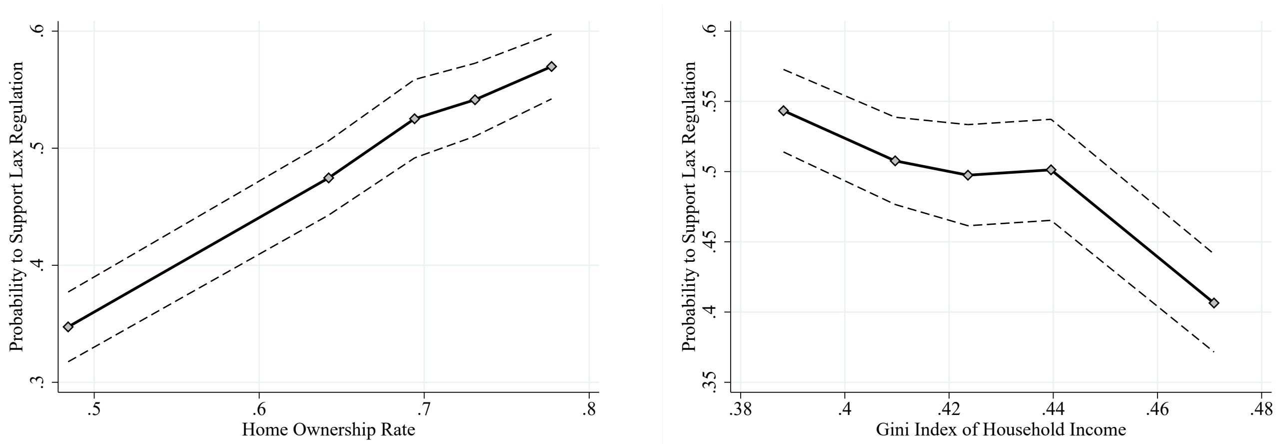
[28]See "Statement of Administration Policy: H.R. 1427 - Federal Housing Finance Reform Act of 2007," available at https://www.presidency.ucsb.edu/node/274946.

[29]Mian, Sufi, and Trebbi (2013) also include two specific amendment votes for H.R. 1461 and 1427. Although including them gives virtually identical results, we exclude them from our analysis in order to streamline the discussion.

[30]Analyzing each support measure of individual bills separately gives very similar, but much noisier, results. These results are available upon request.

6.2 Data Sources

From the data constructed by Mian, Sufi, and Trebbi (2013), we use three sets of information for each congressional district: (i) the congressperson's stance on mortgage-related legislation, indicated by co-sponsorship and voting behavior; (ii) the constituents' interests, as measured by income and housing statistics, as well as the share of employment in housing-related industries; and (iii) the influence of special interest groups, assessed by their financial contributions to the congressperson's electoral campaigns.



(a) Home Ownership Rate

(b) Gini Index of Household Income

Figure 4: Estimated Probability to Support Lax Regulation

Notes: Diamond symbols, connected by solid lines, represent the average values for each quintile of homeownership rate or Gini index across congressional districts. Dashed lines show 95% confidence intervals, calculated using standard errors that are robust to heteroskedasticity and correlation within districts.

For the six bills mentioned above, information on co-sponsorship and final passage votes in the House of Representatives comes from the Congressional Record. Since these legislative activities took place from the 108th through the 110th Congresses, spanning 2003 to 2007, constituents' characteristics for each congressional district are taken from the 2000 census. We use the homeownership rate (fraction of occupied households owned), the median household income and home value, the distribution of households across 16 income brackets (from which we calculate the Gini index[31]), and the share of the workforce employed in finance, construction, and real estate industries. Finally, campaign contributions are obtained from the Federal Election Commission political contributions reports and are aggregated for three broad groups of contributors: (i) "mortgage industry" that includes mortgage bankers and brokers,

[31] Inequality measures on household income are not available at the congressional district level from the 2000 census. Therefore, we estimate the Gini index based on categorical income data using the robust Pareto midpoint estimator from von Hippel, Scarpino, and Holas (2016). This method has been shown to produce accurate estimates of the Gini index, closely matching those calculated by the Census Bureau from raw income data.

(ii) "subprime banks" that are major commercial banks engaged in subprime lending,[32] and (iii) "other finance industry" that consists of contributors from the finance, real estate, and insurance industries that are not included in the first two groups. Since some congresspersons may not receive any contributions from these groups, $1 is added to the campaign contribution amounts before taking logs.

6.3 Empirical Results

We begin with bivariate relationships between congresspersons' support for lax regulation and constituents' characteristics. Figure 4 shows the estimated probability to support lax regulation for each quintile of the home ownership rate or the Gini index of household income. It demonstrates that politicians are more likely to support lax regulation if they are from districts with higher home ownership or lower inequality. Around 35% of congresspersons in the bottom quintile of districts' home ownership rate supported lax regulation, while the fraction rises to almost 60% for the top quintile. In contrast, representatives from districts in the top quintile of inequality are about 15 percentage points less likely to support lax regulation than those from districts in the bottom quintile. The relationship is weaker for inequality compared to home ownership, especially at the middle level.

We next proceed with multivariate analysis using a linear probability model to see whether these relationships still hold when other potential determinants of politicians' voting behavior are controlled for.[33] Table 2 presents results from Ordinary Least Squares (OLS) regressions. All regressions include log median household income and home value to account for differences in income level as well as housing affordability across districts. State fixed effects are included to control for institutional differences across states, such as mortgage and bankruptcy laws (e.g., Ghent and Kudlyak, 2011; Ghent, 2014; Mitman, 2016).

Column 1 of Table 2 presents the main empirical result, where we also control for party affiliation, as it may independently influence representatives' voting behavior, aside from their constituency preferences (Snyder and Groseclose, 2000). This column shows that the bivariate relationships depicted in Figure 4 — the positive effect of the home ownership rate and the negative effect of the Gini index — hold even after accounting for other factors. Furthermore, both effects are statistically significant at the 5% level. These results provide suggestive evidence of our model mechanism: representatives are more likely to support lax regulation if they are from districts with higher shares of home owners and middle-income households, who benefit the most from deregulation according to our theory.

The coefficients on log median household income and home value are also intuitive. They suggest that, when housing is less affordable for the middle class due to lower incomes or higher housing prices,

[32] This is based on "HUD Subprime and Manufactured Home Lender List" for the year 2005.

[33] See Heckman and Snyder (1997) for justification of linear probability models in legislative voting.

Table 2: Determinants of Support for Lax Regulation

	(1)	(2)	(3)	(4)
Home ownership rate	0.448**	0.350**	0.366**	0.348**
	(0.092)	(0.088)	(0.090)	(0.095)
Gini index of household income	-0.631**	-0.522*	-0.493*	-0.566*
	(0.309)	(0.288)	(0.296)	(0.341)
Log median				
Household income	-0.138**	-0.144**	-0.146**	-0.160**
	(0.070)	(0.068)	(0.069)	(0.076)
Home value	0.071*	0.071*	0.073*	0.090**
	(0.040)	(0.038)	(0.039)	(0.040)
Republican	0.180**			
	(0.013)			
DW-Nominate ideology score		0.226**	0.220**	0.224**
		(0.013)	(0.013)	(0.014)
Log campaign contributions from				
Mortgage industry			-0.005**	-0.005**
			(0.002)	(0.002)
Subprime banks			0.005**	0.005**
			(0.002)	(0.002)
Other finance industry			0.004	0.004
			(0.004)	(0.004)
Fraction of workforce in				
Financial industry				0.145
				(0.353)
Construction industry				-0.360
				(0.351)
Real estate industry				-1.584
				(0.974)
Observations	3,915	3,888	3,888	3,888
Adjusted R-squared	0.049	0.058	0.059	0.059

Notes: OLS regressions also control for state fixed effects. Standard errors, reported in parentheses, are robust to heteroskedasticity and within-district correlation. ** and * denote statistical significance at the 5% and 10% levels, respectively.

politicians support deregulation. This is consistent with the narrative of Rajan (2010) and Calomiris and Haber (2014) that the stagnant income of the American middle class influenced government policy toward subprime mortgage credit expansion. However, we note that the relationship between income level and support for regulation may be non-monotonic in theory because districts with very low levels of income may have large shares of households who would be excluded from home ownership even under lax regulation and thus prefer tight regulation.

Column 1 shows that Republicans are more likely to support lax regulation, consistent with the conventional view that reduction of government regulations aligns with conservative ideology. To explore this further, we use the DW-Nominate ideology score (Poole and Rosenthal, 1997, 2007), a measure of a congressperson's political orientation based on their voting record. In Column 2, replacing party affiliation with the first dimension of the DW-Nominate score, which increases with economic conservatism, reveals that more conservative politicians are more likely to support lax regulation. This mirrors the findings for Republicans in Column 1. Controlling for ideology reduces the influence of homeownership and the Gini index, with the latter becoming significant only at the 10% level. This may reflect that constituents in districts with higher homeownership and lower inequality elect conservative politicians who support lax regulation to better represent their interests.

Politicians may respond not only to constituent interests but also to special interest groups because financial contributions from those groups may increase their probability of reelection (e.g., Grossman and Helpman, 1996). Although our model abstracts from special interest politics, we explore this issue empirically by including campaign contributions from the finance industry — a special interest group that would benefit from mortgage credit expansion — in the regression. Column 3 shows that controlling for campaign contributions does not alter the estimated coefficients on the home ownership rate and the Gini index substantially, and, among the three measures of campaign contributions, only contributions from subprime banks have a statistically significant and positive impact. Additionally, the industry-specific benefits of mortgage deregulation may also be reflected in constituents' interests, especially when those industries constitute a large share of the local workforce. Column 4 shows that the industrial composition of the local labor market has no statistically significant effect on the Representatives' voting behavior, and does not alter the results for other variables.

Taken together, our theory on the general interest politics of financial deregulation is empirically supported by congressional voting patterns, and accounting for politicians' ideology or special interest influence does not alter this conclusion.

7 Robustness

In this section, we discuss the sensitivity of our findings to some key simplifying assumptions we have made to keep the model tractable. The following subsections analyze implications of several key departures from our model setting, one at a time.

7.1 Allowing Safe Mortgages

Above, we made a major simplifying assumption that houses are worthless in the bad state. This assumption significantly simplifies the exposition by making all mortgages risky and guaranteeing that all home-buyers take out the largest possible mortgages. Appendix B presents an extension of the model that relaxes this unrealistic assumption and thus generates both safe and risky mortgages in equilibrium. This extension establishes robustness of our results and offers a much more realistic interpretation of the key condition necessary to generate them. The "current-account surplus" needed to generate the political failure in our model merely requires that the total amount of domestic deposits exceed the total amount of *risky portions* of mortgages (which can be thought of as risky tranches of mortgage-backed securities). We further argue (see Appendix B) that, empirically, the risky portion of the aggregate mortgage pool was an order of magnitude smaller than the total domestic deposits, even in the run-up to the GFC.[34]

7.2 Rental Market

The model above abstracts from explicitly modelling the rental market, which is obviously the outside option of potential young home-buyers. Rather straightforward extensions of the model allow us to treat the rental market explicitly and analyze how endogenizing the rental prices affects our findings. The impact of mortgage regulation on rental prices depends critically on the degree of market segmentation (substitutability) between the rental and owner-occupied dwellings. We thus analyze the two extreme settings — one where owner-occupied units can be frictionlessly converted into rentals (and thus rental prices always comove with the house prices) and one where the markets are completely segmented (and where mortgage deregulation may lead to cheaper rents).

7.2.1 No Segmentation between Rental and Owner-Occupied Markets

First, we consider the case where housing markets are not segmented, allowing any housing unit to be used either as owner-occupied or as a rental property. This case maps neatly into our benchmark model

[34] We argue that the at-risk portion of the mortgage portfolio in 2007 did not exceed $400 billion, while the total domestic deposits at that time were around $6 trillion.

and reinforces the key mechanism we're highlighting. The key insight from this model extension is that the impact of financial regulation across the wealth distribution is largely unaffected by the presence of the rental market. When rental prices are proportional to house prices, the poorest households are further disadvantaged by lax regulation as they have to pay inflated rents in addition to facing potential losses on their deposits.

We assume that rental units are smaller than houses, and that houses can be converted to rentals (and vice versa) with a linear technology, one house turning into ψ (>1) rental units. The rental sector is operated by competitive risk-neutral real-estate firms that have access to international financial markets but do not have access to the domestic (residential) mortgage market.

This linear technology and the competitive nature of the rental sector pin down the relation between the house price Q and the rental rate z in period 1:

$$z = \frac{Q - pv}{\psi}. \tag{16}$$

The mapping between the environment with this rental market and our benchmark model then amounts simply to: (i) interpreting the utility of homeownership u as the difference between owning a house and renting a smaller unit; (ii) interpreting the house price q in the benchmark model as the difference between the price of buying a house and the cost of renting, i.e., $q = Q - z$; (iii) shifting the (disposable) wealth distribution by z, with voters recognizing that policy affects the intercept; and (iv) making a distinction between the number of additional homeowners N (which now enters the housing market clearing condition) and the number of additional houses being constructed $I = \frac{\psi-1}{\psi}N$ (which is the argument of the construction function $k(I)$).

7.2.2 Fully Segmented Housing Markets

Next, we consider the opposite extreme: a fully segmented housing market, where owner-occupied housing units cannot be converted into rental units.[35] In this scenario, an increase in demand for owner-occupied housing — driven by deregulation — may lead to a *decrease* in rental prices, as the demand for rental units declines. Renters are thus not necessarily made worse off, as lower rents may offset the losses on deposits brought about by the lax regulation. This may increase the likelihood of lax regulation emerging in equilibrium. One change relative to our benchmark is that greater inequality no longer necessarily increases the support for tighter regulation in this setting, since the poorest renters need not be harmed by the deregulation.

To formalize this, let R_O represent the initial stock of rental units at the start of period 1. Additional

[35] The estimation in Greenwald and Guren (forthcoming) suggests that this assumption is the more relevant one empirically.

rental units can be constructed at a cost given by the convex function $k_R(I)$, where $k_R(0) = k'_R(0) = 0$. The purchase price of rental units, q_R, is pinned down by the marginal cost of construction: $q_R = k'_R(I_R)$, where I_R is the equilibrium level of construction of rental units. We will assume that rental units are subject to the same aggregate valuation shock as houses, i.e., that their value in the second period is v_R with probability p, and zero with probability $1 - p$. Competition among risk-neutral landlords (as above) pins down the rental rate:[36]

$$z = q_R - pv_R = k'_R(1 - H_O - I - R_O) - pv_R.$$

As this equation illustrates, a higher home ownership rate (H_O+I), resulting from lax mortgage regulation, reduces demand for rental units, and lowers the market rent z. This new feature of the model generates support for deregulation among the poorest renters and has political economy implications: (i) The presence of fully segmented rental market has an ambiguous effect on the likelihood of efficient regulation being defeated politically. On the one hand, the poorest young households now join the coalition of initial homeowners and marginal home-buyers in opposing efficient regulation. On the other hand, the benefit of home-ownership to middle-income home-buyers is somewhat eroded as rental alternative becomes more attractive. (ii) The switch in the political preferences of the poorest voters implies that the impact of wealth inequality on equilibrium regulation becomes ambiguous.

7.3 Dead-Weight Loss from Mortgage Crisis

We had assumed that neither mortgage default (foreclosure) nor bank failure was associated with any dead-weight loss. This simplifying assumption is obviously unrealistic, and we now consider several possible ways of relaxing it. Consider first the effects of a foreclosure externality. The negative spillovers of foreclosures on the house price and other socioeconomic outcomes in the neighborhood are well documented by Gerardi et al. (2015) and Mian, Sufi, and Trebbi (2015). In our model, we cannot introduce this externality as a reduction of the house price in the adverse aggregate state, since we assume that the house price in that state is already zero. Instead, we introduce this externality as a utility loss rather than a reduction in the house price. Specifically, we assume that this utility loss is increasing in the number of foreclosures and is imposed on all citizens. The uniformly applied utility loss does not affect the economic equilibria in our model for any given policy parameter, but it does, of course, affect voting behavior. Since this externality is internalized by voters, it does reduce popular support for lax regulation

[36]This equation is derived under the assumption that the initial stock of rental units R_O (and/or the future value v_R) is sufficiently small, so that the rent z is positive. If that condition were violated, then rent would be 0, some rental units would be vacant in equilibrium, and, most importantly, renters would have no benefit from mortgage deregulation, making this model of segmented rental market yield the exact same predictions as our benchmark model.

on the margin, but our key results are robust to the introduction of a modest level of the externality.

Specifically, consider the aggregate dead-weight loss from a foreclosure crisis that takes the form of a utility loss proportional to the aggregate housing stock (all of which are foreclosed in the adverse aggregate state): $\frac{\phi}{1-p}(H_O + I)$, where $\phi > 0$ is the strength of the externality. This implies that the ex-ante expected utility loss from foreclosures is $\phi(H_O + I)$.

This externality reduces the optimal level of housing investment. The modified planner's problem (11) becomes (the social planner's problem, Problem 4, can be adjusted similarly)

$$\max_I \left\{ W - k(I) + (u + pv - \phi)(H_O + I) \right\}.$$

Let I^*_ϕ be the level of housing investment that equates the social marginal benefit and social marginal cost:

$$k'(I^*_\phi) = u + pv - \phi. \tag{17}$$

For I^*_ϕ to be well defined (and interior), the dead-weight loss must not be too large:

Assumption 6. $\phi \leq u + pv$.

Proposition 13. *Under Assumptions 1, 2, and 6, the socially optimal level of construction is I^*_ϕ, defined in (17).*

Since individuals are infinitesimal, they understand that each of their own economic decisions does not affect the aggregate housing stock or the dead-weight loss from a foreclosure crisis. Thus, the economic equilibrium analyzed thus far is unaffected. However, individuals internalize the dead-weight loss when voting for financial regulation. Their indirect utility function now includes the dead-weight loss:

$$U(w;\alpha) = \begin{cases} w\big(1 + \tilde{i}(\alpha)\big) - \phi\big(H_O + I(\alpha)\big), & \text{for } w < \underline{w}(\alpha), \\ u + \big(w - \underline{w}(\alpha)\big)\big(1 + \tilde{i}(\alpha)\big) - \phi\big(H_O + I(\alpha)\big), & \text{for } w \geq \underline{w}(\alpha). \end{cases} \tag{18}$$

We now show that our two main results —"political failure" (Proposition 9) and "ends against the middle" (Proposition 10) — still hold in the presence of a modest foreclosure externality.[37] Specifically, we make the following assumption, which restricts the extent of the dead-weight loss:

Assumption 7. $F(u - \phi) > 1 - H_O - I^*_\phi$.

[37]The robustness of our results is, of course, not universal. If the externality from foreclosure is large enough, all voters may be willing to vote for the strictest of regulations.

Note that this assumption implies both Assumption 5 and Assumption 6, since $\phi > 0$ and $I_\phi^* < I^*$. As the following proposition shows, this assumption implies that the maximum regulation is inefficiently tight.

Proposition 14. *If Assumptions 3 and 7 hold, then the equilibrium with maximum regulation ($\alpha = 1$) has an inefficiently low level of construction.*

The optimal regulation α_ϕ^* is then interior (the argument of Section 5.2 applies) and solves

$$q(\alpha_\phi^*) = u + pv - \phi.$$

We can now establish that our key political failure result still holds in the presence of the foreclosure externality, as long as it is not too large.

Proposition 15. *If Assumptions 3, 4, and 7 and Conditions 1, and 2 are satisfied, then $\alpha = 0$ wins over $\alpha = \alpha_\phi^*$ in a simple majority vote.*

While the introduction of the foreclosure externality does increase support for tougher regulation among home-buyers, it does not change the key result that young individuals would never prefer a policy that excludes them from buying a house. Similarly, the "ends-against-the-middle" also survives modest levels of the foreclosure externality:

Proposition 16. *Suppose that Assumptions 3 and 7 hold. The preferred policy mapping has the following properties:*

- $A(w) = 1$ *for* $w < \underline{w}(0)$,
- $A(w) = 0$ *for* $w = \underline{w}(0)$,
- $A(w)$ *is increasing in* w *for* $w > \underline{w}(0)$.

That is, policy preferences of young voters are still successfully illustrated by Figure 3.

The key insights are also robust to associating the dead-weight loss with the bank failure (for empirical support for this, see, for example, Laeven and Valencia (2013, 2020)), as opposed to (or in addition to) the foreclosures. If this dead-weight loss is modelled simply as a utility cost applied to everyone alive at the time of the banking crisis, then the economic equilibria for any given policy parameter are unaffected, just as in the above case. And just like in that case, under modest levels of the externality, a group of middle-wealth young voters still join the initial old home-sellers in voting for lax banking regulation. An alternative way of modelling this externality as a proportional tax on remaining bank deposits (needed to cover the financial dead-weight loss of bank failure) further strengthens our key point. In such a setting, some political support for lax banking regulation among young voters would remain even when the externality is arbitrarily large, as marginal home-buyers have very few deposits and thus bear very little of the cost of lax regulation while getting the bulk of the benefit.

7.4 Other Departures

This subsection contains a discussion of the implications of relaxing some other key simplifying assumptions of our model. Formal model extensions that would incorporate these departures are somewhat complicated and are beyond the scope of this paper, but we briefly discuss below the key forces and mechanisms associated with these departures from our assumptions.

7.4.1 Risk Aversion

For simplicity, we have assumed that all agents in the model are risk-neutral. A more natural assumption, of course, is that households are risk-averse. Incorporating risk aversion into the model would increase the social cost of lax regulation, as the *risk* of bank failure induces additional cost on depositors, beyond lowering the expected rate of return. But the basic political mechanism we highlight is still present. Marginal home-buyers still side with old homeowners in support of lax regulation. The benefit of being able to buy a house outweighs the cost of added risk on the deposits side, especially since these households have very small deposits when they buy a house.

7.4.2 Deposit Insurance

The key forces at play in our model are largely unaffected by the presence of deposit insurance. If deposit insurance is financed ex-ante via insurance premia paid by banks (e.g., to a foreign insurer), then the model is entirely unaffected, since the premia would be passed on to the depositors via lower deposit interest rates, leaving *expected* interest rates on deposits exactly as in the benchmark model. In the perhaps more relevant case of deposit insurance being paid for ex-post by taxes (e.g., consumption tax), the burden of losses from mortgage default is shifted from depositors to tax-payers. However, the resulting distribution of policy preferences across the wealth distribution remains largely unchanged. The poorest young households, who can never afford a house, suffer from the additional tax burden under lax regulation without getting any of the benefit of subsidized mortgages. The richest young households bear the brunt of the additional tax burden, and thus also prefer tight regulation. And it is still the middle-wealth young who benefit from deregulation, as greater availability and more favorable pricing of mortgages more than compensate them for the extra tax burden. And the old home-sellers still benefit from higher house prices in the unregulated economy.[38]

7.4.3 Households' Access to Financial Markets

Our key mechanism relies on households' deposits staying in the banking system even in the presence of the systemic risk. We have already discussed the possible role of deposit insurance above. Let's now consider the possibility that *some* households have access to savings instruments outside the domestic banking system. Such households would be at the top of the wealth distribution (both empirically, and from the viewpoint of a model where such access entails a fixed cost). The impact of this change in the model would be two-fold. On the one hand, it would make current account surplus a more binding condition (by shrinking the supply of deposits in the banking system). On the other hand, if the banking deposits still exceed the risky mortgages in the economy (which we argue is the empirically relevant case), this model change would *increase* the popular support for inefficiently lax regulation, as the richest young households who used to oppose it are now sheltered from the losses in the banking system, and the poorest young are the only ones left bearing the cost of the banking gamble.

7.4.4 Recourse Mortgages

We made a stark assumption that mortgages are defaultable and are non-recourse. This implies that mortgage lenders do not recover any part of the loan in the event of default, and that default is purely strategic. Of course, this drastic simplifying assumption is not supported empirically (see, for example, Gerardi et al. (2015) and Guiso, Sapienza, and Zingales (2013)). The implications of relaxing the non-recourse assumption are ambiguous but fairly intuitive. On the one hand, if intermediaries recover a portion of the defaulted loans, the aggregate losses in the adverse state are smaller, and the downside of lax regulation is correspondingly smaller as well. This may increase support for lax financial regulation. On the other hand, having to make (partial) repayment on a defaulted mortgage decreases the attractiveness of risky mortgages for middle-wealth home-buyers. The decline in support from this segment of the population makes lax regulation less likely to be the outcome of a political process.

[38] Progressive nature of taxation does not alter this argument. Even if poorest households receive net government transfers, they are still harmed by the financial crisis as such transfers are lowered when the budget is used to bail out the depositors. In order to break this logic, one has to assume that the poor receive larger government transfers during a banking crisis (due to, for example, stimulus measures or automatic stabilizers). In that case, the poorest renters may align with the middle class in supporting lax regulation, making it more likely to prevail in equilibrium (as discussed in Section 7.2.2).

7.4.5 Lobbying

Our analysis above focuses exclusively on popular support for financial regulation based on voters' economic outcomes. However, there is convincing empirical evidence for the presence and importance of lobbying, not least by financial institutions (e.g., Mian, Sufi, and Trebbi (2010, 2013)). Explicitly incorporating such lobbying into our model is somewhat tricky, as our lenders are competitive and thus earn zero expected profits regardless of the regulation. However, intuitive implications of adding lobbying are rather straightforward. If lenders benefit from the aggregate volume of loans, they always prefer (and lobby for) lax regulation. Another group of potential lobbyists in our environment is the owners of construction companies. In contrast to the financiers, construction firm owners do receive positive profits in equilibrium and are thus the most natural candidates for generating political contributions. Critically, their political preferences are simple and unambiguous — they always benefit from lax regulation, as it leads to greater house prices, greater levels of construction, and greater profits for construction firms.

To summarize, introducing lobbying into our environment would only strengthen political support for (inefficiently) lax financial regulation.

8 Conclusion

We have put forward a parsimonious model that captures one key intuitive message — there are two groups of households/voters who may have benefited from lax regulation of the mortgage lending industry. The first such group is relatively wealth-poor young households who cannot afford the down payment needed to buy a house under strict financial regulation. Under lax regulation, though, banks are willing to advance risky mortgages to these households, charging less than actuarially fair interest rates. (These banks will themselves fail in the event of a negative aggregate house-value shock, and thus do not demand adequate compensation for the non-repayment risk in that aggregate state.) The added demand from marginal young home-buyers, whose entry into the market is facilitated by the regulatory failure, pushes up the price of existing (as well as newly constructed) houses. This generates the second group of households who benefit from the lax regulation — incumbent (old) homeowners. This key economic insight translates into a simple political economy implication. If the coalition of old homeowners and young wealth-poor potential home-buyers is large enough, then regulatory failure (inefficiently lax financial regulation) can arise as an outcome of a democratic process. The regulatory failure in the model leads to inefficiently high levels of housing construction (fueled by a house-price bubble). In reality, this failure brings along additional costs of financial fragility, which is abstracted from in our model (as all agents are risk-neutral and there is no dead-weight loss associated with a banking crisis in the model).

The political economy of financial regulation in our environment does not depend on whether the construction boom generated by lax regulation is efficiency-improving or wasteful. The equilibrium in our model may have an inefficiently low housing level when the aggregate wealth of young households is low. Under these parameter values, lax regulation improves aggregate efficiency. In contrast, when the aggregate wealth of young households is sufficiently high, the laissez-faire equilibrium has excessive levels of construction relative to the utilitarian social optimal. In that case, lax regulation lowers aggregate welfare. It is worth highlighting that only this latter case yields a housing bubble under lax regulation (i.e., the house price under lax regulation exceeds the fundamental value of the house). More importantly, regardless of the aggregate welfare implications, the distribution of welfare gains remains unchanged — marginal young home-buyers and old homeowners benefit from lax regulation, while renters and sub-marginal home-buyers lose.

The basic mechanism we are emphasizing applies not just to financial regulation, but to other potential government interventions. Take for example the "shared equity mortgage" program introduced by the Canada Mortgage and Housing Corporation (CMHC) in 2019. The idea of the government agency helping first-time home-buyers come up with a down payment on a house is touted as making housing more affordable. The basic point that such a policy would make homes more expensive rather than more affordable is not new. Our analysis highlights that nonetheless this policy of stimulating home-buying may well have political support from a coalition of wealth-poor prospective new home-buyers (who benefit from the policy directly) and existing homeowners (who reap the benefit of increased house prices).

Embedding our key mechanism in a dynamic setting yields two additional insights. First, current financial regulation affects not only the financial markets for the newly issued mortgages, but, by affecting the current house prices, it also affects the current default rate on old outstanding mortgages. This mechanism may provide an additional (political) motivation for lax financial regulation.[39] Second, the popular support for lax regulation is self-perpetuating, as lax regulation today leads to a larger voting group of old homeowners tomorrow. We leave explicit treatment of these issues for future work.

[39] Incorporating large lenders into such a dynamic environment could additionally capture the mechanism of Gupta (2021), who highlights how decisions of (large) lenders to extend risky mortgages affect contemporaneous house prices.

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A Characterization of Economic Equilibrium

A.1 Solution to the Young Households' Problem

In this subsection, we characterize the solution to Problem 3. We begin by solving the mortgage choice problem for those who buy a house. We then turn to the home-purchase decision.

A.1.1 Mortgage Choice of Homeowners

A household with wealth w who buys a house ($h = 1$) solves the following mortgage/deposit choice problem:

$$\begin{aligned} &\max_{d,m} \Big\{(1-p)\big[(1+i)(1-\tau)d\big] + p\big[(1+i)d + v - (1+r)m\big]\Big\} \\ &\text{subject to } d + q = w + m, \\ &\qquad (1+r)m \le v, \\ &\qquad m \ge \max\{q-w, 0\}, \end{aligned}$$

where the last condition states that deposits and mortgages cannot be negative.

Denoting the expected rate of return on deposits by $\tilde{i} := [1-(1-p)\tau](1+i)-1$, the objective function can be rewritten as $(1+\tilde{i})d + p[v-(1+r)m]$. Plugging in the budget constraint yields simply

$$\begin{aligned} &\max_{m} \Big\{(1+\tilde{i})(w-q) + pv + \big[(1+\tilde{i}) - p(1+r)\big]m\Big\} \\ &\text{subject to } (1+r)m \le v, \\ &\qquad m \ge \max\{q-w, 0\}, \end{aligned}$$

Note that the objective function is linear in m, and thus, the solution is characterized as follows:

$$m(w) \begin{cases} = \max\{q-w, 0\} & \text{for } 1+\tilde{i} < p(1+r), \\ \in \big[\max\{q-w,0\}, \frac{v}{1+r}\big] & \text{for } 1+\tilde{i} = p(1+r), \\ = \frac{v}{1+r} & \text{for } 1+\tilde{i} > p(1+r). \end{cases}$$

Since $\tau \le 1$, $1+\tilde{i} = [1-(1-p)\tau](1+i) \ge p(1+i)$. Furthermore, in the laissez-faire environment (where $i = r$), $1+\tilde{i} \ge p(1+r)$. More generally, Lemma 11 ensures that we can consider solely the case $m(w) = \frac{v}{1+r}$ without loss of generality.

A.1.2 Homeownership Choice

Buying a house is feasible only for those with sufficient wealth (i.e., $w \geq q - \frac{v}{1+r}$).

With the maximum size of mortgage, the utility of buying a house is

$$u + (1+\tilde{i})(w-q) + pv + \left[(1+\tilde{i}) - p(1+r)\right]\frac{v}{1+r} = u + (1+\tilde{i})\left(w - q + \frac{v}{1+r}\right).$$

In contrast, the utility of not buying a house is $(1+\tilde{i})w$. Therefore, the utility gain from homeownership is positive if and only if $q \leq \overline{q}$, where

$$\overline{q} := \frac{u}{1+\tilde{i}} + \frac{v}{1+r}. \tag{19}$$

As long as $q < \overline{q}$ (Proposition 5), everyone who can afford to buy a house will buy one.

A.2 Expected Losses on Deposits

This subsection derives the expression for the fraction of deposits at risk in an economic equilibrium under arbitrary level of regulation α.

Since all banks make zero expected profit in equilibrium, the aggregate expected profits are also zero:

$$(1-p)\left[S - (1+i)(1-\tau)D\right] + p\left[S + (1+r)M - (1+i)D\right] - E = 0. \tag{20}$$

Aggregating banks' balance sheets gives $M + S = D + E$. Substituting this into (20) gives the fraction of deposits held by mortgage banks:

$$\tau = \frac{i + \left[1 - p(1+r)\right]\frac{M}{D}}{(1-p)(1+i)} = \left[\frac{1-p(1+r)}{1-p}\right]\frac{M}{D} = (1-\alpha)\frac{M}{D},$$

where we used $i = 0$ (Lemma 10) and $r = \alpha r^*$ (Lemma 6).

Because $M = \frac{Hv}{1+r}$ (Lemma 11) and $M - D = qH - W$,

$$\frac{M}{D} = \frac{\frac{v}{1+r}H}{\frac{v}{1+r}H - (qH - W)} = \left[1 + \left(\frac{1+r}{v}\right)\left(\frac{W}{H} - q\right)\right]^{-1}.$$

Thus, τ becomes

$$\tau = (1-\alpha)\left[1 + \left(\frac{1+r}{v}\right)\left(\frac{W}{H} - q\right)\right]^{-1}. \tag{21}$$

A.3 Equilibrium Equations

When $i = 0$ (Lemma 10) and $q < \overline{q}$ (Proposition 5), the equilibrium values (r, q, I, τ) solve

$$\begin{aligned} r =& \alpha r^*, \\ q =& k'(I), \\ H_O + I =& 1 - F\left(q - \frac{v}{1+r}\right), \\ \tau =& (1-\alpha)\left[1 + \left(\frac{1+r}{v}\right)\left(\frac{W}{H_O + I} - q\right)\right]^{-1}. \end{aligned}$$

Since we can simply plug the first two equations into the last two equations, this reduces to a system of two equations and two unknowns.

B Model Extension: Incorporating Safe Mortgages

The model in the paper makes a major simplifying assumption that houses are worth 0 with probability $(1 - p)$ in the second period. This assumption significantly simplifies the exposition, but (combined with the assumption that mortgages are non-recourse) implies that all mortgages are risky, as they are defaulted on with probability $(1 - p)$. This section presents an extension of the model that disposes with that unrealistic assumption and thus generates both safe and risky mortgages in equilibrium. This establishes robustness of our results and offers a much more realistic interpretation of the key condition necessary to generate them — the "current-account surplus" needed to generate the political failure in our model merely requires that the total amount of domestic deposits exceed the total amount of *risky portions* of mortgages (which can be thought of as risky tranches of mortgage-backed securities).

Before presenting this extension, let us point out that, empirically, the risky portion of the aggregate mortgage pool was dramatically smaller than the total domestic deposits, even in the run-up to the GFC. To get a rough estimate of the risky portion of the mortgage pool, we first consider the size of the mortgage market that is not completely safe and then consider what portion of that segment of the market is actually at risk (i.e., not fully secured by the value of the underlying property in the worst state of the world). Bernanke (2007) reports that 14% of all outstanding mortgages in 2007 were subprime mortgages, with another 8 to 10% classified as "near prime." Making the conservative assumption that these risky mortgages are on average the same size as prime mortgages, puts the total amount of less-than-safe mortgage market at no more than \$2.5 trillion.[40] A similar generous upper bound can be obtained by

[40]The total size of the residential mortgage market in 2007 was about \$11 trillion according to the Financial Account of the United States (series FL893065105 in Z.1).

accumulating all of the subprime originations over the period from 2001 through 2006, as done in Acharya et al. (2011). This procedure, which ignores paying down of principal and repeated originations due to refinancing, puts the upper bound at \$2.4 trillion. Finally, one other widely-used measure of the size of the unsafe mortgage market is the size of non-agency residential MBS market, since almost none of the subprime mortgages could be securitized via agency MBS. The size of this non-agency residential MBS market, which includes prime (jumbo) and Alt-A components along with subprime mortgages, also peaked below \$2.4 trillion in 2007.[41] How much of this pool was actually at risk? Ospina and Uhlig (2018) document that 87% of principal amount of non-agency residential MBS were assigned AAA rating, and that losses on these AAA pools during the GFC were small, cumulating to just 2.3% by 2013. Thus, we can think of 15% as an upper bound on the at-risk portion of the less-than-safe mortgage market. This gives us an upper bound of \$400 billion as the counterpart of the risky portion of the mortgage market in the model. This number is an order of magnitude smaller than the total amount of deposits in the banking system, which in 2007 was around \$6 trillion.[42]

B.1 Generalizing the Model

The key departure from the benchmark model is the change in the (exogenous) value of houses in the adverse aggregate state in the second period. Rather than setting it to 0, we now set it to v_L, and denote the value in the good state of the world by v_H. That is, the house value (price) in the second period is either high, v_H, with probability p, or low, v_L, with probability $(1 - p)$.

In this environment, mortgages with face value up to v_L pose no risk of default. We assume that such mortgages are treated as a safe asset both by investors and by any banking regulation, and they thus yield the safe rate of return $\bar{r} = 0$. We will treat mortgages with face value $l > v_L$ as a bundle of two products — a safe mortgage with face value v_L (and interest rate $\bar{r} = 0$) and a risky (second) mortgage with face value $m = (l - v_L)$ and interest rate r, which reflects the default risk of (this portion of) the mortgage. This second mortgage can alternatively be thought of as a home equity loan or a risky tranche of a (securitized) mortgage pool.

The rest of the model is exactly the same as in the benchmark setting in Section 2.

[41] See series FL673065105 in the Financial Account of the United States (Z.1) as in Fuster, Lucca, and Vickery (2022).

[42] The total deposits in commercial banks reported in Assets and Liabilities of Commercial Banks in the United States (series 1058 in H.8) exceeded \$6 trillion, while the total household deposits reported in the Financial Account of the United States (series FL193030205 and FL193020005 in Z.1) were just under \$6 trillion.

B.2 Equilibrium of the Generalized Model

The bank(er)'s problem remains exactly the same as in the benchmark model. The only difference is in the interpretation of the safe asset s, which now includes safe portions (tranches) of mortgages, and the risky asset m, which is now interpreted as only the risky portion of the mortgage. We again offer an equilibrium characterization that relies on banks specializing in only one type of assets:

Lemma 12. *For any equilibrium of our economy in which individual banks (and investors) purchase both risky portions of mortgages and safe assets, there is an outcome-equivalent equilibrium in which individual banks (investors) specialize.*

The young household's problem changes slightly and now reflects the choice between a safe mortgage ($l \leq v_L$), which we denote by s, and a risky mortgage, in which case we denote the risky portion of it by $m = l - v_L$. The problem is then

Problem 5. *Taking house price q, interest rates r and i, fraction of deposit at risk τ, and their own wealth w as given, households solve*

$$
\begin{aligned}
\max_{h\in\{0,1\},(d,s,m)\in\mathbb{R}^3_+} \quad & \left\{uh + (1-p)c_L + pc_H\right\} \\
\text{subject to} \quad & d + qh = w + s + m, \\
& c_L = (1+i)(1-\tau)d + v_L h - s, \\
& c_H = (1+i)d + v_H h - s - (1+r)m, \\
& s \leq v_L h, \\
& (v_L - s)m = 0, \qquad (22) \\
& m \leq \frac{v_H - v_L}{1+r}h.
\end{aligned}
$$

where condition (22) simply states that a risky mortgage cannot be issued until the safe mortgage has been exhausted.

The definition of equilibrium is exactly the same as in the benchmark model, the only difference again being the interpretation, as safe (portions of) mortgages are now part of the safe asset category (s), while m refers to just the risky portion of the mortgages.

Rather than go through a complete characterization of the economic equilibrium in the generalized model, we now point out the key changes in the equilibrium characterization and in the conditions needed to generate political failure.

First, the expression for the wealth cutoff $\underline{w}$ (minimal wealth needed to buy a house) changes to reflect the availability of safe mortgages. I.e., equation (6) is replaced by

$$\underline{w} := q - v_L - \frac{v_H - v_L}{1+r}. \tag{23}$$

Second, we can longer be sure that every home-buyer takes out the maximum available mortgage. While the risky portion of the mortgage is still "subsidized" in an environment with insufficient regulation (i.e., the expected interest rate paid on it is no higher than that received on deposits: $p(1+r) \leq (1+\tilde{i})$), the safe portion of the mortgage isn't (since $(1+\tilde{i}) \leq 1$). So, if one takes out a risky mortgage, they take out the maximum one available, but those who can afford to buy a house without one may now choose to minimize their mortgage size. We thus need to introduce an additional wealth cutoff $\hat{w}$, above which home-buyers take out the minimal safe mortgage required to buy a house (or no mortgage at all), while those with wealth between $\underline{w}$ and $\hat{w}$ take out the maximum possible mortgage, including the risky portion.

$$\hat{w} := q - \frac{1}{-\tilde{i}}\left[pv_H + (1-p)v_L - \frac{v_H + rv_L}{1+r}(1+\tilde{i})\right]. \tag{24}$$

Note that if $pv_H+(1-p)v_L < \frac{v_H+rv_L}{1+r}(1+\tilde{i})$, then every home-buyer takes out the maximum size mortgage (to take advantage of the "subsidy" on the risky portion of the mortgage).

The "current account surplus" equilibrium (where a portion of deposits is invested in safe assets, and thus the interest rates are given by $i = 0$ and $r = \alpha r^*$) is then characterized by the following set of equations:

$$\begin{aligned} H =& H_O + \frac{q}{\kappa} = 1 - F(\underline{w}), \\ \tau =& (1-\alpha)\frac{M}{D}, \\ 1+\tilde{i} =& (1-p)(1-\tau) + p, \\ D =& M + S + (qH - W), \end{aligned}$$

where the expressions for the financial market quantities depend on whether wealthy households participate in the mortgage market: Scenario 1: every home buyer borrows if $(1+\tilde{i})\overline{m} > \mathbb{E}[v]$:

$$\text{If } \; pv_H + (1-p)v_L < \frac{v_H + rv_L}{1+r}(1+\tilde{i}) \; \text{ then } \begin{cases} M = \left(1 - F(\underline{w})\right)\frac{v_H - v_L}{1+r}, \\ S = \left(1 - F(\underline{w})\right)v_L, \end{cases}$$

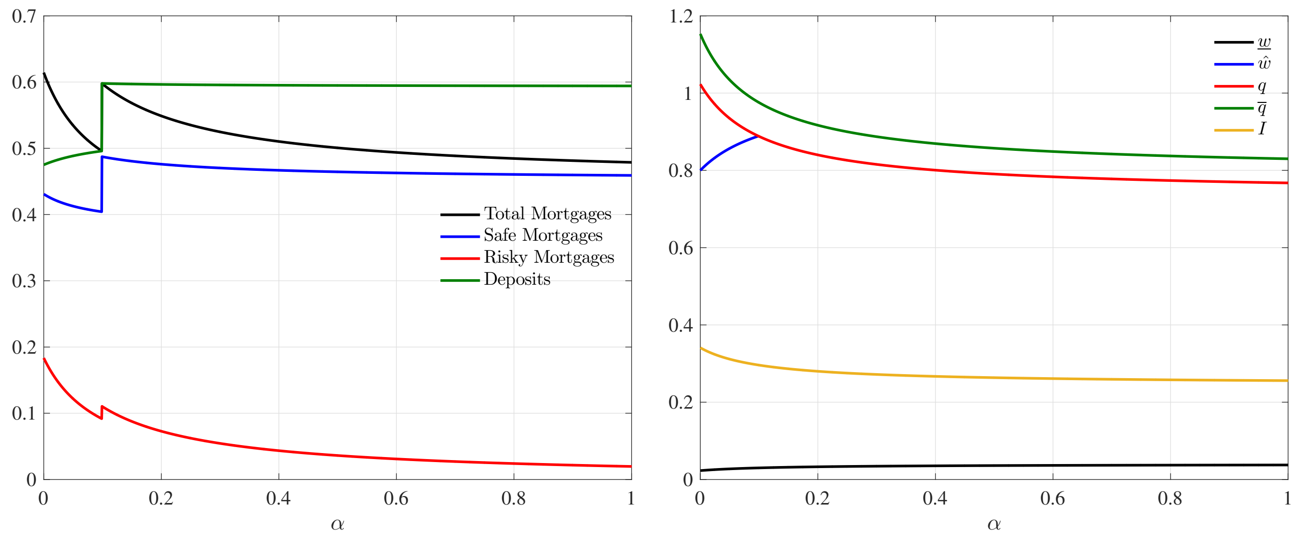
$$\text{If } \; pv_H + (1-p)v_L > \frac{v_H + rv_L}{1+r}(1+\tilde{i}) \; \text{ then } \begin{cases} M = \left(F(\hat{w}) - F(\underline{w})\right)\frac{v_H - v_L}{1+r}, \\ S = \left(F(\hat{w}) - F(\underline{w})\right)v_L + \int_{\hat{w}}^{q}(q-w)dF(w), \end{cases}$$

where $\hat{w}$ is given by equation (24). If $pv_H + (1-p)v_L = \frac{v_H + rv_L}{1+r}(1+\tilde{i})$, then wealthy homebuyers (with $w \geq q$) are indifferent between taking out a maximum mortgage and not taking one at all as the benefit from the mortgage subsidy is exactly offset by the expected losses on additional bank deposits (while all other homebuyers strictly prefer the largest available mortgage). In this (measure 0) case, the exact (gross) quantities of mortgages and deposits are indeterminate, but all other variables are uniquely pinned down, including τ and $\tilde{i}$ as all the possible equilibrium combination of M and D yield the same $\frac{M}{D}$ in this case.

Most importantly perhaps, the sufficient condition for the "current-account surplus" to be the equilibrium is dramatically relaxed. The expression implying that a portion of households' deposits is invested in safe assets is still $D > M$, but M now stands for just the risky portion of the mortgages. This is an important observation for mapping the model to the data and for assessing the plausibility of this key assumption.

All of this is illustrated by the numerical example below, where the total stock of mortgages in the laissez-faire setting exceeds the amount of deposits, but the equilibrium is still "current account surplus," since the risky portion of the mortgages is well below the stock of deposits. The parameter values in the example are $u = 0.1$, $v_H = 1$, $v_L = 0.7$, $p = 0.1$, $k(I) = \frac{\kappa}{2}I^2$ with $\kappa = 3$, $H_O = 0.4$, and $\ln w \sim N(-2.48, 4)$. These values satisfy Assumptions 1 and 2 and the appropriately adjusted Assumption 4. Figure 5 plots the values of the key equilibrium variables as a function of the level of banking regulation, and Figure 6 depicts the variables that are key to the political analysis. In this example, for low values of α, wealthy homebuyers choose not to borrow, as the expected losses on additional deposits more than offset the gain from the "subsidy" on the risky portion of the mortgage. But under tighter regulation (larger α), all homebuyers, including the wealthiest ones, take out the largest possible mortgage to take advantage of the mispricing of the risky portion.

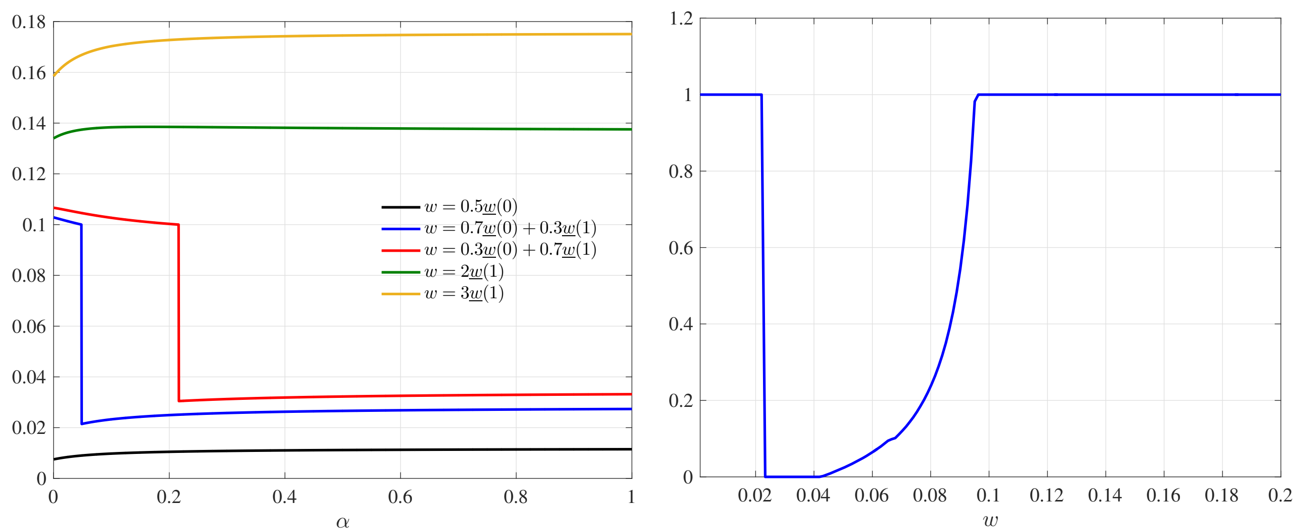
The key point of this exercise is to confirm that the political economy forces present in the simpler benchmark model carry over to the generalized environment (under the weaker condition that total deposits exceed only the risky portion of the mortgage market). First, lax regulation makes homeownership accessible to a larger segment of the population and increases house prices. Second, among young households, the richest and the poorest prefer tight regulation, while the middle-wealth young prefer laissez-faire. The underlying mechanism and the resulting policy preferences are exactly the same as in the benchmark model.



(a) Financial market

(b) Housing market

Figure 5: Equilibrium with Regulation



(a) Indirect Utility

(b) Preferred Regulation

Figure 6: Political Economy

C Proofs

We begin with two preliminary results that are helpful for other proofs in this section.

Lemma 13. *In any equilibrium, $i \geq 0$.*

Proof. Consider a strategy $m = e = 0$ (i.e., $s = d$), which yields the expected profit $s - (1+i)d = -id$. When $i < 0$, the expected profit is strictly increasing in d. This means that there is no solution to the bank's problem. □

Lemma 14. *In any equilibrium, $r \leq r^*$.*

Proof. Consider a strategy $s = d = 0$ (i.e., $m = e$), which yields the expected profit $p(1+r)m - e = \left[p(1+r) - 1\right]e$. When $r > r^*$, the expected profit is strictly increasing in e. This means that there is no solution to the bank's problem. □

C.1 Proof of Lemma 1

Suppose that there is an equilibrium where some banks (or investors) purchase both mortgages and the safe asset, that is, $m > 0$ and $s > 0$. To establish that there is an outcome-equivalent equilibrium with specialization, we simply split such "diversified" investors into two specialized components and show that this specialized allocation also solves the banker's problem.

First, consider the case where the bank defaults on (some) deposits in the event of the adverse housing shock (i.e., where limited liability on deposits is binding). In this case, the (maximized) expected profit is

$$p\left[(1+r)m + s - (1+i)d\right] - e = 0,$$

where $m > 0$ and $0 < s < (1+i)d$. The fact that the bank cannot further increase the expected profit implies that $i = 0$, as otherwise the bank could increase the expected profit by increasing or decreasing both s and d by the same amount (which would not violate the regulatory constraint (1)). In turn, $i = 0$ means that we can divide the bank into two banks with zero expected profits: (i) a mortgage bank with $m' = m$, $s' = 0$, $d' = d - s > 0$, and $e' = e$, and (ii) a safe bank with $d'' = s'' = s$ and $m'' = e'' = 0$. The two specialized banks' strategies are profit-maximizing and meet the regulatory constraint (1).

Next, consider the case of an investor or a bank that does not default on deposits regardless of the realization of the housing shock. The (maximized) expected profit in that case is

$$p(1+r)m + s - (1+i)d - e = 0,$$

where $m > 0$, $s > 0$, and $s \geq (1+i)d$. If $r < r^*$, then the bank could increase the expected profit by reducing m and e by the same amount. Moreover, $r \leq r^*$ by Lemma 14. Therefore, $r = r^*$ must hold. In turn, $r = r^*$ implies that we can break the bank into two entities with zero expected profits: (i) a mortgage investor with $m' = e' = m$ and $s' = d' = 0$, and (ii) a safe bank with $s'' = s$, $d'' = d$, $m'' = 0$, and $e'' = e - m \geq 0$, where $e \geq m$ is implied by $i \geq 0$ (Lemma 13) and $s \geq (1+i)d$. The two specialized banks' strategies are profit-maximizing and meet the regulatory constraint (1).

C.2 Proof of Lemma 2

The first-order necessary condition for profit maximization of the construction firm (Problem 2) is

$$q = k'(I).$$

Suppose that $I = 0$ in equilibrium. Then $q = 0$ also holds because $k'(0) = 0$. When $q = 0$, all young individuals can buy a house without a mortgage and enjoy the benefit from the house $u + pv > 0$. Therefore, the demand for houses is 1, while the supply is H_O. Since $H_O < 1$, $q = 0$ does not clear the housing market. Thus, $I > 0$ in equilibrium.

C.3 Proof of Lemma 3

From the budget constraint (2) and the borrowing limit (4), the maximum amount of resources young households can raise in the first period is $w + \frac{v}{1+r}$. Therefore, young households can buy a house if and only if $w \geq q - \frac{v}{1+r}$.

C.4 Proof of Lemma 4

Suppose that there is an equilibrium where some banks hold more than the minimal amount of equity required by the regulation. That is, $e > \alpha m$. To establish that there is an outcome-equivalent equilibrium with all banks holding the minimum amount of equity required by the regulation, we simply split such banks into a bank that holds the minimum amount of equity and a private-equity investor, and show that this alternative allocation is also consistent with profit maximization.

First, consider the case of a mortgage bank. The maximized expected profit is

$$p\left[(1+r)m - (1+i)d\right] - e = 0,$$

where $e > \alpha m > 0$ and $d > 0$. If $r < r^*$, then the bank could increase the expected profit by reducing m

and e by the same amount. Moreover, $r \leq r^*$ by Lemma 14. Therefore, $r = r^*$ must hold. In turn, $r = r^*$ implies that we can break the bank into two entities with zero expected profits: (i) a mortgage bank with $e' = \alpha m' = \frac{\alpha}{1-\alpha} d$ and $d' = d$, and (ii) a private-equity investor with $m'' = e'' = m - \frac{d}{1-\alpha} > 0$ and $d'' = 0$, where $m > \frac{d}{1-\alpha}$ is implied by $e > \alpha m$ and $m = d + e$. These two strategies are profit-maximizing, meet the regulatory constraint (1), and combine to the same overall allocation as the original bank.

Next, consider the case of a safe bank. The (maximized) expected profit in that case is

$$s - (1 + i)d - e = 0,$$

where $s > 0$, $d > 0$, and $e > 0$. We can break this bank into two entities with zero expected profits: (i) a safe bank with $s' = s - e$, $e' = 0$, and $d' = d$, and (ii) a private-equity investor with $s'' = e'' = e$ and $d'' = 0$. These two strategies are profit-maximizing, meet the regulatory constraint (1), and combine to the same overall allocation as the original bank.

C.5 Proof of Lemma 5

1. By Lemma 4, it suffices to consider a mortgage bank with $e = \alpha m$. Then the identify $m = d + e$ implies $d = (1 - \alpha)m$. The expected profit from a given strategy m, $e = \alpha m$, and $d = (1 - \alpha)m$ is

$$p\big[(1 + r)m - (1 + i)d\big] - e = \Big\{p\big[(1 + r) - (1 + i)(1 - \alpha)\big] - \alpha\Big\}m.$$

When $p\big[(1+r) - (1+i)(1-\alpha)\big] - \alpha > 0$, there is no solution to the bank's problem because the bank can increase the expected profit by increasing m. Therefore, $p\big[(1 + r) - (1 + i)(1 - \alpha)\big] - \alpha \leq 0$ must hold.

When there are some mortgage banks in equilibrium, the expected profit must be non-negative for some $m > 0$. This is possible only when $p\big[(1 + r) - (1 + i)(1 - \alpha)\big] - \alpha = 0$.

2. $i \geq 0$ follows from Lemma 13. By Lemma 4, it suffices to consider a safe bank with $e = 0$ (i.e., $s = d$). Its expected profit is $s - (1 + i)d = -id$. When there are some safe banks in equilibrium, the expected profit must be non-negative for some $d > 0$. This is possible only when $i = 0$.

3. $r \leq r^*$ follows from Lemma 14. Consider a private-equity investor that specializes in mortgage (i.e., $m = e$ and $d = s = 0$). Its expected profit is $p(1 + r)m - e = \big[p(1 + r) - 1\big]e$. When there are some private-equity investment in mortgages in equilibrium, the expected profit must be non-negative for some $m > 0$. This is possible only when $r = r^*$.

C.6 Proof of Lemma 6

Suppose that $\alpha < 1$ and there are no mortgage banks in equilibrium. Then there must be safe banks because the aggregate supply of deposit is strictly positive (because the wealth distribution is non-degenerate). The existence of safe banks implies $i = 0$ (Lemma 5). In turn, $i = 0$ implies $r \le \alpha r^*$ (due to $p\big[(1+r) - (1+i)(1-\alpha)\big] - \alpha \le 0$ from Lemma 5). Because $\alpha < 1$, $r < r^*$ holds and there cannot be any private-equity investment in mortgages. That is, the aggregate supply of mortgages is zero.

On the one hand, because there are no mortgage banks, no banks fail. That is, $\tau = 0$ and the expected return on deposits is $1 + i = 1$. On the other hand, $r < r^*$ implies that the expected return on mortgages, $p(1 + r)$, is smaller than 1. Therefore, everyone who buys a house takes out the maximum size mortgage $m = \frac{v}{1+r}$ (see Section A.1.1), and the aggregate demand for mortgages is strictly positive. Because the mortgage market does not clear, there cannot be an equilibrium without mortgage banks.

Therefore, there must be some mortgage banks and $\tau > 0$ in equilibrium when $\alpha < 1$, and $r = \alpha r^* + (1 - \alpha)i$ must hold (Lemma 5). Combining this with $i \ge 0$ (Lemma 13) and $r \le r^*$ (Lemma 14) gives $i \in [0, r^*]$.

C.7 Proof of Lemma 7

When $\alpha = 1$, there are no mortgage banks and $\tau = 0$. Therefore, as shown in the proof of Lemma 6, there must be both safe banks and private-equity investment in mortgages to meet strictly positive aggregate demand for deposits and mortgages. This implies $r = r^*$ and $i = 0$ must hold (Lemma 5) when $\alpha = 1$.

C.8 Proof of Lemma 8

When $\alpha = 0$, $e = \alpha m = 0$ for mortgage banks (Lemma 4) and $i = r$ holds (Lemma 6). Since there are always mortgage banks (Lemma 6), the fraction of deposits held by mortgage banks, $\tau = D_M/(D_M + D_S)$, is strictly positive.

C.9 Proof of Proposition 1

When $\alpha = 0$, mortgage banks hold zero equity (Lemma 4) and $i = r \in [0, r^*]$ holds (Lemmata 6 and 8). While there are always mortgage banks, there cannot be both safe banks and private-equity investment in mortgages (Lemma 5). Therefore, it suffices to consider the following three cases:

1. There are only mortgage banks and safe banks: In this case, $M = D_M$ and $D = D_M + D_S$ hold. Therefore, $M - D = -D_S < 0$ and $\tau = D_M/D \in (0, 1)$. The fact that there are safe banks implies $i = r = 0$ (Lemma 5).

2. There are only mortgage banks: In this case, $M = D = D_M$. Therefore, $M - D = 0$ and $\tau = D_M/D = 1$.

3. There are only mortgage banks and private-equity investment in mortgages: In this case, $M = D_M + M_P$ and $D = D_M$. Therefore, $M - D = M_P > 0$ and $\tau = D_M/D = 1$. The fact that there is private-equity investment in mortgages implies $i = r = r^*$.

C.10 Proof of Proposition 2

The three equality constraints of Problem 4 imply

$$C_O + pC_L + (1-p)C_H = W - k(I) + pv(H_O + I).$$

Therefore, Problem 4 is identical to the modified problem (11) with additional inequality constraints. Because $I = I^*$ solves the modified problem, it also solves Problem 4 if all inequality constraints can be satisfied at $I = I^*$.

Consider an allocation with $I = I^*$, $A_L = 0$, $A_H = -v(H_O + I^*)$, $C_O = W - k(I^*) + pv(H_O + I^*)$ $C_L = C_H = 0$. Because of Assumptions 1 and 2, such allocation satisfies all inequality constraints. Therefore, $I = I^*$ solves Problem 4.

C.11 Proof of Proposition 3

Let $\hat{c}_O$ and $(\hat{c}_L(w), \hat{c}_H(w), \hat{h}(w))$ be an allocation of consumption for the old and consumption and housing for the young with wealth level w such that $\hat{I} := \int \hat{h}(w)dF(w) - H_O > I^*$. We will show that there is an alternative feasible allocation under which no one is worse off and someone is strictly better off.

Let $\mathcal{W} \subset \mathbb{R}_+$ be a set of wealth levels such that $\hat{h}(w) = 1$ for all $w \in \mathcal{W}$ and $\int_{\mathcal{W}} dF(w) = \varepsilon > 0$. Consider an alternative allocation $\tilde{c}_O = \hat{c}_O$, $\left(\tilde{c}_L(w), \tilde{c}_H(w), \tilde{h}(w)\right) = \left(\hat{c}_L(w), \hat{c}_H(w), \hat{h}(w)\right)$ for all $w \notin \mathcal{W}$ and, for all $w \in \mathcal{W}$,

$$\begin{aligned}
\tilde{c}_L(w) =& \hat{c}_L(w) + \frac{k(\hat{I}) - k(\tilde{I})}{\varepsilon} - pv, \\
\tilde{c}_H(w) =& \hat{c}_H(w) + \frac{k(\hat{I}) - k(\tilde{I})}{\varepsilon} - pv, \\
\tilde{h}(w) =& 0,
\end{aligned}$$

where $\tilde{I} := \int \tilde{h}(w)dF(w) - H_O = \hat{I} - \varepsilon$.

This allocation is resource-feasible, that is,

$$\begin{aligned}
&\tilde{c}_O + \int \Big((1-p)\tilde{c}_L(w) + p\tilde{c}_H(w)\Big) dF(w) \\
=&\left[\hat{c}_O + \int \Big(p(1-p)\hat{c}_L(w) + p\hat{c}_H(w)\Big) dF(w)\right] + \left[\int_{\mathcal{W}} \left(\frac{k(\hat{I}) - k(\tilde{I})}{\varepsilon} - pv\right) dF(w)\right] \\
=&\left[W - k(\hat{I}) + pv(H_O + \hat{I})\right] + \left[k(\hat{I}) - k(\tilde{I}) - pv\varepsilon\right] \\
=&W - k(\tilde{I}) + pv(H_O + \tilde{I}).
\end{aligned}$$

The old and the young with $w \notin \mathcal{W}$ are indifferent between the alternative allocation and the original allocation. In contrast, the young with $w \in \mathcal{W}$ experience the utility gain

$$\left[u\tilde{h}(w) + (1-p)\tilde{c}_L(w) + p\tilde{c}_H(w)\right] - \left[u\hat{h}(w) + (1-p)\hat{c}_L(w) + p\hat{c}_H(w)\right] = -u + \frac{k(\hat{I}) - k(\hat{I} - \varepsilon)}{\varepsilon} - pv,$$

which is strictly positive if and only if

$$\frac{k(\hat{I}) - k(\hat{I} - \varepsilon)}{\varepsilon} > u + pv. \tag{25}$$

Since $\hat{I} > I^*$ implies $k'(\hat{I}) = \lim_{\varepsilon \to 0} \frac{k(\hat{I}) - k(\hat{I} - \varepsilon)}{\varepsilon} > u + pv$, there exists $\varepsilon > 0$ such that (25) holds. Notice that (25) also implies that the consumption of the young is positive in each state. Therefore, the original allocation with $\hat{I} > I^*$ is not Pareto optimal.

C.12 Proof of Lemma 9

This is a special case of Lemma 10.

C.13 Proof of Proposition 4

Suppose that $I \leq I^*$ holds in any equilibrium with $\alpha = 0$. We first show that $q < \overline{q}$ holds. Since $i = r = 0$ (Lemma 9), we have

$$\overline{q} = \frac{u}{1 - (1-p)\tau} + v > u + pv = k'(I^*) \geq k'(I) = q,$$

where the first inequality holds because $\tau \geq 0$ and $p < 1$ and the second inequality follows from $I \leq I^*$.

Next, $q < \overline{q}$ implies that the aggregate demand for housing is $1 - F(q - v)$. Thus, the housing market clearing condition gives

$$1 - H_O = I + F\big(k'(I) - v\big) \leq I^* + F\big(k'(I^*) - v\big) = I^* + F\big(u - (1-p)v\big),$$

where the inequality follows from $I \leq I^*$. This contradicts Assumption 4. Therefore, $I > I^*$ must hold under Assumption 4.

C.14 Proof of Proposition 5

We first show that $\overline{q} \geq u + pv$. Since $i = 0$ (Lemma 10), we have

$$\overline{q} = \frac{u}{1-(1-p)\tau} + \frac{v}{1+r}.$$

Because $r \leq r^*$ (Lemma 14) and $\tau \geq 0$, $\overline{q} \geq u + pv$ holds.

Next, suppose that $q = \overline{q}$. Then the housing market clearing condition gives

$$H_O + I \leq 1 - F\left(\overline{q} - \frac{v}{1+r}\right) = 1 - F\left(\frac{u}{1-(1-p)\tau}\right).$$

Because $\tau \geq 0$ and $q \geq u + pv$ (which implies $I \geq I^*$), the above inequality further implies

$$H_O + I^* \leq 1 - F(u),$$

which contradicts Assumption 5. Therefore, $q < \overline{q}$ must hold.

C.15 Proof of Lemma 10

Aggregating young households' budget constraint (2) gives

$$M - D = qH - W.$$

In any equilibrium, $q \leq \overline{q}$ holds, where $\overline{q}$ is given by (from (19))

$$\overline{q} = \frac{u}{[1-(1-p)\tau](1+i)} + \frac{v}{1+r}.$$

From Lemma 6, $i \geq 0$ and $r \geq 0$ hold. Moreover, $\tau \leq 1$ holds by definition. Therefore,

$$\overline{q} \leq \frac{u}{p} + v.$$

This implies

$$M - D \leq \overline{q}H - W \leq \frac{u}{p} + v - W.$$

Thus, $M < D$ holds by Assumption 3.

That means that mortgage banks cannot absorb all of the deposits in the economy ($D_M \leq M$), and thus some deposits must end up in safe banks.

C.16 Proof of Lemma 11

Since $i = 0$ (Lemma 10), the expected return on deposits is $1 - (1 - p)\tau$. The expected (gross) rate paid on mortgages is $p(1 + r)$. We first establish that $1 - (1 - p)\tau > p(1 + r)$ whenever $\alpha < 1$. With $i = 0$ and $M + S = D + E$, the aggregate zero expected profit condition (20) of the financial sector becomes

$$1 - \left[1 - (1 - p)\tau\right] = \left[1 - p(1 + r)\right]\frac{M}{D}.$$

Because $M < D$ (Lemma 10), this implies $1 - (1 - p)\tau > p(1 + r)$. Since the expected rate of return on deposits is greater than the expected rate paid on mortgages, all home-buyers always take out the largest mortgage when $\alpha < 1$ (see Section A.1.1). Therefore, the maximum mortgage is the only possible equilibrium outcome when $\alpha < 1$.

When $\alpha = 1$, the expected rates of return on deposits and mortgages are the same: $1-(1-p)\tau = p(1+r)$ holds because $r = r^*$ (Lemma 6) and $\tau = 0$ (Lemma 7). Therefore, home-buyers are indifferent regarding the size of the mortgage they take out, as long it is sufficient for them to afford the house purchase. Importantly, though, the mortgage choice does not affect the home purchase decision. Therefore, any equilibrium in which home-buyers take out mortgages of various sizes is identical in terms of (q, H, i, r, τ) to the equilibrium in which all home-buyers take out the largest possible mortgage. Of course, the aggregate quantities of mortgages (M) and deposits (D) are shifted by the same amount as we "switch" to the maximum-mortgage equilibrium, but that does not affect consumption or utility of households. Regulatory constraint is also unaffected since all mortgages come from private-equity investors when $\alpha = 1$.

C.17 Proof of Proposition 6

Since $r = \alpha r^*$ (Lemma 10), and $q < \overline{q}$ (Proposition 5), the equilibrium housing investment I satisfies

$$H_O + I = 1 - F\left(k'(I) - \frac{v}{1+\alpha r^*}\right). \tag{26}$$

For any given α, the left-hand side of this equation is increasing in I, while the right-hand side is decreasing in I.

Since an increase in α reduces the right-hand side of (26), the equilibrium levels of I (and $q = k'(I)$) must be decreasing in α in order for (26) to hold. In turn, the observation that I is decreasing in α implies that $\underline{w} = k'(I) - \frac{v}{1+\alpha r^*}$ must be increasing in α.

From (21), the fraction of deposits held by mortgage banks is

$$\tau = (1-\alpha)\left[1 + \left(\frac{1+\alpha r^*}{v}\right)\left(\frac{W}{H} - q\right)\right]^{-1}.$$

Since H and q are decreasing in α, τ is decreasing in α.

It is easy to see that τ is strictly decreasing and $\underline{w}$ is strictly increasing in α, while q, H, and I are constant when the homeownership rate is 100% (i.e., $F(\underline{w}) = 0$).

C.18 Proof of Proposition 7

When $\alpha = 1$, $\tau = i = 0$ and $r = r^*$ (Lemmas 6 and 7), which implies $\overline{q} = u + pv$. Because $q < \overline{q}$ (Proposition 5), $I < I^*$ holds and the equilibrium investment is inefficiently low when $\alpha = 1$.

C.19 Proof of Proposition 8

The results follow from Proposition 6.

Households who cannot afford a house under the more lax regulation α certainly cannot afford it under the stricter regulation α'. That is, $w < \underline{w}(\alpha)$ implies $w < \underline{w}(\alpha')$, which follows from $\underline{w}(\alpha)$ being strictly increasing in α. Therefore, these households are concerned only with the expected return on their deposits and thus prefer the stricter regulation: $U(w;\alpha') - U(w;\alpha) = w\big(\tilde{i}(\alpha') - \tilde{i}(\alpha)\big) > 0$, because τ is strictly increasing in α.

For those with $w \in \big[\underline{w}(\alpha), \underline{w}(\alpha')\big)$, the stricter regulation α' precludes them from buying a house, thus making them worse off than under the looser regulation α:

$$\begin{aligned} U(w;\alpha') - U(w;\alpha) =& w\left(1+\tilde{i}(\alpha')\right) - \left[u + \left(w - \underline{w}(\alpha)\right)\left(1+\tilde{i}(\alpha)\right)\right] \\ <& \underline{w}(\alpha') - u \\ \leq& q(1) - pv - u \\ <& 0, \end{aligned}$$

where the first inequality follows from $w \in \left[\underline{w}(\alpha), \underline{w}(\alpha')\right)$ and $\tilde{i}(\alpha') \leq 0$, the second inequality holds due to $\underline{w}(\alpha') \leq \underline{w}(1) = q(1) - pv$, and the third inequality reflects $q(1) < u + pv$ (Proposition 7).

Finally, for those with $w \geq \underline{w}(\alpha')$,

$$\begin{aligned} U(w;\alpha') - U(w;\alpha) =& \left(w - \underline{w}(\alpha')\right)\left(1+\tilde{i}(\alpha')\right) - \left(w - \underline{w}(\alpha)\right)\left(1+\tilde{i}(\alpha)\right) \\ =& w\left(\tilde{i}(\alpha') - \tilde{i}(\alpha)\right) - \underline{w}(\alpha')\left(1+\tilde{i}(\alpha')\right) + \underline{w}(\alpha)\left(1+\tilde{i}(\alpha)\right). \end{aligned}$$

Because $\tilde{i}(\alpha') > \tilde{i}(\alpha)$, we have

$$U(w;\alpha') - U(w;\alpha) \begin{cases} < 0, & \text{for } w < \overline{w}(\alpha,\alpha'), \\ = 0, & \text{for } w = \overline{w}(\alpha,\alpha'), \\ > 0, & \text{for } w > \overline{w}(\alpha,\alpha'), \end{cases}$$

where $\overline{w}(\alpha,\alpha')$ is given by (15). Moreover, $\overline{w}(\alpha,\alpha') > \underline{w}(\alpha')$ holds because $\underline{w}(\alpha) < \underline{w}(\alpha')$.

C.20 Proof of Corollary 1

This immediately follows from $U(w;\alpha') < U(w;\alpha)$ for $w \in \left[\underline{w}(\alpha), \underline{w}(\alpha')\right)$ (Proposition 8).

C.21 Proof of Proposition 9

We first show that Condition 1 implies $F\left(\underline{w}(0)\right) = 0$. Suppose that $F\left(\underline{w}(0)\right) > 0$. Because $q(0) < \overline{q}(0)$ (Proposition 5), the housing market clearing condition under $\alpha = 0$ implies

$$H_O + I(0) = 1 - F\left(\underline{w}(0)\right) < 1.$$

Because $k'(\cdot)$ is an increasing function, this can be written as

$$k'\big(I(0)\big) < k'(1 - H_O) \leq v,$$

where the last inequality holds due to Condition 1. Therefore, $\underline{w}(0) = k'\big(I(0)\big) - v < 0$ and, thus $F\big(\underline{w}(0)\big) = 0$. This contradicts $F\big(\underline{w}(0)\big) > 0$, and therefore $F\big(\underline{w}(0)\big) = 0$ must hold.

By Propositions 6 and 8, young households with wealth levels $w \in \big[\underline{w}(0), \overline{w}(0, \alpha^*)\big]$ and the old home-sellers prefer $\alpha = 0$ to $\alpha = \alpha^*$. Therefore, the number of people who would vote for $\alpha = 0$ over $\alpha = \alpha^*$ is

$$H_O + F\big(\overline{w}(0, \alpha^*)\big) - F\big(\underline{w}(0)\big) > H_O + F\big(\underline{w}(\alpha^*)\big) = 1 - I^*,$$

where the inequality holds because $\overline{w}(0, \alpha^*) > \underline{w}(\alpha^*)$ (see Proposition 8) and $F\big(\underline{w}(0)\big) = 0$ (Condition 1); and the equality reflects the housing market clearing condition under $\alpha = \alpha^*$. When Condition 2 holds, $1 - I^*$ exceeds 50% of the population, $(H_O + 1)/2$. Therefore, $\alpha = 0$ wins over $\alpha = \alpha^*$ in majority vote.

C.22 Proof of Proposition 10

The first two properties follow from Proposition 8. Suppose that the third property does not hold. That is, there exist (w, w', α, α') such that $\underline{w}(0) \leq w < w'$, $\alpha \in A(w)$, $\alpha' \in A(w')$, and $\alpha > \alpha'$. Since $\alpha \in A(w)$, $\underline{w}(\alpha) \leq w$ must hold (Corollary 1). This also implies $\underline{w}(\alpha') < \underline{w}(\alpha) \leq w < w'$ because $w < w'$, $\alpha > \alpha'$, and $\underline{w}(\cdot)$ is strictly increasing (Proposition 6). Therefore,

$$\begin{aligned}
U(w'; \alpha) - U(w'; \alpha') =& w'\big(\tilde{i}(\alpha) - \tilde{i}(\alpha')\big) - \underline{w}(\alpha)\big(1 + \tilde{i}(\alpha)\big) + \underline{w}(\alpha')\big(1 + \tilde{i}(\alpha')\big) \\
>& w\big(\tilde{i}(\alpha) - \tilde{i}(\alpha')\big) - \underline{w}(\alpha)\big(1 + \tilde{i}(\alpha)\big) + \underline{w}(\alpha')\big(1 + \tilde{i}(\alpha')\big) \\
=& U(w; \alpha) - U(w; \alpha') \\
\geq& 0,
\end{aligned}$$

where the first inequality follows from $w < w'$, $\alpha > \alpha'$, and $\tilde{i}(\cdot)$ being strictly increasing (Proposition 6), and the second inequality reflects $\alpha \in A(w)$. However, this contradicts $\alpha' \in A(w')$. Thus, the third property must hold.

C.23 Proof of Proposition 11

Let $\widehat{\alpha} := \min A(\widehat{w})$. Suppose that α is a Condorcet winner and $\alpha < \widehat{\alpha}$. Since the median-wealth ($\widehat{w}$) household strictly prefers $\widehat{\alpha}$ to α (by construction), and since $\widehat{w} \geq \underline{w}(\widehat{\alpha}) \geq \underline{w}(\alpha)$ (by Corollary 1), it follows from Proposition 8 that $\widehat{w} > \overline{w}(\alpha, \widehat{\alpha})$. Proposition 8 further implies that $U(w; \alpha) < U(w; \widehat{\alpha})$ holds for all $w > \overline{w}(\alpha, \widehat{\alpha})$. But that means that the mass of people who strictly prefer $\widehat{\alpha}$ to α constitutes a majority of votes:

$$1 - F\big(\overline{w}(\alpha, \widehat{\alpha})\big) > 1 - F(\widehat{w}) = \frac{1 + H_O}{2}.$$

This contradicts α being a Condorcet winner. Therefore, any Condorcet winner α cannot be smaller than $\widehat{\alpha}$.

Next, when $1 \in A(\widehat{w})$, $U(w; \alpha) \leq U(w; 1)$ holds for all $w \geq \widehat{w}$ (Proposition 8). Therefore, $\alpha = 1$ has at least majority of support against all $\alpha' < 1$ and thus is a Condorcet winner.

C.24 Proof of Proposition 12

Let $\alpha_m := \min A(w_m)$. Suppose that α is a Condorcet winner and $\alpha < \alpha_m$. By Proposition 8, $U(w; \alpha) < U(w; \alpha_m)$ holds for all $w > \overline{w}(\alpha, \alpha_m)$ and $w < \underline{w}(\alpha)$. Because $\overline{w}(\alpha, \alpha_m) < w_m$ holds due to $\alpha < \alpha_m$,

$$1 - F\big(\overline{w}(\alpha, \alpha_m)\big) + F\big(\underline{w}(\alpha)\big) > 1 - F(w_m) + F\big(\underline{w}(0)\big) = \frac{1 + H_O}{2}.$$

Therefore, we have more than majority support for α_m over α, which contradicts that α is a Condorcet winner. Therefore, any Condorcet winner α cannot be smaller than α_m.

Next, when $1 \in A(w_m)$, $U(w; \alpha) \leq U(w; 1)$ holds for all $w \geq w_m$ and $w < \underline{w}(0)$ (Proposition 8). Therefore, $\alpha = 1$ has at least majority support against all $\alpha' < 1$ and thus is a Condorcet winner.

Finally, when $0 \in A(w_m)$, $U(w; \alpha) \leq U(w; 0)$ holds for all $w \in [\underline{w}(0), w_m]$ (Proposition 8). Therefore, $\alpha = 0$ has at least majority support against all $\alpha' > 0$ and thus is a Condorcet winner.

C.25 Proof of Proposition 13

This follows from the proof of Proposition 2, $I^*_\phi < I^*$, and the properties of $k(\cdot)$.

C.26 Proof of Proposition 14

When $\alpha = 1$ and the housing price is given by $u + pv - \phi$, the aggregate housing demand is $1 - F(u - \phi)$ and the aggregate housing supply is $H_O + I^*_\phi$. By Assumption 7, the housing supply exceeds housing demand at the price $u + pv - \phi$. Therefore, $q(1)$ must be lower than $u + pv - \phi$ to clear the housing market.

C.27 Proof of Proposition 15

The proof is identical to that of Proposition 9, except that we now use Lemma 15 instead of Proposition 8:

Lemma 15. *Consider two levels of banking regulation α and α', where $\alpha' > \alpha$. Then, under Assumptions 3 and 7,*

$$U(w;\alpha') - U(w;\alpha) \begin{cases} > 0, & \text{for } w < \underline{w}(\alpha), \\ < 0, & \text{for } w \in \left[\underline{w}(\alpha), \underline{w}(\alpha')\right), \\ < 0, & \text{for } w \geq \underline{w}(\alpha') \text{ and } w < \overline{w}(\alpha,\alpha'), \\ = 0, & \text{for } w \geq \underline{w}(\alpha') \text{ and } w = \overline{w}(\alpha,\alpha'), \\ > 0, & \text{for } w \geq \underline{w}(\alpha') \text{ and } w > \overline{w}(\alpha,\alpha'), \end{cases}$$

where

$$\overline{w}(\alpha,\alpha') := \frac{\underline{w}(\alpha')\left(1+\tilde{i}(\alpha')\right) - \underline{w}(\alpha)\left(1+\tilde{i}(\alpha)\right) + \phi\left(I(\alpha') - I(\alpha)\right)}{\tilde{i}(\alpha') - \tilde{i}(\alpha)} \tag{27}$$

is the wealth level of the young house-buyer indifferent between the two policies.

Proof. The proof is very similar to that of Proposition 8, but we reproduce the full step here for completeness.

Households who cannot afford a house under the more lax regulation α certainly cannot afford it under the stricter regulation α'. That is, $w < \underline{w}(\alpha)$ implies $w < \underline{w}(\alpha')$, which follows from $\underline{w}(\alpha)$ being strictly increasing in α. Therefore, these households are concerned only with the expected return on their deposits and the dead-weight loss, and thus they prefer the stricter regulation: $U(w;\alpha') - U(w;\alpha) = w\left(\tilde{i}(\alpha') - \tilde{i}(\alpha)\right) - \phi\left(I(\alpha') - I(\alpha)\right) > 0$, because τ is strictly increasing in α and I is strictly decreasing in α.

For those with $w \in \left[\underline{w}(\alpha), \underline{w}(\alpha')\right)$, the stricter regulation α' precludes them from buying a house, thus making them worse off than under the looser regulation α:

$$\begin{aligned}U(w;\alpha')-U(w;\alpha)=&w\big(1+\tilde{i}(\alpha')\big)-\Big[u+\big(w-\underline{w}(\alpha)\big)\big(1+\tilde{i}(\alpha)\big)\Big]-\phi\big(I(\alpha')-I(\alpha)\big)\\<&\underline{w}(\alpha')-u-\phi\big(I(\alpha')-I(\alpha)\big)\\\leq&q(1)-pv-u-\phi\big(I(\alpha')-I(\alpha)\big)\\<&-\phi\big(1+I(\alpha')-I(\alpha)\big)\\<&0,\end{aligned}$$

where the first inequality follows from $w\in\big[\underline{w}(\alpha),\underline{w}(\alpha')\big)$ and $\tilde{i}(\alpha')\leq 0$, the second inequality holds due to $\underline{w}(\alpha')\leq\underline{w}(1)=q(1)-pv$, the third inequality reflects $q(1)<u+pv-\phi$ (Proposition 14), and the final inequality holds because $I(\alpha)\in[0,1-H_O]$ for all α.

Finally, for those with $w\geq\underline{w}(\alpha')$,

$$\begin{aligned}U(w;\alpha')-U(w;\alpha)=&\big(w-\underline{w}(\alpha')\big)\big(1+\tilde{i}(\alpha')\big)-\big(w-\underline{w}(\alpha)\big)\big(1+\tilde{i}(\alpha)\big)-\phi\big(I(\alpha')-I(\alpha)\big)\\=&w\big(\tilde{i}(\alpha')-\tilde{i}(\alpha)\big)-\underline{w}(\alpha')\big(1+\tilde{i}(\alpha')\big)+\underline{w}(\alpha)\big(1+\tilde{i}(\alpha)\big)-\phi\big(I(\alpha')-I(\alpha)\big).\end{aligned}$$

Because $\tilde{i}(\alpha')>\tilde{i}(\alpha)$, we have

$$U(w;\alpha')-U(w;\alpha)\begin{cases}<0, & \text{for } w<\overline{w}(\alpha,\alpha'),\\=0, & \text{for } w=\overline{w}(\alpha,\alpha'),\\>0, & \text{for } w>\overline{w}(\alpha,\alpha'),\end{cases}$$

where $\overline{w}(\alpha,\alpha')$ is given by (27). However, $\overline{w}(\alpha,\alpha')>\underline{w}(\alpha')$ may not hold. □

C.28 Proof of Proposition 16

The proofs of the first two properties are identical to those of Proposition 10, except that we now use Lemma 15 instead of Proposition 8. It is easy to see that the proof for the third property also works with the dead-weight loss because the dead-weight loss does not interact with the level of individual wealth (i.e., $U(w;\alpha)-U(w;\alpha')$ does not depend on w).

D Current Account Deficit

This section characterizes the equilibrium and effects of regulation in an economy where the laissez-faire allocation is a current account deficit. I.e., we relax Assumption 3 and consider the case when total mortgage demand in the unregulated economy is larger than the domestic supply of deposits. To simplify the exposition, we parameterize the construction function as $k(I) = \frac{\kappa}{2} I^2$, which implies that in any equilibrium with construction, $I = \frac{q}{\kappa}$.

In the absence of regulation ($\alpha = 0$), the interest rates are $i = r = r^* = \frac{1}{p} - 1$. The equilibrium house price is pinned down either by the housing market clearing or by the maximum willingness to pay of young buyers. Specifically, define q^u to be the solution of the market clearing equation:

$$H_O + \frac{q^u}{\kappa} = 1 - F\left(q^u - \frac{v}{1+r}\right). \tag{28}$$

The laissez-faire equilibrium house price is $q = \min\{q^u, \overline{q}\}$, where $\overline{q}$ is the solution of the system of equations

$$\overline{q} = \frac{u}{1-(1-p)\tau} + \frac{v}{1+r}, \tag{29}$$

$$\tau = (1-\alpha)\frac{M}{D} = (1-\alpha)\frac{\left(H_O + \frac{\overline{q}}{\kappa}\right)\frac{v}{1+r}}{Y + \left(H_O + \frac{\overline{q}}{\kappa}\right)\frac{v}{1+r} - \left(H_O + \frac{\overline{q}}{\kappa}\right)\overline{q}}. \tag{30}$$

The set of equations characterizing the equilibrium are:

$$\overline{y} = q - \frac{v}{1+r}, \tag{31}$$

$$q_m = \frac{u}{\left[1-(1-p)\tau)\right](1+i)} + \frac{v}{1+r}, \tag{32}$$

$$H_O + \frac{q}{\kappa} = 1 - F(\overline{y}), \quad \text{if} \quad q < q_m, \tag{33}$$

$$H_O + \frac{q}{\kappa} \leq 1 - F(\overline{y}), \quad \text{if} \quad q = q_m, \tag{34}$$

$$M = \left(H_O + \frac{q}{\kappa}\right)\frac{v}{1+r}, \tag{35}$$

$$D = Y - \left(H_O + \frac{q}{\kappa}\right)\left(q - \frac{v}{1+r}\right), \tag{36}$$

$$M - D = \left(H_O + \frac{q}{\kappa}\right) q - Y, \tag{37}$$

$$1 + r = \frac{\alpha}{p} + (1-\alpha)(1+i). \tag{38}$$

D.1 Current-Account Deficit under Laissez-Faire

Consider an economy where the laissez-faire outcome is a current-account deficit (i.e., $M > D$). In the absence of regulation ($\alpha = 0$), the interest rates are $i = r = r^* = \frac{1}{p} - 1$. The equilibrium house price is pinned down either by the housing market clearing or by the maximum willingness to pay of young buyers. Specifically, define q^u to be solution of the market clearing equation:

$$H_O + \frac{q^u}{\kappa} = 1 - F(q^u - pv). \tag{39}$$

The laissez-faire equilibrium house price is $q = \min\{q^u, q_m\}$, where $q_m = u + pv$. Note that this immediately implies that there can be no excess construction under a current-account deficit.

Having thus pinned down all of the prices, note that the quantities are uniquely determined. The housing level is simply $H_O + \frac{q}{\kappa}$, regardless of whether q is pinned down by q^u or q_m. The inverse of the "current account" is given the equation (37), and we simply need to verify that $M - D > 0$.

D.2 Effects of Regulation on Equilibrium Allocation

We will present the effects of financial regulation in this setting as a comparative static exercise of increasing α from 0 to 1. The first thing to note is that low levels of regulation $\alpha < \frac{M-D}{M}$ have no effect on the equilibrium allocation. Foreign investments in domestic mortgages, which were held directly (outside of the banking sector) in the laissez-faire setting, now partly shift into the required banking equity of domestic banks. But as long as the aggregate required banking equity does not exceed the amount of foreign capital voluntarily entering the domestic economy, the regulation has no allocative effects.

Once α exceeds this threshold (namely, the laissez-faire level of $\frac{M-D}{M}$), the equilibrium first resembles the "current account balance" equilibrium, where all of the domestic deposits are in risky banks, which exactly satisfy the regulation. Then, for even higher values of α, the equilibrium starts to resemble the "current account surplus," as some of the domestic deposits end up in safe banks.

For the intermediate levels of α, the equilibrium is characterized by $\tau = 1$, $\alpha = \frac{M-D}{M}$, and intermediate levels of interest rates $i, r \in (0, r^*)$. The house price is again pinned down either by the market clearing condition or by the maximum willingness to pay. The market-clearing candidate price level q^u now solves

$$H_O + \frac{q^u}{\kappa} = 1 - F\left(q^u - \frac{v}{1+r}\right). \tag{40}$$

And the new maximum willingness to pay is $q_m = \frac{u}{p(1+i)} + \frac{v}{1+r}$. The equilibrium house price is $q = min\{q^u, q_m\}$. The comparative statics in this region are quite counter-intuitive. Increasing α within this range necessarily leads to lower interest rates. The lower interest rates in turn imply higher house prices, as both potential determinants of the house prices (q_m and q^u) are decreasing in interest rates.

The counter-intuitive results arise from the counter-intuitive movement of the interest rates in response to the policy. Banking regulation forces banks to attract (more) foreign equity. In order to so, banking equity has to be rewarded, which can only be achieved by lowering the interest rate on domestic deposits. Note that this lower deposit interest rate comes with no greater protection from the crisis — all of the deposits are still entirely in gambling banks. Thus, the banking regulation within this intermediate range necessarily makes domestic depositors worse off.

For high levels of α, some domestic deposits are pushed into the safe banks (crowded out of the mortgage market by the forced bank equity). This implies $i = 0$ and $\tau = (1 - \alpha)M/D$. Unlike in the intermediate range, the depositors' welfare is increasing in α, as does the interest rate on mortgages r. And since the interest rate is increasing in α, the house price decreases with α, restoring the usual intuitive result.