The Postpandemic U.S. Immigration Surge: New Facts and Inflationary Implications*

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Abstract

The U.S. experienced an extraordinary surge in immigration from 2021 to 2024, which triggered widespread discussions about its macroeconomic impact, particularly on inflation. To determine the impact of the immigration surge, we first document the salient features of these new immigrants: they are primarily low-skilled relative to the existing workforce and more likely to be hand-to-mouth consumers. We then incorporate these features into a heterogeneous agent model with capital-skill complementarity. We find that the supply- and demand-side effects of the immigration surge roughly cancel out, causing a negligible response of inflation.

Keywords: Immigration, population growth, inflation, skill complementarity, hand-to-mouth
JEL Classifications: E21, E22, E31, F22, J11, J15

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1 INTRODUCTION

Prior to 2020, immigration to the U.S. was relatively stable, with about one million net immigrants added to the population annually from 2000 to 2019, according to Congressional Budget Office (CBO) estimates. Starting in 2021, the U.S. experienced an unprecedented surge in immigration. The CBO estimated in September 2025 that total net immigration reached 10.5 million from 2021 to 2024, causing annual population growth to increase from about 0.6% before 2020 to 1.1% at its peak in 2023.[1] This extraordinary shock triggered widespread discussions about its macroeconomic impact, particularly on inflation, given the worldwide surge in inflation that began in mid-2021. Motivated by the policy relevance and historic nature of the shock, this paper examines the inflationary implications of the 2021–2024 immigration surge.

The inflationary effect of a surge in immigration is theoretically ambiguous due to the tension between supply and demand. This core dilemma was articulated by Wicksell, who noted that when

> *"the growth of population is accompanied by an increased demand for all kinds of products, on the one hand, and by an increased supply of labor available in the future, on the other, then a capital accumulation...will only just suffice to maintain capital at about the same relative level, for which reason it will continue to possess a high marginal productivity and to yield a high rate of interest." —Wicksell (1934, p. 213)*

An immigration surge, which temporarily boosts population growth, therefore generates two competing effects: It increases the labor supply, which eases cost pressures and pushes down inflation, but it also increases consumption demand and spurs investment as firms race to equip new workers.

Although previous studies have explored the macroeconomic effects of immigration from various angles, they are not suited to answer the current question. For example, theoretical models often abstract from inflation dynamics, empirical macro models such as VARs tend to face data limitations, and empirical micro studies typically focus on local labor market effects. Our approach, which is specifically designed to address the impact of the 2021-2024 immigration surge,

[1] See *An Update to the Demographic Outlook, 2025 to 2055*, www.cbo.gov/publication/61390.

is to first understand the characteristics of these immigrants and then to develop a macroeconomic model consistent with these characteristics.

In the first part of our paper, we set up a stylized New Keynesian model that permits an analytical solution to illustrate the competing supply and demand effects of an immigration shock. We fix investment growth and use a representative agent, so there is no household heterogeneity. In this case, the supply-side effects dominate and inflation falls in response to the immigration shock. However, we show that when a fraction of households are hand-to-mouth consumers or investment is endogenously determined, the demand-side effects dominate, leading to a positive inflation response. This exercise highlights the importance of using data to discipline the key features of a quantitative model that examines the effect of the postpandemic U.S. immigration surge.

The second part of our paper provides empirical evidence on the features of the 2021–2024 immigration surge. Using administrative data from government agencies and immigration courts, we document the unprecedented size of this shock, and more importantly, the unusual composition of this immigration surge. Unlike in the past, this surge was driven by unauthorized immigrants from a few Central and South American countries, rather than legal and skilled immigrants worldwide.[2]

Since administrative data do not contain demographic or economic characteristics of immigrants, we explore several household survey datasets, including the Current Population Survey (CPS) and the Panel Study of Income Dynamics (PSID). A major challenge with the survey data is that they do not indicate whether an immigrant is unauthorized. To address this issue, we use as a proxy respondents who arrived in the U.S. recently and who were born in countries where the majority of unauthorized immigrants originated. This approach is motivated by a large literature on immigration enclaves, which finds that immigrants from the same countries share similar socioeconomic characteristics (Bartel, 1989; Borjas, 1987, 1994; Caiumi and Peri, 2024; Card, 2001, 2009; Munshi, 2003). We provide evidence consistent with this view and show that further restricting

[2] We use unauthorized immigrants to refer to people who entered the U.S. illegally, people who overstay their legal temporary status, and people who were temporarily permitted to enter the U.S. through the use of parole or may be awaiting proceedings in immigration court (referred to as "other foreign nationals" by the CBO). Some of these individuals may have received a temporary status that allows them to live and work in the U.S. However, they are not provided with an immigration status nor are they formally "admitted" into the country for purposes of immigration law.

our sample to immigrants who are most likely to be unauthorized has little effect on our estimates.

Our empirical analysis establishes three stylized facts. First, unauthorized immigrants who arrived in the U.S. after 2020 have lower skills and earn much lower income than the native-born population. Second, these immigrants spend a much higher fraction of their income, have substantially lower wealth and liquid savings, and are more likely to be viewed as “hand-to-mouth” consumers (Kaplan and Violante, 2014). Third, the characteristics of unauthorized immigrants are persistent.

In the third part of our paper, we build the empirical characteristics of the 2021–2024 immigration surge into a heterogeneous agent New Keynesian model with population growth. There are high-skilled and low-skilled workers (consistent with fact 1), a fraction of the low-skilled workers are hand-to-mouth consumers (consistent with fact 2), and household characteristics are persistent (consistent with fact 3). Our model also captures other salient features of the data. For example, a fraction of the income of low-skilled workers is remitted abroad. On the production side, there is a higher degree of complementarity between high-skilled labor and capital than between low-skilled labor and capital, consistent with empirical evidence in Krusell et al. (2000) and Ohanian et al. (2023).[3] The model is calibrated to match micro evidence in the literature and population and income shares in the data, providing a credible laboratory for us to examine the responses of inflation and real activity to the postpandemic immigration surge.

Our quantitative results suggest that the inflationary demand-side pressures and disinflationary supply-side effects of the immigration surge roughly canceled out. The large increase in low-skilled labor reduced the low-skilled wage rate and boosted aggregate supply, putting downward pressure on inflation. There are two potential offsetting demand-side responses: investment and consumption. The decline in the capital-to-labor ratio increased the return to capital and aggregate investment, although the responses were tempered by the low-skilled nature of the shock. The large increase in the low-skilled population also boosted aggregate consumption, even though the decline in the low-skilled wage rate lowered per capita consumption. We find a robust result that

[3]Since Krusell et al. (2000), capital skill complementarity has become a common feature in macroeconomic models. See, for example, Lindquist (2004), Ben-Gad (2008), He and Liu (2008), Parro (2013), Dolado et al. (2021), Carroll and Hur (2023), and Bilbiie et al. (2023). Violante (2008) provides a review of the early literature.

the net effect on aggregate inflation from these two competing channels was positive but negligible.

Although the model suggests that the immigration surge had little impact on inflation, there were larger effects on economic activity. The influx of workers causes a persistent increase in output, which leads to a temporary increase in the growth rate that could be interpreted as an overheating economy. However, our model predicts that there is a roughly one-for-one increase in potential output, so there is little change in the output gap. The muted responses of inflation and the output gap suggest that policymakers should be careful not to overreact to low-skilled immigration shocks.

As a final exercise, we consider two extensions of our baseline analysis. First, we examine a counterfactual scenario in which the immigration surge was concentrated among high-skilled workers, given that these individuals made up the bulk of immigration before the pandemic. In this scenario, firms respond by significantly increasing investment, which generates stronger demand-side effects and a larger increase in aggregate inflation. Second, we analyze the post-2024 immigration reversal, when net unauthorized immigration turned negative. Comparing a counterfactual inflation path that removes the estimated effects of the immigration shocks to actual inflation shows that the immigration surge had only a small effect on inflation throughout the 2021–2025 period.

Related literature Our paper builds on a small but important literature that employs general equilibrium models to explore the implications of immigration. For example, Canova and Ravn (2000) consider an influx of low-skilled workers as a consequence of the reunification of Germany. Storesletten (2000) utilizes an overlapping generations model to examine the fiscal repercussions of immigration. Ben-Gad (2004, 2008) uses a similar model with overlapping dynasties to investigate the effects of immigration on investment. Our model shares some features of these models, but also builds in nominal rigidities, allowing us to assess the impact of immigration on inflation dynamics.

Several studies have also used macro models to study migration in other countries and contexts. Burriel et al. (2010), for example, estimate a New Keynesian model for the Spanish economy, and Bentolila et al. (2008) show that immigration moderates the slope of the Phillips curve in Spain. Similar models with net migration are analyzed for New Zealand (Smith and Thoenissen, 2019), Germany (Braun and Weber, 2021), and the U.S. (Hauser and Seneca, 2022). A few papers examine the cross-country effects of immigration (Burstein et al., 2020; Mandelman and Zlate, 2012). Relative to these papers, we account for the unique characteristics of the U.S. immigration surge.

There is a related empirical literature that uses VAR models to estimate the impact of immigration shocks in different countries. Kiguchi and Mountford (2019) estimate a VAR model with sign restrictions on U.S. data, observing muted impacts of immigration on real wages. Furlanetto and Robstad (2019) apply a similar approach to Norwegian data, concluding that immigration shocks affect unemployment fluctuations but have negligible effects on inflation. Smith and Thoenissen (2019) analyze New Zealand data, finding that migration shocks contribute to per capita GDP growth with the size dependent on the relative human capital of immigrants and natives. Weiske (2019) estimates a VAR model with long-run restrictions for the U.S., finding that immigration temporarily decreases the real wage, stimulates investment, and has modest effects on per capita output, consumption, and hours. These models are intended to capture the impact of legal and skilled immigration. A recent exception is Orrenius et al. (2025), who use U.S. data on unauthorized immigration to quantify the effects on inflation. They find a muted inflationary response and higher real activity in response to an unauthorized immigration shock, consistent with our model.

Finally, our paper is related to a large empirical micro literature that exploits cross-sectional variation to estimate the impact of immigration on specific markets. Studies that focus on the labor market have long debated the effects of immigration on native wages and employment (Borjas, 2003; Caiumi and Peri, 2024; Card, 2005, 2009; East et al., 2023; Ottaviano and Peri, 2012), while others have documented important price effects on non-tradable services (Cortes, 2008; Frattini, 2014), consumer goods (Lach, 2007), and housing (Saiz, 2003, 2007). Most closely related to our empirical motivation, Wilson and Zhou (2026) study the same postpandemic immigration episode using administrative microdata and local variation in unauthorized immigrant worker flows. A key insight from this literature is the crucial role of capital in mediating these impacts (Clemens et al., 2018; Peri, 2012). Our model with heterogeneous labor, hand-to-mouth consumers, and capital accumulation provides a macroeconomic framework consistent with these micro channels that can assess the effects of immigration on aggregate inflation, echoing the broader literature emphasizing the distinction between cross-sectional estimates and aggregate effects (e.g., Guren et al., 2020).

Outline The paper proceeds as follows. Section 2 illustrates the tension between the supply- and demand-side effects of immigration using a stylized New Keynesian model. Section 3 presents our empirical analysis based on administrative and survey data. Section 4 describes our macroeconomic model motivated by the empirical analysis. Section 5 quantifies the inflationary effects of the U.S. immigration surge and presents the results of several robustness exercises. Section 6 considers the policy implications, a counterfactual scenario with a large influx of high-skilled immigrants, and the post-2024 immigration reversal. Section 7 discusses the implications of sectoral and geographic heterogeneity. Section 8 concludes.

2 COMPETING FORCES OF IMMIGRATION

We begin by highlighting the competing forces of a change population growth that were first articulated by Wicksell by considering a stylized representative agent New Keynesian model with capital accumulation. To allow for balanced growth while maintaining analytical tractability, we initially assume that aggregate investment growth is fixed at the trend growth rate of the population.

As shown in Appendix B, a log-linear approximation of the detrended model around the deterministic steady state simplifies to the usual investment-saving (IS) relation and Phillips curve (PC):

$$\widehat{gap}_t = \mathbb{E}_t \widehat{gap}_{t+1} - C(\hat{R}_t - \mathbb{E}_t \hat{\Pi}_{t+1} - \hat{r}_t^*), \tag{IS}$$

$$\hat{\Pi}_t = \kappa \widehat{gap}_t + \beta \Gamma_N \mathbb{E}_t \hat{\Pi}_{t+1}, \tag{PC}$$

where $\widehat{gap}_t$ is the output gap, $\hat{R}_t$ is the nominal interest rate set by the central bank, $\hat{\Pi}_t$ is the inflation rate, C is the steady-state consumption share of aggregate expenditure that governs the interest rate semi-elasticity of the output gap, κ is the slope of the Phillips curve, β is the subjective discount factor, and Γ_N is the trend population growth rate. The natural interest rate $\hat{r}_t^*$ is given by

$$\hat{r}_t^* = \frac{1+\eta}{(1-C)(1-\alpha)+C(1+\eta)} \mathbb{E}_t \Delta \hat{a}_{t+1} - \frac{(1-C)(\alpha+\eta)}{(1-C)(1-\alpha)+C(1+\eta)} \mathbb{E}_t \Delta \hat{\imath}_{t+1},$$

where α is the capital share of income, $1/\eta$ is the Frisch elasticity, Δ is a first-difference operator, $\hat{\imath}_t = \hat{\imath}_{t-1} - \hat{\Gamma}_{N,t}$ is per capita investment, and $\hat{a}_t = \alpha(\hat{k}_{t-1} - \hat{\Gamma}_{N,t})$ is a measure of productivity that depends on the initial per capita capital stock ($\hat{k}_{t-1}$) and population growth ($\hat{\Gamma}_{N,t}$). What is new relative to a conventional New Keynesian model is that there are population growth shocks that shift the natural rate through a supply-side effect arising from changes in productivity growth ($\mathbb{E}_t\Delta\hat{a}_{t+1}$) and a demand-side effect due to changes in per capita investment growth ($\mathbb{E}_t\Delta\hat{\imath}_{t+1}$).

Assume that population growth follows a first-order autoregressive process with persistence $\rho_N > 0$ and that the economy is initially in steady state ($\hat{\imath}_{t-1} = \hat{k}_{t-1} = 0$). Under these conditions, fixed aggregate investment growth implies that $\hat{\imath}_t = -\hat{\Gamma}_{N,t}$ and $\mathbb{E}_t\hat{\imath}_{t+1} = -(1+\rho_N)\hat{\Gamma}_{N,t}$, so expected per capita investment growth is given by $\mathbb{E}_t\Delta\hat{\imath}_{t+1} = -\rho_N\hat{\Gamma}_{N,t}$. Therefore, an increase in population growth pushes down expected per capita investment growth and raises the current natural interest rate, similar to a positive preference shock in a conventional New Keynesian model.

Turning to aggregate supply, the law of motion for the capital stock implies that $\hat{k}_t = -\hat{\Gamma}_{N,t}$, so current and expected productivity are given by $\hat{a}_t = -\alpha\hat{\Gamma}_{N,t}$ and $\mathbb{E}_t\hat{a}_{t+1} = -\alpha(1+\rho_N)\hat{\Gamma}_{N,t}$. It immediately follows that expected productivity growth is given by $\mathbb{E}_t\Delta\hat{a}_{t+1} = -\alpha\rho_N\hat{\Gamma}_{N,t}$. Therefore, an increase in population growth pushes down on productivity growth and reduces the current natural interest rate, similar to a positive technology shock in a conventional New Keynesian model.

These supply- and demand-side channels have competing effects on the natural interest rate. Given the above solutions for $\mathbb{E}_t\Delta\hat{\imath}_{t+1}$ and $\mathbb{E}_t\Delta\hat{a}_{t+1}$, the solution for the natural rate collapses to

$$\hat{r}_t^* = -\rho_N \frac{C\alpha - \eta(1-\alpha-C)}{(1-C)(1-\alpha) + C(1+\eta)}\hat{\Gamma}_{N,t}.$$

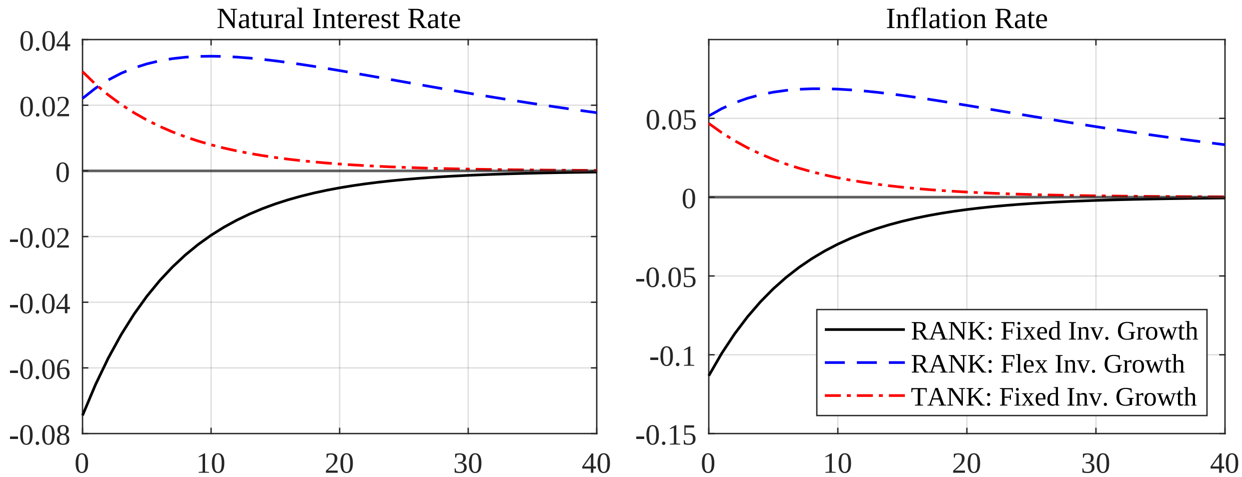
An increase in population growth reduces the natural rate under weak conditions.[4] In this case, the supply-side effects of the shock dominate the demand-side effects. Given a change in the natural rate, the dynamics are standard: A decrease in the natural rate lowers the output gap and inflation.[5]

As an illustration, Figure 1 plots the responses of the natural rate and inflation to an increase in population growth under standard parameter values. Consistent with our analytical results, both

[4]It requires that $\frac{1}{\eta} > \frac{1-\alpha-C}{C\alpha}$, which is a weak restriction since $\alpha + C$ tends to exceed unity.

[5]These dynamics assume monetary policy responds more than one-for-one with inflation to ensure determinacy.

Figure 1: Impulse responses to an immigration shock in alternative settings



Notes: The responses are in annualized percentage point deviations from steady state. The solid and dashed lines are based on a representative agent New Keynesian (RANK) model with fixed investment growth and flexible investment growth, respectively. The dashed-dotted line is based on a two-agent New Keynesian (TANK) model with fixed investment growth, where a fraction of households are hand-to-mouth consumers.

variables fall on impact (solid lines). This confirms that when we use a representative agent model that does not account for any household heterogeneity and shut down the firm's investment decision by fixing investment growth, the supply-side effects of the population growth shock dominate.

To demonstrate the sensitivity of the responses, we consider the same-sized population growth shock in two alternative models: a representative agent New Keynesian (RANK) model with endogenous investment growth and a two-agent New Keynesian (TANK) model where investment growth remains fixed but a fraction of households are hand-to-mouth consumers.[6] In the first model, the larger workforce from higher population growth endogenously increases the return to capital, boosting investment demand (dashed line). In the second model, the larger population coupled with the fact that a fraction of the households consume all of their income each period boosts aggregate consumption (dashed-dotted lines). In either case, the demand-side effects become strong enough to dominate the supply-side effects of the shock, causing the natural rate and inflation responses to flip signs. This sensitivity highlights the importance of accounting for the unique features of the postpandemic immigration surge when assessing its inflationary effects.

[6] Appendix B derives the stationary equilibrium and provides the parameter values for all three models.

3 EMPIRICAL EVIDENCE

In this section, we first discuss the nature of the postpandemic immigration surge, drawing on a wide range of administrative data. These data show that unauthorized immigrants, rather than legal immigrants, constituted the bulk of this influx, which is in sharp contrast to U.S. immigration before 2020. We then use household survey data to learn about the labor-market and consumption-savings patterns of likely unauthorized immigrants. Our analysis shows that these immigrants tend to be low-skilled workers and hand-to-mouth consumers, and that they share similar characteristics with earlier immigrants from the same country.

3.1 THE 2021–2024 IMMIGRATION SURGE Prior to 2020, immigration to the U.S. was relatively stable (Figure 2A). The CBO estimates that about one million immigrants were added to the U.S. population each year during 2000–2019. Authorized immigrants, which include lawful permanent residents, individuals who are eligible to apply for lawful permanent residency, and nonimmigrants admitted under the Immigration and Nationality Act (e.g., students and temporary workers), accounted for the majority of net immigration. Unauthorized immigrants were not an important contributor to net immigration during this period.

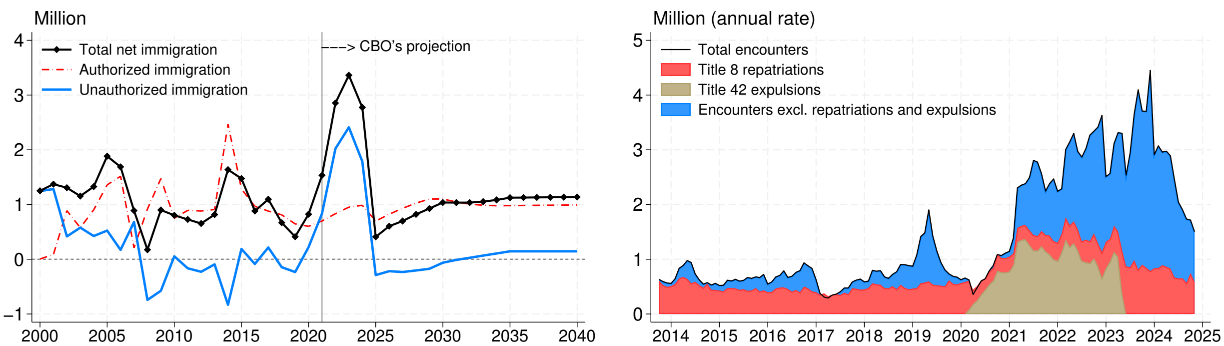
Starting in 2021, border protection officers working between or at ports of entry encountered an increasing number of foreign nationals who attempted to enter the U.S. without legal immigration status (Figure 2B). Moreover, a higher fraction of these individuals than in the past was released into the country through the use of parole or with a "notice to appear", which permits the individual to wait in the U.S. while petitioning an immigration court for asylum.[7] While in the U.S., these individuals can apply for work authorization, typically after 0-6 months for parolees (depending on the country of origin) and 150 days for asylum seekers (Edelberg and Watson, 2024).

Using Department of Homeland Security (DHS) data on border encounters and removals (the sum of repatriations and expulsions), we estimate that net unauthorized immigration surged from

[7] It often takes several years to process immigration court cases, especially when the court faces a large influx of new cases. Immigration court data from TRAC, a research center at Syracuse University, show that the average time between the court filing and the final decision is 1,027 days for cases that were completed in fiscal years 2021–2023.

Figure 2: The 2021–2024 immigration surge

(A) Immigration by type **(B)** Border encounters



Notes: Encounters are the sum of apprehensions (arrests of potentially removable noncitizens by the U.S. Border Patrol under Title 8 authority), inadmissibles (determined by the Office of Field Operations at ports of entry under Title 8 authority), and expulsions under Title 42 public health authority.

Sources: Congressional Budget Office; U.S. Department of Homeland Security.

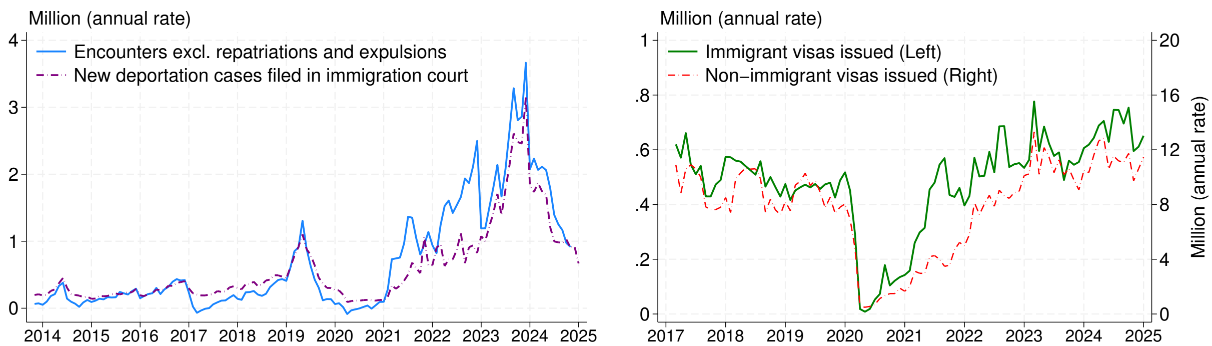
17,000 in 2020 to 2.2 million in 2023, before falling to 1.6 million in 2024, as the Biden administration restricted the ability to apply for asylum at the southern border (Figure 3A, solid line). This boom coincided with a sharp rise in new deportation cases filed in U.S. immigration courts (Figure 3A, dashed line). In contrast, authorized immigration has been stable since 2022 and only slightly above its pre-2020 level, based on visa-issuance data from the Department of State (Figure 3B).[8]

The surge of unauthorized immigration raises the question of whether this is a national shock or a regional shock that mainly impacts border states. Figure 4 shows that, although most of these immigrants attempted to enter through the southern border, immigration court records, which track the mailing addresses of individuals who received a notice to appear, suggest that the geographical footprint of unauthorized immigrants has been widespread. In 39 states, new deportation cases filed after 2021 exceeded 0.5% of the state population. The spatial distribution of these immigrants supports the view that the 2021–2024 immigration surge was a national shock.

[8]In 2020, authorized immigration inflows dropped sharply due to global travel restrictions and a slowdown in the processing of applications. In addition, the Center for Disease Control issued a public health order under a provision of a 1944 public health law (Section 265 of Title 42), which allowed for the rapid expulsion of unauthorized border crossers and asylum seekers, citing COVID-19 concerns. The order was lifted on May 11, 2023.

Figure 3: Measures of immigration inflows

(A) Unauthorized immigration **(B)** Authorized immigration



Sources: U.S. Department of Homeland Security; TRAC, Syracuse University; U.S. Department of State.

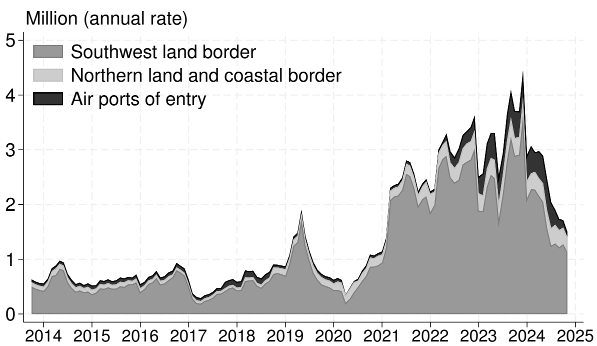
At the individual level, publicly available administrative data reveal little about the characteristics of these immigrants but important information about their country of origin. Figure 5 shows the nationality of unauthorized immigrants from the data on border encounters and new deportation cases filed in immigration courts. A small number of countries in Central and South America have been associated with 80%–90% of these entries. These countries include Mexico, Guatemala, Honduras, and El Salvador—the main contributors before 2021—and some new contributors after 2021 (Venezuela, Colombia, Cuba, Ecuador, Nicaragua, Haiti, and Peru). We refer to these eleven countries as high-encounter (HE) countries and immigrants from these countries as HE immigrants. Our micro-level analysis will contrast HE immigrants with immigrants born in other countries (non-HE immigrants), as well as with native-born individuals.

3.2 Micro Data and Empirical Approach

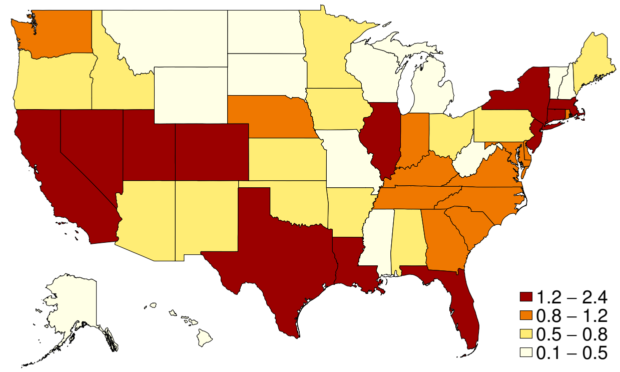
To examine the labor-market and consumption-savings patterns of immigrants who arrived in the U.S. after 2020, we turn to household survey data. We use two nationally representative household surveys that have information on respondents' immigration status based on citizenship or country of birth: (i) the monthly IPUMS CPS microdata and its Annual Social and Economic (ASEC) supplement, and (ii) the PSID. The former provides an up-to-date picture of labor market conditions, while the latter offers a comprehensive view of households' consumption, income, and wealth. Appendix A provides an overview of these

Figure 4: Geographic distribution of encounters and immigration court cases

(A) Encounters by border region



(B) New deportation cases by state



Notes: The left panel shows encounters in each border region. The right panel shows new deportation cases filed in immigration courts from 2022–2024 as a percent of the state's population in 2021.
Sources: U.S. Department of Homeland Security; TRAC, Syracuse University.

surveys, detailing the questions we use to identify immigrants and their composition.[9]

Although these survey data allow us to identify immigrants, they do not indicate whether an immigrant is unauthorized. To address this issue, we utilize the rich information and large sample size of the CPS (about 110,000 individuals each month), restricting the sample to individuals that reasonably well approximate unauthorized immigrants in the 2021–2024 surge. Specifically, we apply three sample selection criteria: (i) the respondent is an immigrant, (ii) the respondent arrived in the U.S. after 2020, and (iii) the respondent was born in one of the countries where the majority of the unauthorized immigrants came from, as suggested by DHS encounters data.[10] This approach, especially the last criterion, is motivated by a large literature in economics and sociology on immigration enclaves.[11] This literature finds that new immigrants tend to live in neighborhoods with a high concentration of immigrants coming from the same country of origin ("enclaves"), and

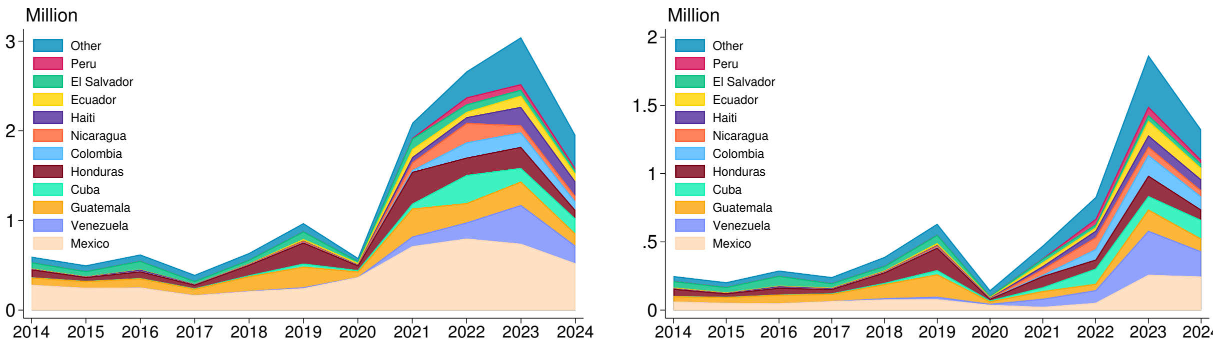
[9]We obtain very similar results to the CPS-based analysis when using the American Community Survey (ACS). As to consumption and wealth information, the PSID is the only household survey that contains this information and allows us to identify immigrants. The Consumer Expenditure Survey and the Survey of Consumer Finances, for example, do not provide enough information to determine immigration status or the country of origin.

[10]Although the legal status of an immigrant is unknown, large-scale U.S. household surveys, such as the CPS and ACS, capture unauthorized immigrants. In fact, the Department of Homeland Security publishes annual estimates of the total number of undocumented immigrants based on the information from household survey data and legal immigration records (Borjas, 2017).

[11]See, e.g., Borjas (1987), Bartel (1989), Borjas (1994), Card (2001), Munshi (2003), Card (2009) and Caiumi and Peri (2024) in the economics literature and Wilson and Portes (1980) and Logan et al. (2002) in the sociology literature.

Figure 5: Nationality of unauthorized immigrants

(A) Encounters by country of origin **(B)** New deportation cases by country of origin



Notes: Encounters data underlying the left panel are the sum of the U.S. Border Patrol encounters, the Office of Field Operations enforcement encounters, and confirmed CHNV paroles. The 2024 encounters data cover from January to November due to the suspension of the data after November 2024.
Sources: U.S. Department of Homeland Security; TRAC, Syracuse University.

that new immigrants share similar socioeconomic status with their predecessors. Indeed, we will show that immigrants arriving in the U.S. after 2020 have similar skills, labor-market outcomes, and consumption-savings behavior as the earlier immigrants coming from the same country.

One may be concerned that the characteristics of legal and unauthorized immigrants may still be different even conditional on the country of origin. While we cannot completely address this concern, given that such information is not asked in any large-scale U.S. household survey, we explore further sample selections to identify the most likely unauthorized immigrants. The previous literature has often used "low-educated foreign-born" to proxy for undocumented immigrants (Albert, 2021; Borjas and Cassidy, 2019; East et al., 2023; East and Velasquez, 2024). We find that our most restrictive sample—new immigrants arriving after 2020 from HE countries who are non-U.S. citizens, have a high-school degree or less, and are male aged between 20-50—shares similar labor market characteristics with those in our baseline sample. This alleviates the concern arising from the missing legal status in the survey data.

Applying these additional sample restrictions to PSID data is challenging because of the small sample size (about 6,000 households) and low frequency (biennial) of the survey. Our baseline PSID sample of unauthorized immigrants includes those born in HE countries and arriving in the

U.S. after 2015. As we will show, further restricting the sample to immigrants who are more likely to be unauthorized such as renters and young households, at the cost of an even smaller sample size, makes little difference to our main conclusion.

It is important to note that differentiating immigrants based on their country of origin is essential for understanding the U.S. immigration surge. Some studies have used the average immigrant in the CPS who arrived in the U.S. after 2020 to characterize the population underlying this immigration surge.[12] A closer look at the composition of survey immigrants (Appendix A) suggests that this approach paints a biased picture of these recent immigrants, because those born in HE countries accounted for less than half of the new immigrants in the survey. The rest are high-skilled, likely legal immigrants from other countries. This happens because household surveys tend to undercount unauthorized immigrants due to their residency conditions and lower response rates (Brown et al., 2023). In other words, ignoring the information on the country of origin leads to bias in characterizing the immigration surge, a pitfall we avoid using our empirical approach.

3.3 STYLIZED FACTS ABOUT RECENT IMMIGRANTS

Drawing on a comprehensive set of micro data, we next compare unauthorized immigrants who arrived in the U.S. after 2020 with new immigrants from other countries and native-born individuals. We also show how the characteristics of unauthorized immigrants evolved over time in terms of their expected labor market outcomes and consumption-savings behavior. This analysis establishes three new stylized facts.

Fact 1. *Newly arrived unauthorized immigrants have low skills and earn low income.*

We use monthly CPS data from January 2022 to June 2025 and its ASEC supplement to examine labor market characteristics of individuals born in different country groups.[13] The first two rows of Table 1 show basic demographic features of new immigrants. They tend to be younger and are more likely to be of working age. In addition, immigrants from HE countries are more likely

[12] See, e.g., *Rising Immigration Has Helped Cool an Overheated Labor Market*, Federal Reserve Bank of Kansas City Economic Bulletin, May 22, 2024; *Who's Coming to America?*, Goldman Sachs U.S. Daily, April 4, 2024.

[13] Our sample begins in January 2022 rather than January 2021, because the 2021 surveys contain few immigrants arriving in 2020-2021. In addition, the CPS reports the year of arrival in bins, which typically cover 2-3 years. Thus, we are unable to distinguish between immigrants arriving in 2020-2021 from those arriving in 2018-2019 in the 2021 surveys. Using January 2022 and later surveys, we can clearly isolate immigrants who arrived in and after 2020.

Table 1: Labor market characteristics

	Native-born	New immigrants from		Difference
		HE countries	Non-HE countries	
% Working age (16–65)	61.6	78.6***	77.5***	1.1***
% Working-age male	49.6	55.1***	48.7***	6.4***
Labor force participation rate, %				
Cond. on working age	73.8	73.3*	64.0***	9.3***
Cond. on working-age male	77.4	85.3***	75.0***	10.3***
Employment rate, % (cond. on participation)	96.1	93.3***	92.3***	1.0***
Education (cond. on participation)				
% high school or below	31.9	64.4***	27.2***	37.2***
% master degree and above	14.4	5.8***	28.3***	-22.5***
Wage and salary, thous. 2019 $ (cond. on employment)	53.9	24.6***	45.2*	-20.6***

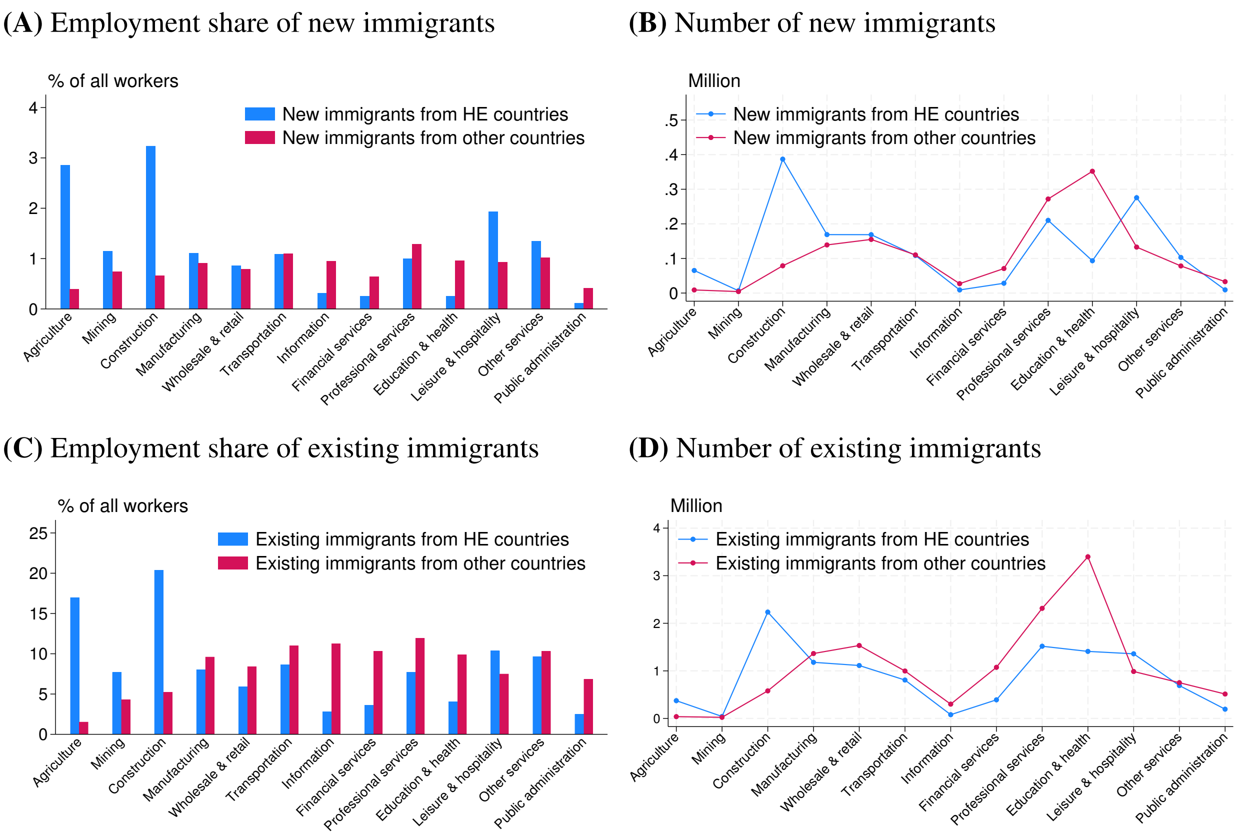
Notes: *, ** and *** in columns 2 and 3 denote significance at the 10%, 5% and 1% level, respectively, for testing the equality of the means between immigrants in a specific country group (HE or non-HE) and native-born individuals. The last column shows the difference between columns 2 and 3, with stars indicating the significance level for testing whether the difference is zero. All tests control for the month fixed effect. New immigrants refer to immigrants who arrived in the U.S. after 2020.

Source: Monthly Current Population Survey (CPS) from January 2022 to June 2025 and the Annual Social and Economic (ASEC) supplement from 2022 to 2024.

to be male. The next two rows show that the labor force participation rate (LFPR) is similar for native-born individuals and HE immigrants, but conditional on being male, the latter group has the higher participation rate. The employment rate does not differ much across groups.

We present three pieces of evidence that support the differences in skills between HE immigrants and other workers. First, the bottom three rows of Table 1 show that the educational attainment of HE immigrants is much lower than for other workers: 64% of them have a high-school degree or lower, compared to about 30% for the other two groups. Non-HE immigrants, in contrast, are more concentrated at the upper end of educational attainment: 28% of them hold at least a master's degree, compared to 14% for native-born individuals and only 6% for HE immigrants. The difference in education is reflected in their wages and salaries. HE immigrants earn about half

Figure 6: The presence of immigrants by industry



Notes: Industry classification based on the NAICS 2-digit code. New immigrants refer to immigrants arriving in the U.S. after 2020. Existing immigrants refer to those who arrived before 2020.
Source: Monthly Current Population Survey from January 2022 to June 2025.

of what native-born workers earn, whereas the earnings of non-HE immigrants are comparable to the earnings of native-born workers.

Second, immigrants from HE countries are more likely to work in industries with lower skill requirements (measured by workers' average educational attainment) and lower salary, such as agriculture, construction, and leisure and hospitality (Figure 6, panels a and b). In contrast, non-HE immigrants are more concentrated in private sector jobs that require higher skills, such as information, financial services, and education.

Third, within an industry, immigrants from HE countries tend to work in occupations that require lower skills and pay less. Table 2 shows ten industries that have the highest employment shares of new HE immigrants. Within each industry, we classify various occupations into three

Table 2: The employment share of HE immigrants at the industry-occupation level

		A. New HE immigrants			B. Existing HE immigrants		
Code	Industry Description	Manager	IT	Other	Manager	IT	Other
5617	Building and landscaping services	0.3	0.0	4.5	10.2	2.7	30.3
814	Private households	0.0	0.0	4.0	3.7	0.0	28.9
721	Accommodation	0.4	0.0	3.9	3.3	1.5	19.1
23	Construction	0.5	0.0	3.9	9.0	2.0	23.2
11	Agriculture	0.4	0.0	4.6	4.0	0.0	26.0
311	Food manufacturing	0.9	0.8	2.8	5.8	3.1	17.9
315	Apparel, knitting and fabric	0.0	0.0	3.1	7.4	0.0	18.2
493	Warehousing and storage	0.6	4.1	2.6	4.3	8.0	15.9
722	Food and drinking places	0.4	0.0	2.7	8.0	3.6	12.7
492	Couriers and delivery services	0.0	0.0	2.3	3.4	0.0	7.1

Notes: Industry classification based on NAICS codes; occupation classification based on SOC codes for major groups. New HE immigrants refer to immigrants who were born in high-encounter countries and arrived in the U.S. after 2020. Existing HE immigrants refer to those who were born in high-encounter countries and arrived in the U.S. before 2020.

Source: Monthly Current Population Survey (CPS) from January 2022 to June 2025.

broad categories: management occupations ("Manager"), computer and IT related occupations ("IT"), and all other occupations ("Other"). Panel A shows that new HE immigrants are highly concentrated in non-management, non-IT occupations. In the data, these occupations tend to require lower skills and pay less than management and IT related jobs.

Is the missing legal status a concern? Recall that the legal status of an immigrant is not asked in U.S. household surveys. To address the concern that unauthorized immigrants may have different labor market characteristics from legal immigrants of the same country of origin, we perform several additional sample restrictions to identify the most likely unauthorized immigrants.

In Table 3, we impose an increasing number of restrictions on our baseline new-HE-immigrant sample. The literature has used low-educated noncitizens to capture the undocumented population (Albert, 2021; Borjas and Cassidy, 2019; East et al., 2023; East and Velasquez, 2024). In columns (2) and (3) we apply these two restrictions and find similar patterns to the baseline sample. In columns (4) and (5), we further impose age and gender restrictions, given that unauthorized immigrants tend to be younger and are more likely to be male. Even under the most restrictive set in

Table 3: Further restrictions imposed to identify the most likely unauthorized immigrants

	(1) Baseline	(2) Noncitizens	(3) HS or less	(4) Age 20-50	(5) Male
% Working age	78.6	78.8	72.0	100	100
% Working-age male	55.1	55.6	59.0	59.6	100
Labor force participation rate, % (cond. on working-age male)	85.3	85.2	86.2	90.3	90.4
Employment rate, % (cond. on participation)	93.3	93.0	92.8	93.1	94.9
% High school or below (cond. on participation)	64.4	64.7	100	100	100
% Employed in construction sector	23.7	24.6	31.5	32.4	42.2
% Employed in low-skilled occupations	96.0	96.5	98.3	98.4	98.3
Wage and salary, thous. 2019 $	24.6	23.6	21.5	22.1	21.9
# of immigrants in CPS	30,010	28,077	20,300	11,643	6,977

Notes: Column (1) uses the sample of HE immigrants arriving in the U.S. after 2020. Columns (2)-(5) impose an additional restriction to the previous column. Low-skilled occupations refer to non-management and non-IT related occupations in an industry.

Source: Monthly Current Population Survey (CPS) from January 2022 to June 2025 and the Annual Social and Economic (ASEC) supplement from 2022–2024.

column 5, immigrants have a similar LFPR, employment rate, industry and occupation specialization, and earnings as those in the baseline sample. This suggests that the concern of missing legal status is not likely to be quantitatively important for characterizing the 2021–2024 immigration surge, given the information on the country of origin.

Fact 2. *Newly arrived unauthorized immigrants have similar characteristics as their predecessors.*

Our analysis so far has focused on new immigrants who arrived in the U.S. after 2020. There are two related questions. First, do unauthorized immigrants arriving after 2020 share similar characteristics with their predecessors (i.e., immigrants from the same country of origin who arrived in the U.S. earlier)? Second, do unauthorized immigrants' labor market outcomes change much after arriving in the U.S.? A positive answer to the first question would support using a macroeconomic model that fits U.S. data prior to 2020 for studying the effects of the 2021–2024 immigration surge.

Table 4: Labor market characteristics by arrival status

	A. New HE immigrants		B. Existing HE immigrants	
	2020-2024	2015-2019	2020-2024	2015-2019
Labor force participation rate, % (cond. on working age male)	85.3	83.0	88.9	89.3
Employment rate, % (cond. on participation)	93.3	94.0	96.2	95.9
% High school or below (cond. on participation)	64.4	64.3	67.7	71.0
% Employed in construction sector	23.6	21.5	20.0	17.8
% Employed in low-skilled occupations	96.0	94.7	92.3	93.3
Wage and salary, thous. 2019 $	24.6	28.7	34.8	34.2
# of immigrants in CPS	30,101	29,142	192,845	318,639

Notes: New HE immigrants refer to immigrants who were born in high-encounter countries and arrived in the U.S. during the period indicated. Existing HE immigrants refer to those who were born in high-encounter countries and arrived before the beginning of the period. Low-skilled occupations refer to non-management and non-IT related occupations in an industry.

Source: Monthly Current Population Survey (CPS) from January 2022 to June 2025 and the Annual Social and Economic (ASEC) supplement from 2022–2024.

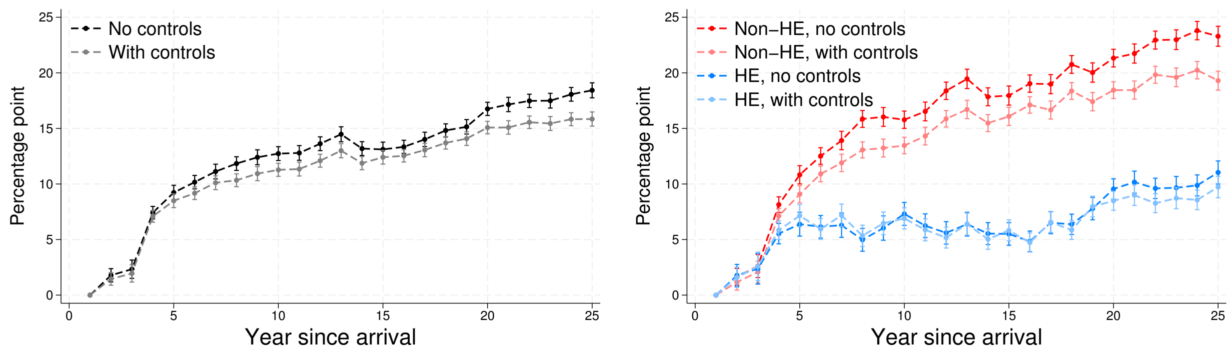
After all, in this case it would be the size of the unauthorized immigration shock that is unprecedented, not the characteristics of these immigrants. A positive answer to the second question would require a model that captures the evolution of recent immigrants' labor market characteristics.

To answer the first question, we compare HE immigrants who arrived during 2020-2024 with those arriving from 2015-2019. Panel A of Table 4 shows that the two cohorts are very similar.

When considering the second question, we present three pieces of evidence. First, Panel B of Table 4 shows that new HE immigrants share similar characteristics with existing HE immigrants, except that the latter have a modestly higher LFPR and higher wages. Second, Figure 6 (panels C and D) and Table 2 (panel B) show a striking similarity between new and existing HE immigrants' concentration across industries and occupations. This evidence suggests that the labor-market profiles of HE immigrants do not change much over time. Third, we formally evaluate the variation

Figure 7: The evolution of the labor force participation rate

(A) All immigrants **(B)** HE vs. non-HE immigrants



Notes: The point estimates and 95% confidence intervals are obtained by estimating Equation 1 using the monthly Current Population Survey from January 2015 to June 2025. All regressions include month fixed effects. Control variables include dummies of educational attainment, age and gender.

in immigrants' labor market profiles by estimating the following event-study type of regression:

$$y_{it} = \delta_t + \sum_{n=2}^{N} \alpha_n \mathbb{I}(t - E_i \in n) + \beta \mathbf{x}_{it} + \varepsilon_{it}, \quad (1)$$

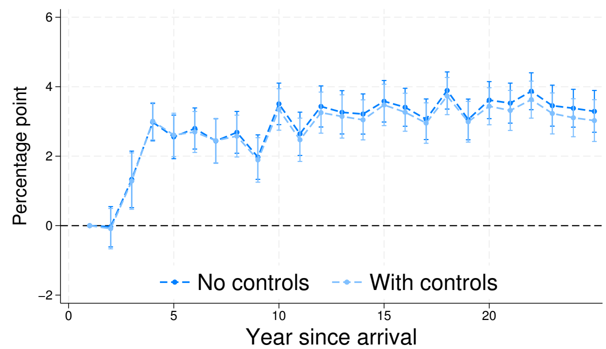
where y_{it} is an outcome variable. $\mathbb{I}(t - E_i \in n)$ is an indicator that equals 1 if immigrant i has been in the U.S. for n years since his or her arrival in year E_i. δ_t is the survey month fixed effect and $\mathbf{x}_{it}$ is a vector of controls including educational attainment, age dummies and gender.

It is widely believed that the LFPR of immigrants increases steeply over time, by about 10-20 percentage points in the first several years of arrival (Edelberg and Watson, 2024). This view, however, does not distinguish between immigrants' county of origin. Figure 7A confirms the view that the LFPR increases notably over time for the average immigrant, by about 15pp over a 15-year horizon. Focusing on HE immigrants in Figure 7B, however, we find that their profile is not as steep, increasing by only 5pp. Including control variables does not change the results.

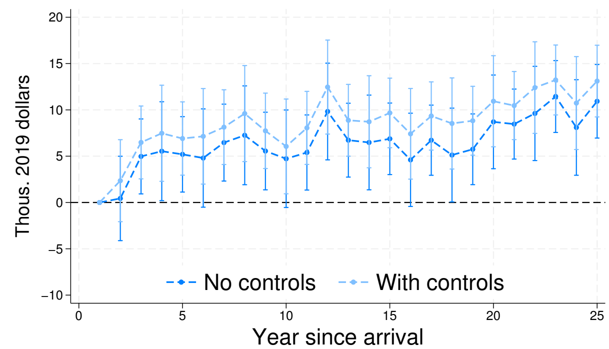
Consistent with this pattern, Figure 8 shows the evolution of a broader set of labor-market outcomes for HE immigrants. Although the employment rate increase is statistically significant (panel a), the magnitude is small and the path is essentially flat after the first three years of arrival. Real wages (panel b) and the likelihoods of working in the construction sector (panel c) and low-

Figure 8: Labor market profiles of HE immigrants over time

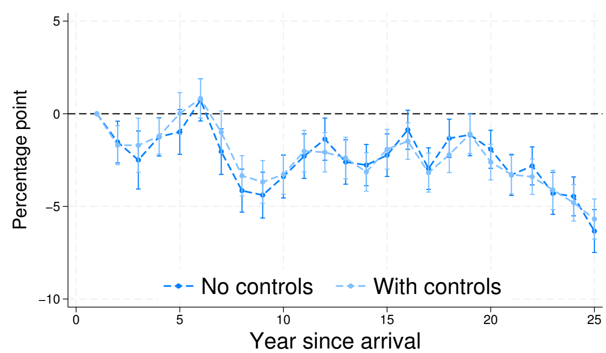
(A) Employment rate conditional on participation



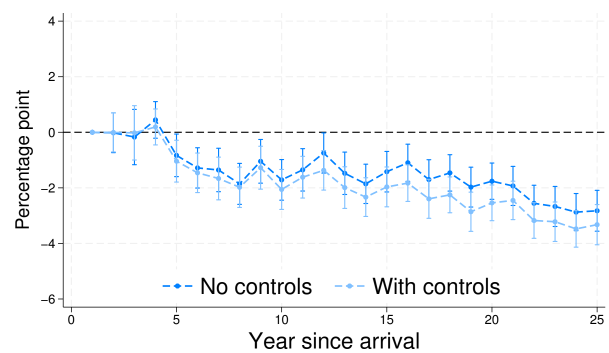
(B) Real wage



(C) Prob. of working in the construction sector



(D) Prob. of working in low-skilled occupations



Notes: The point estimates and 95% confidence intervals are obtained by estimating Equation 1 using the monthly Current Population Survey from January 2015 to June 2025. All regressions include month fixed effects. Control variables include dummies of educational attainment, age and gender.

skilled occupations (panel d) do not change much over time.

Together, this evidence suggests that immigrants arriving in the U.S. after 2020 do not differ from those who arrived before 2020. Furthermore, the labor market outcomes of HE immigrants do not appear to change much over time, suggesting that their economic status is persistent. Our evidence is also consistent with the aforementioned literature on immigration enclaves.

Fact 3. *Unauthorized immigrants behave like "hand-to-mouth" consumers.*

Turning to the consumption-savings behavior of immigrants, we first use PSID data from 2015–2023 to document key features of new immigrants (HE vs non-HE) and contrast them with native-born households. We then restrict the sample to identify the respondents that are most likely to be

Table 5: Prevalence of hand-to-mouth consumers

	Native-born	New immigrants from	
		HE countries	Non-HE countries
Consumption-income ratio, %			
Total consumption	65.5	82.9	79.3
Basic consumption	51.1	70.6	65.9
Wealth, thous. 2019 $			
Total wealth	280.8	23.7	53.9
Liquid wealth	24.3	1.6	12.6
Months of consumption using liquid wealth	6.9	0.6	6.3
KV hand-to-mouth prob, %	37.8	62.8	40.0

Notes: New immigrants refer to PSID households whose head was born in a foreign country and arrived in the U.S. after 2015. Basic consumption refers to spending on food, housing, utilities and gasoline. See text for the measurement of total consumption, wealth and the KV hand-to-mouth probability.

Source: Panel Study of Income Dynamics from 2015-2023.

unauthorized immigrants. Finally, we compare new HE immigrants with existing HE immigrants and estimate how the probability of HE immigrants being hand-to-mouth changes over time.

We measure the prevalence of hand-to-mouth consumers in several ways. The first row of Table 5 shows the total consumption-to-income ratio, a commonly used indicator for savings behavior.[14] This ratio is significantly higher for newly arrived HE immigrants (about 83%) than native-born households (66%). This difference is explained by the fact that HE immigrants have much lower income and that most of their income is spent—a necessary condition for being "hand-to-mouth" (Kaplan et al., 2014). Regarding the unspent portion of income, remittances are likely to be the main outlet. Previous studies based on surveys of Mexican immigrants suggest that a quarter of their monthly income is remitted (see Amuedo-Dorantes et al., 2005). Using more recent data on Mexican workers' remittances published by the Bank of Mexico for 2022–2024 and the average income of Mexican immigrants in the CPS, we estimate that about 13% of immigrants' income is remitted. The fact that HE immigrants spend almost all of their income net of remittances suggests that they behave like hand to mouth.

[14]We measure consumption, wealth, and income in the PSID as in Zhou (2022). See Appendix A for more details.

Table 6: Robustness of the hand-to-mouth feature of HE immigrants

	Immigrants from HE countries who are			
	New Baseline	New Renters	New Renters & Young	Existing Renters & Young
Consumption-income ratio, %				
Total consumption	82.9	85.1	86.0	88.2
Basic consumption	70.6	75.2	78.2	73.6
Wealth, thous. 2019 $				
Total wealth	23.7	10.0	11.0	16.5
Liquid wealth	1.6	0.8	0.9	3.1
Months of consumption using liquid wealth	0.6	0.3	0.4	0.8
KV hand-to-mouth prob, %	62.8	66.7	64.5	60.7

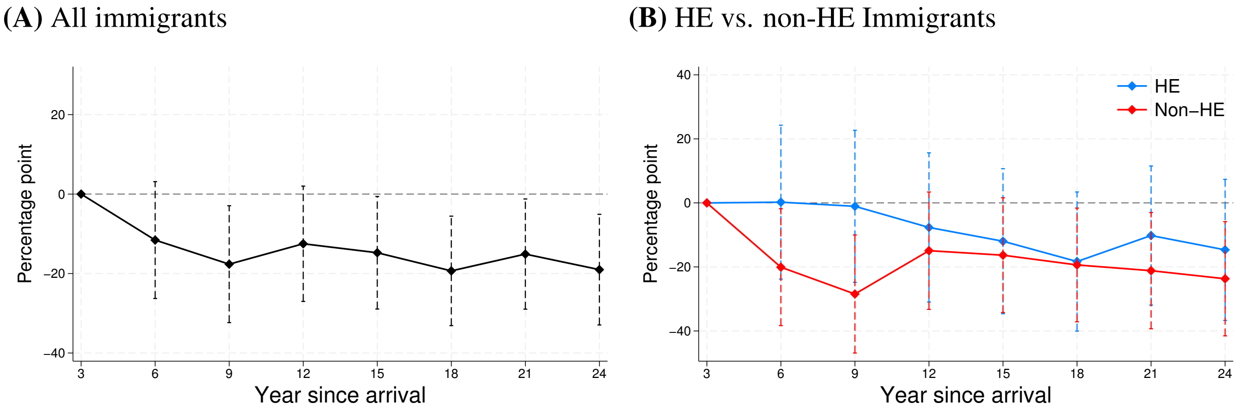
Notes: See Table 5. Existing immigrants refer to those who arrived before 2015. Young households refer to those whose head is between the ages of 20 and 50.
Source: Panel Study of Income Dynamics from 2015-2023.

One caveat with the total consumption to income ratio is that the consumption basket may differ substantially across households due to preferences or shocks unrelated to income. To address this issue, we conduct a more direct comparison by isolating spending on necessities, which includes food, housing, utilities, and gasoline (Table 5, row 2). These expenditures take up 71% of HE immigrants' income, the highest among all households, confirming the prevalence of the hand-to-mouth feature of this group.[15] The next three rows of Table 5 focus on household wealth. Newly arrived HE immigrants have the lowest wealth, with $24K compared to $281K for native-born and $54K for non-HE families. Their liquid savings are particularly low, in that these households are unable to support even a full month of their consumption. In contrast, liquid savings of native-born and non-HE immigrants can support their respective consumption for about 6-7 months.

In the last row of Table 5, we use a conservative approach to measure the prevalence of hand-to-mouth consumers. Following Kaplan and Violante (2014), we define hand-to-mouth households

[15] Kaplan et al. (2014) and Kaplan and Violante (2014) distinguish between two types of hand-to-mouth households: the poor hand-to-mouth, who hold little or no wealth, and the wealthy hand-to-mouth, who hold a significant amount of illiquid wealth but have little or no liquid wealth. The balance sheets of HE immigrants, as shown in Table 5 and Table 6, suggest that they are closer to poor hand-to-mouth consumers.

Figure 9: Immigrant hand-to-mouth probability over time



Notes: The point estimates and 95% confidence intervals are obtained by estimating Equation 1 using the Panel Study of Income Dynamics from 2015-2023. All regressions include year fixed effects and control for the household size, age and educational attainment of the household head, and housing-tenure status.
Source: Panel Study of Income Dynamics from 2015-2023.

as those whose liquid savings are less than half their per-pay-period earnings.[16] In our data, the probability of being hand-to-mouth is 38% for native-born households, in line with the estimate by Kaplan and Violante (2014), while it is 63% for newly arrived HE immigrants. This corroborates the earlier evidence that HE immigrants behave like hand-to-mouth consumers.

Due to the small sample size and low frequency of the PSID survey, further restricting the sample of new HE immigrants to those arriving only after 2020 would substantially increase the uncertainty of our estimates. Instead, we show in Table 6 that restricting the sample to renters and young households (the middle two columns)—two features that likely characterize the 2021–2024 unauthorized immigrants—does not change our conclusion that hand-to-mouth is a prevalent trait among these immigrants. Furthermore, the last column of Table 6 shows that existing HE immigrants with these two features behave very similarly to new HE immigrants.

Finally, Figure 9 shows that, while the hand-to-mouth probability decreases over time for the average immigrant, there is no significant change in this probability for HE immigrants. This supports the persistence of the hand-to-mouth feature of unauthorized immigrants.

[16]Since the PSID does not have information on paycheck frequency, we use the weighted mean frequency from Kaplan and Violante (2014) to compute the per-pay-period income for every household.

4 MODEL OF THE 2021–2024 IMMIGRATION SURGE

Having established the labor-market and consumption-savings characteristics of post-pandemic immigrants, in this section we present a heterogeneous agent New Keynesian model with capital, population growth, and features consistent with the empirical facts documented in Section 3. There are N_t households, of which $N_{h,t}$ are high skilled. The remaining $N_{\ell,t}$ households are low skilled of two types: $N_{\ell n,t}$ that are hand-to-mouth as in Galí et al. (2004) and Bilbiie (2008) and $N_{\ell s,t}$ that can save each period. The production process includes capital-skill complementarity as in Krusell et al. (2000), so that high-skilled labor is more complementary to capital than low-skilled labor.

High-skilled population growth is fixed at Γ_N, while low-skilled population growth follows

$$\ln \Gamma_{\ell,t} = (1-\rho_N)\ln \Gamma_N + \rho_N \ln \Gamma_{\ell,t-1} + \sigma_\ell \epsilon_{\ell,t}, \quad \epsilon_{\ell,t} \sim N(0,1). \tag{2}$$

Consistent with the empirical evidence in Section 3, immigrants in the model are low-skilled, and the 2021–2024 immigration surge is modeled as an exogenous shock to their growth rate ($\Gamma_{\ell,t}$).

Define ν_t as the high-skilled population share $^{N_{h,t}}/_{N_t}$. This share can be written recursively as

$$\nu_t = (\Gamma_N/\Gamma_{N,t})\nu_{t-1}, \tag{3}$$

where the gross population growth rate is given by

$$\Gamma_{N,t} = \Gamma_N \nu_{t-1} + \Gamma_{\ell,t}(1-\nu_{t-1}). \tag{4}$$

The share of the low-skilled population that is hand-to-mouth $^{N_{\ell n,t}}/_{N_{\ell,t}}$ is fixed at ϑ, so $\Gamma_{\ell n,t} = \Gamma_{\ell,t}$.

4.1 HOUSEHOLDS

Given that households of the same type are identical, we focus on the representative household of each type. Household preferences are consistent with balanced growth as in King et al. (1988) and Jaimovich and Rebelo (2009). Households of type $i \in \{h, \ell s, \ell n\}$ consume $c_{i,t}$, supply labor $l_{i,t}$ to firms, and receive real wage $w_{i,t}$ per hour worked. Those of type $i \in \{h, \ell s\}$ are also able to save via a risk-free nominal bond $b^n_{i,t}$, which returns gross nominal interest rate R_t. The high-skilled households own all firms in the economy and receive per capita real dividends d_t.

High-Skilled The high-skilled household's optimization problem is given by

$$\max_{c_{h,t},l_{h,t},b_{h,t}} \quad \mathbb{E}_0 \sum_{j=0}^{\infty} \beta^j N_{h,j} \frac{\left(c_{h,j}(1-\psi l_{h,j}^{1+\theta})\right)^{1-\sigma}}{1-\sigma}$$

$$\text{s.t.} \quad c_{h,t} + b_{h,t} = w_{h,t} l_{h,t} + \tfrac{R_{t-1}}{\Gamma_{h,t}\Pi_t} b_{h,t-1} + d_t,$$

where $b_{h,t} = {}^{b_{h,t}^n}\!/_{P_t}$ is real bond holdings, P_t is the price of the consumption good, $\Pi_t = {}^{P_t}\!/_{P_{t-1}}$ is the gross inflation rate, β is the discount factor, σ is the elasticity of intertemporal substitution, θ controls the Frisch elasticity, and ψ controls the disutility of labor.

The optimality conditions imply

$$l_{h,t} = (1+\theta)\frac{\psi l_{h,t}^{1+\theta}}{1-\psi l_{h,t}^{1+\theta}} \frac{c_{h,t}}{w_{h,t}}, \tag{5}$$

$$1 = \mathbb{E}_t\left[\Lambda_{h,t+1}\tfrac{R_t}{\Pi_{t+1}}\right], \tag{6}$$

where

$$\Lambda_{h,t} = \beta\left(\frac{1-\psi l_{h,t}^{1+\theta}}{1-\psi l_{h,t-1}^{1+\theta}}\right)^{1-\sigma}\left(\frac{c_{h,t-1}}{c_{h,t}}\right)^{\sigma}. \tag{7}$$

Low-Skilled Savers The low-skilled saver's optimization problem is given by

$$\max_{c_{\ell s,t},l_{\ell s,t},b_{\ell s,t}} \quad \mathbb{E}_0 \sum_{j=0}^{\infty} \beta^j N_{\ell s,t} \frac{\left(c_{\ell s,j}(1-\psi l_{\ell s,j}^{1+\theta})\right)^{1-\sigma}}{1-\sigma}$$

$$\text{s.t.} \quad c_{\ell s,t} + b_{\ell s,t} = w_{\ell,t} l_{\ell s,t} + \tfrac{R_{t-1}}{\Gamma_{\ell s,t}\Pi_t} b_{\ell s,t-1} - \tau_{\ell s,t}$$

where $\tau_{\ell s,t}$ is an exogenous fraction of income that is remitted abroad.

The optimality conditions imply

$$l_{\ell s,t} = (1+\theta)\frac{\psi l_{\ell s,t}^{1+\theta}}{1-\psi l_{\ell s,t}^{1+\theta}} \frac{c_{\ell s,t}}{w_{\ell,t}}, \tag{8}$$

$$1 = \mathbb{E}_t\left[\Lambda_{\ell s,t+1}\tfrac{R_t}{\Pi_{t+1}}\right], \tag{9}$$

where

$$\Lambda_{\ell s,t} = \beta\left(\frac{1-\psi l_{\ell s,t}^{1+\theta}}{1-\psi l_{\ell s,t-1}^{1+\theta}}\right)^{1-\sigma}\left(\frac{c_{\ell s,t-1}}{c_{\ell s,t}}\right)^{\sigma}. \tag{10}$$

Low-Skilled Non-Savers The low-skilled non-saver's optimization problem is given by

$$\max_{c_{\ell n,t}, l_{\ell n,t}} \quad N_{\ell n,t} \frac{\left(c_{\ell n,t}\left(1-\psi l_{\ell n,t}^{1+\theta}\right)\right)^{1-\sigma}}{1-\sigma}$$

$$\text{s.t.} \quad c_{\ell n,t} = w_{\ell,t} l_{\ell n,t} - \tau_{\ell n,t}. \tag{11}$$

The optimality conditions imply

$$l_{\ell n,t} = (1+\theta) \frac{\psi l_{\ell n,t}^{1+\theta}}{1-\psi l_{\ell n,t}^{1+\theta}} \frac{c_{\ell n,t}}{w_{\ell,t}}. \tag{12}$$

4.2 PRODUCTION SECTOR

The production sector is separated into three levels. The wholesaler produces a good for sale to a continuum of monopolistically competitive retailers. Retailers differentiate the wholesale good for sale to a final good bundler and exercise market power in pricing. The bundler operates in a perfectly competitive market, selling the final good to the households.

We describe the production sector from the top down. The final good producer purchases $Y_t(f)$ units of each retail good $f \in [0,1]$ and then bundles them to produce a finished good $Y_t = \left(\int_0^1 Y_t(f)^{(\varepsilon-1)/\varepsilon} df\right)^{\varepsilon/(\varepsilon-1)}$ that is sold to households, where ε is the elasticity of substitution across retail goods. The bundler chooses retail good purchases to maximize profits $P_t Y_t - \int_0^1 P_t(f) Y_t(f) df$. Optimality implies $Y_t(f) = \left(P_t(f)/P_t\right)^{-\varepsilon} Y_t$, where $P_t = \left(\int_0^1 P_t(f)^{1-\varepsilon} df\right)^{1/(1-\varepsilon)}$.

Monopolistically competitive retailers purchase $Y_{w,t}(f)$ units of the wholesale good at the relative price $p_{w,t}$. Each retailer maximizes profits subject to final good firm demand, differentiating wholesale goods for sale as retail goods, $Y_t(f) = Y_{w,t}(f)$, and optimally resetting its price each period with probability $1-\zeta$. A retailer that can reset its price at t chooses P_t^* to maximize $E_t \sum_{k=t}^{\infty} \zeta^{k-t} \Lambda_{h,t,k} D_k^*$, where $\Lambda_{h,t,t} \equiv 1$, $\Lambda_{h,t,k} \equiv \prod_{j=t+1}^{k>t} \Lambda_{h,j}$, and $D_k^* = \left(\frac{P_t^*}{P_k} - p_{w,k}\right)\left(\frac{P_t^*}{P_k}\right)^{-\varepsilon} Y_k$.

Letting $p_t^* \equiv P_t^*/P_t$, the optimality condition implies

$$p_t^* = \frac{\varepsilon}{\varepsilon-1} \frac{X_{1,t}}{X_{2,t}}, \tag{13}$$

$$X_{1,t} = p_{w,t} Y_t + \zeta \mathbb{E}_t[\Lambda_{h,t+1} \Pi_{t+1}^{\varepsilon} X_{1,t+1}], \tag{14}$$

$$X_{2,t} = Y_t + \zeta \mathbb{E}_t[\Lambda_{h,t+1} \Pi_{t+1}^{\varepsilon-1} X_{2,t+1}]. \tag{15}$$

The aggregate price index implies that inflation evolves according to

$$1 = (1-\zeta)(p_t^*)^{1-\varepsilon} + \zeta \Pi_t^{\varepsilon-1}. \tag{16}$$

The wholesaler produces a wholesale good using a nested CES production technology given by

$$Y_{w,t} = \left((1-\mu) L_{\ell,t}^{\eta} + \mu \left((1-\chi) L_{h,t}^{\xi} + \chi K_{t-1}^{\xi} \right)^{\frac{\eta}{\xi}} \right)^{\frac{1}{\eta}}, \tag{17}$$

where $\eta, \xi < 1$ govern the elasticities of substitution. The elasticity of substitution between capital (or high-skilled labor) and low-skilled labor is $1/(1-\eta)$. The elasticity of substitution between capital and high-skilled labor is $1/(1-\xi)$. Thus, capital-skill complementarity requires that $\eta > \xi$.

The wholesaler maximizes the expected present discounted value of real profits,

$$\max_{L_{\ell,t}, L_{h,t}, K_t, I_t} \mathbb{E}_t \sum_{k=t}^{\infty} \Lambda_{h,t,k} (p_{w,k} Y_{w,k} - w_{\ell,k} L_{\ell,k} - w_{h,k} L_{h,k} - I_k),$$

subject to the production function and the law of motion for capital,

$$K_t = I_t + (1-\delta) K_{t-1}, \tag{18}$$

where δ is the depreciation rate. Defining R^k as the rental rate, the optimality conditions imply

$$w_{\ell,t} = p_{w,t} \frac{Y_{w,t}}{L_{\ell,t}} \frac{(1-\mu) L_{\ell,t}^{\eta}}{(1-\mu) L_{\ell,t}^{\eta} + \mu \big((1-\chi) L_{h,t}^{\xi} + \chi K_{t-1}^{\xi} \big)^{\eta/\xi}}, \tag{19}$$

$$w_{h,t} = p_{w,t} \frac{Y_{w,t}}{L_{h,t}} \frac{\mu \big((1-\chi) L_{h,t}^{\xi} + \chi K_{t-1}^{\xi} \big)^{\eta/\xi}}{(1-\mu) L_{\ell,t}^{\eta} + \mu \big((1-\chi) L_{h,t}^{\xi} + \chi K_{t-1}^{\xi} \big)^{\eta/\xi}} \frac{(1-\chi) L_{h,t}^{\xi}}{(1-\chi) L_{h,t}^{\xi} + \chi K_{t-1}^{\xi}}, \tag{20}$$

$$R_t^k = p_{w,t} \frac{Y_{w,t}}{K_{t-1}} \frac{\mu \big((1-\chi) L_{h,t}^{\xi} + \chi K_{t-1}^{\xi} \big)^{\eta/\xi}}{(1-\mu) L_{\ell,t}^{\eta} + \mu \big((1-\chi) L_{h,t}^{\xi} + \chi K_{t-1}^{\xi} \big)^{\eta/\xi}} \frac{\chi K_{t-1}^{\xi}}{(1-\chi) L_{h,t}^{\xi} + \chi K_{t-1}^{\xi}}, \tag{21}$$

$$1 = \mathbb{E}_t \left[\Lambda_{h,t,t+1} (R_{t+1}^k + 1 - \delta) \right]. \tag{22}$$

4.3 MONETARY POLICY

The central bank sets the gross nominal interest rate according to

$$R_t = R(\Pi_t/\Pi)^{\upsilon_\pi}, \tag{23}$$

where υ_π controls the response to the inflation gap, but our results are robust to alternative rules.

4.4 COMPETITIVE EQUILIBRIUM Aggregate supply is defined by

$$Y_{w,t} = \int_0^1 Y_t(j)dj = \Delta_t Y_t, \tag{24}$$

where price dispersion is defined as

$$\Delta_t \equiv \int_0^1 \left(\tfrac{P_t(f)}{P_t}\right)^{-\varepsilon} df = (1-\zeta)(p_t^*)^{-\varepsilon} + \zeta \Pi_t^{\varepsilon} \Delta_{t-1}. \tag{25}$$

Aggregate bond holdings are in zero net supply. Aggregate labor of each skill type is given by

$$L_{\ell,t} = N_{\ell s,t} l_{\ell s,t} + N_{\ell n,t} l_{\ell n,t}, \tag{26}$$

$$L_{h,t} = N_{h,t} l_{h,t}. \tag{27}$$

Low-skilled households remit a fraction of their income, so aggregate remittances are given by

$$T_{\ell,t} = N_{\ell s,t}\tau_{\ell s,t} + N_{\ell n,t}\tau_{\ell n,t} = \phi w_{\ell,t} L_{\ell,t}$$

The goods market clearing condition implies

$$N_{h,t}c_{h,t} + N_{\ell s,t}c_{\ell s,t} + N_{\ell n,t}c_{\ell n,t} + I_t = Y_t - \phi w_{\ell,t} L_{\ell,t}. \tag{28}$$

A competitive equilibrium is defined by sequences of quantities, $\{l_{h,t}, c_{h,t}, l_{\ell s,t}, c_{\ell s,t}, l_{\ell n,t}, c_{\ell n,t}, L_{h,t}, L_{\ell,t}, N_t, N_{h,t}, N_{\ell,t}, N_{\ell s,t}, N_{\ell n,t}, K_t, I_t, Y_t, Y_{w,t}\ \nu_t\}$, prices, $\{\Lambda_{h,t}, \Lambda_{\ell s,t}, R_t, \Pi_t, p_t^*, X_{1,t}, X_{2,t}, \Delta_t, w_{h,t}, w_{\ell,t}, R_t^k, p_{w,t}\}$, and growth rates, $\{\Gamma_{\ell,t}, \Gamma_{N,t}\}$, such that (2)–(28) are satisfied, given the low-skilled non-saver population $N_{\ell n,t} = \vartheta N_{\ell,t}$, the total low-skilled population, $N_{\ell,t} = N_{\ell s,t} + N_{\ell n,t}$, the aggregate population, $N_t = N_{h,t} + N_{\ell,t}$, low-skilled population growth $\Gamma_{\ell,t} = {}^{N_{\ell,t}}/_{N_{\ell,t-1}}$, and aggregate population growth $\Gamma_{N,t} = {}^{N_t}/_{N_{t-1}}$. The model is detrended by redefining trending variables in per capita terms. Appendix C provides the detrended equilibrium system. We solve the log-linearized model around the detrended steady state using Sims (2002) `gensys` algorithm.

4.5 QUARTERLY CALIBRATION The parameters in Table 7 are informed by moments in our microdata and the related literature. The moments are computed using data averages over 2015-2019.

The weight on high-skilled labor in the production function (μ) is set to achieve a steady-state wage-skill premium, $w_h/w_\ell - 1$, of 0.86, where high-skilled workers in the data are defined as those in the CPS with greater than a high school degree. The weight on capital in the production function (χ) is set to target a steady-state capital income share, $R^k k/(p_w y_w \Gamma_N)$, of 0.38, consistent with updated estimates of the income share based on the methodology in Fernald (2014). The parameters governing the elasticities of substitution between capital and low-skilled labor (η) and between capital and high-skilled labor (ξ) are set to the estimates in Krusell et al. (2000).[17] In line with the New Keynesian literature (see, e.g., Galí, 2015), the elasticity of substitution between retail goods (ε) implies a steady-state price markup of 20%, while the degree of price stickiness (ζ) implies that retailers reset prices every 3 quarters on average. The capital depreciation rate (δ) is set to match the 10% annual depreciation rate on fixed assets and durable goods in the data.

The discount factor (β) implies a steady-state annual real interest rate of 1%, consistent with the long-run interest rate in the December 2025 Summary of Economic Projections. The elasticity of intertemporal substitution (σ) is set to 1, consistent with Jaimovich and Rebelo (2009). The labor preference weight (ψ) implies that steady-state hours worked, l, are one-third of total hours. The labor preference elasticity (θ) is set to achieve an aggregate Frisch elasticity of 0.5, consistent with the estimates in Chetty et al. (2012). The steady-state high-skilled population share (ν) is set to 0.655 to match the share of individuals in the CPS with greater than a high school degree. The low-skilled non-saver population share (ϑ) is set to 0.54 to match the share of households in the PSID with a high school degree or less whose liquid savings are less than half of their income per pay period. These shares imply that 19% of households in the model are non-savers, consistent with the share of poor hand-to-mouth consumers in the Survey of Consumer Finances (see Kaplan et al., 2014). To help pin down the division between agents, the steady-state share of wage income earned by low-skilled workers, $\varphi \equiv \frac{(1-\nu)w_\ell l_\ell}{(1-\nu)w_\ell l_\ell + \nu w_h l_h}$, is set to 0.221, which matches the analogous share in the CPS, where low-skilled workers are defined as those with a high school degree or less.

[17]The estimated parameters in Krusell et al. (2000), which are commonly used in the literature, are based on data from 1963-1992. Ohanian et al. (2023) updated the sample to include data through 2019 and found little change in the original estimates. Using a slightly shorter sample, Castex et al. (2022) and Maliar et al. (2022) obtain similar results.

Table 7: Model calibration

Parameter	Description	Value	Source
Production			
μ	High-skilled Labor Production Weight	0.564	CPS, Wage Skill-Premium
χ	Capital Production Weight	0.893	Fernald, Capital Share
η	Capital, Low-Skilled Labor Elasticity	0.4	Krusell et al. (2000)
ξ	Capital, High-Skilled Labor Elasticity	-0.5	Krusell et al. (2000)
ε	Goods Elasticity of Substitution	6	Galí (2015), 20% Markup
ζ	Probability of Changing Prices	0.667	Galí (2015), 3Q Duration
δ	Capital Depreciation Rate	$1.1^{1/4} - 1$	Depreciation, Fixed Assets
Households			
β	Subjective discount factor	$1.01^{-1/4}$	1% Annual Real Rate
σ	Intertemporal Substitution Elasticity	1	Jaimovich-Rebelo (2009)
ψ	Labor Preference Weight	2.953	Work $1/3$ of Total Hours
θ	Labor Preference Elasticity	1.253	Frisch Elasticity of 0.5
ν	High-Skilled Population Share	0.655	CPS, More than HS
ϑ	Low-Skilled Non-Saver Pop. Share	0.54	PSID HtM, HS or Less
φ	Low-Skilled Wage Income Share	0.221	PSID Wage, HS or Less
ϕ	Low-Skilled Remittance Share	0.13	Bank of Mexico, CPS
Monetary Policy			
υ_π	Monetary Response to Inflation	1.5	Galí (2015); Taylor (1993)
Π	Inflation Target	$1.02^{1/4}$	2% Annual Inflation Rate
Demographics			
Γ_N	Steady-State Population Growth	$1.0065^{1/4}$	CBO Demographic Outlook
ρ_N	Immigration Shock Persistence	0.875	CBO Demographic Outlook

The share of income that is remitted by low-skilled households, ϕ, is set to 13% (see Section 3.3).

The monetary response to inflation (υ_π) is set to 1.5, as is common in the literature (see, e.g., Galí, 2015; Taylor, 1993). The steady-state inflation rate (Π) is consistent with an annual inflation target of 2%. The demographic parameters are based on data from the CBO's September 2025 update to the demographic outlook. The steady-state population growth rate (Γ_N) is set to the average growth rate over 2015-2019. The persistence of the immigration shock (ρ_N) is set to 0.875 so the average duration of the shock is 2 years, consistent with the CBO data. When computing impulse responses, the size of the immigration shock is set so that the increase in annual population growth matches the increase from its 2015-2019 average (0.65%) to its peak in 2023 (1.12%).

It is possible to design a model that distinguishes between low-skilled native workers and low-

Table 8: Untargeted Moments

	High Skilled		Low-Skilled Savers		Low-Skilled Nonsavers	
	Model	Data	Model	Data	Model	Data
Consumption Share	77.6%	72.7%	12.7%	15.7%	9.7%	11.7%
Hours Worked Share	65.5%	68.6%	14.1%	14.9%	20.5%	16.6%

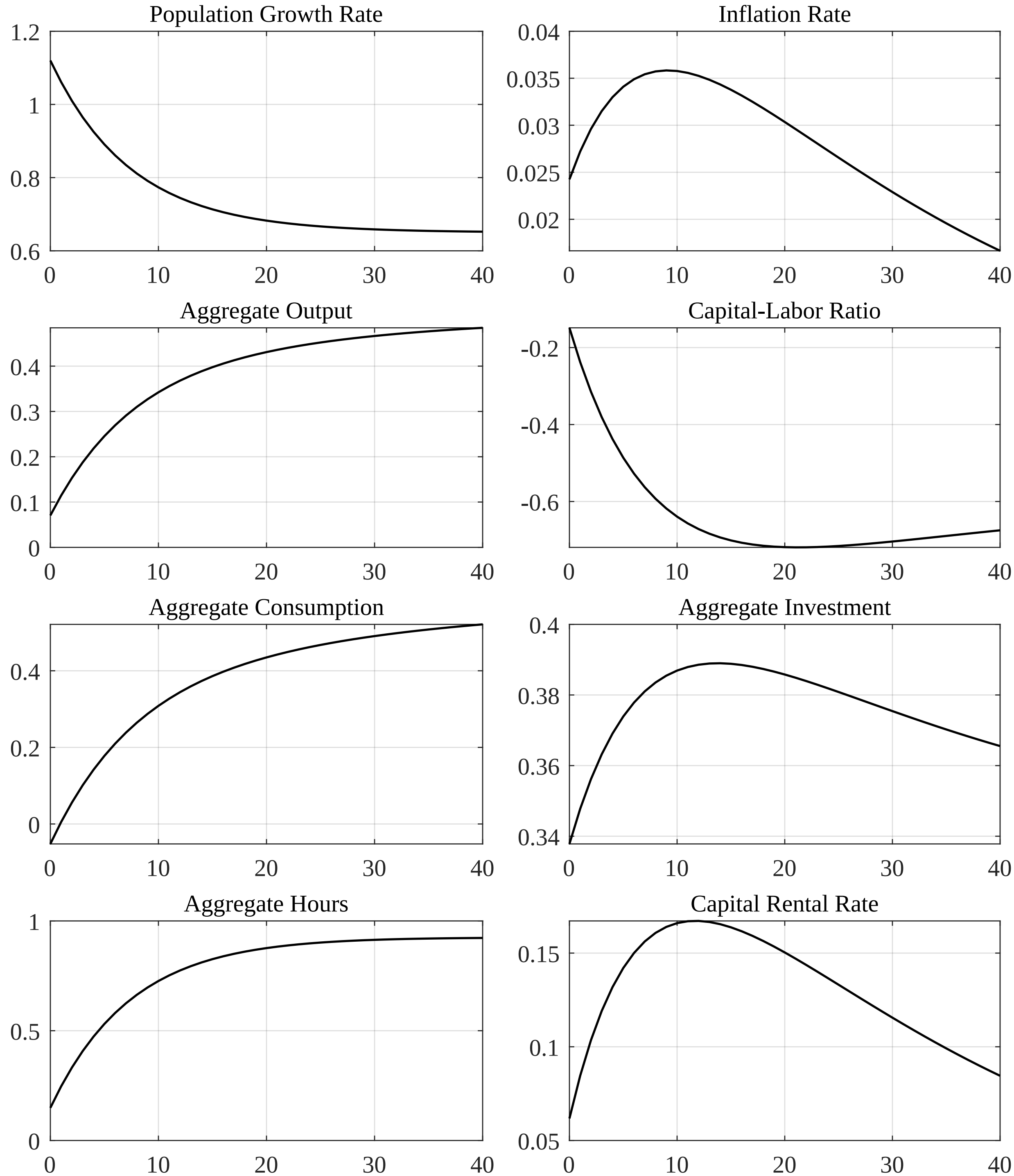
skilled immigrant workers, further interacted with their liquidity status. However, this distinction would substantially increase the model complexity, not only because it would require two additional household types, but because we have limited extraneous evidence to inform how different worker types interact in the production process. For this reason, we assume that domestic and foreign low-skilled workers are perfectly substitutable. Our calibration strategy captures low-skilled workers in the data that include both domestic and immigrant workers. The calibration of the low-skilled population shock reflects the 2021–2024 surge of low-skilled immigrants, adjusted for their share in the low-skilled population to be consistent with the CBO projection for population growth.

Untargeted Moments Table 8 compares untargeted moments from the model with the data. In the model, high-skilled individuals make up 78% of total consumption, while the low-skilled consumption share is split roughly evenly between savers and nonsavers. All three shares closely match their counterparts in the PSID. We obtain similar results for the hours shares. In particular, high-skilled individuals make up the bulk of totals hours, while low-skilled nonsavers work more hours than low-skilled savers in the model and the data. These results help validate the model.

5 INFLATIONARY IMPLICATIONS OF THE 2021–2024 IMMIGRATION SURGE

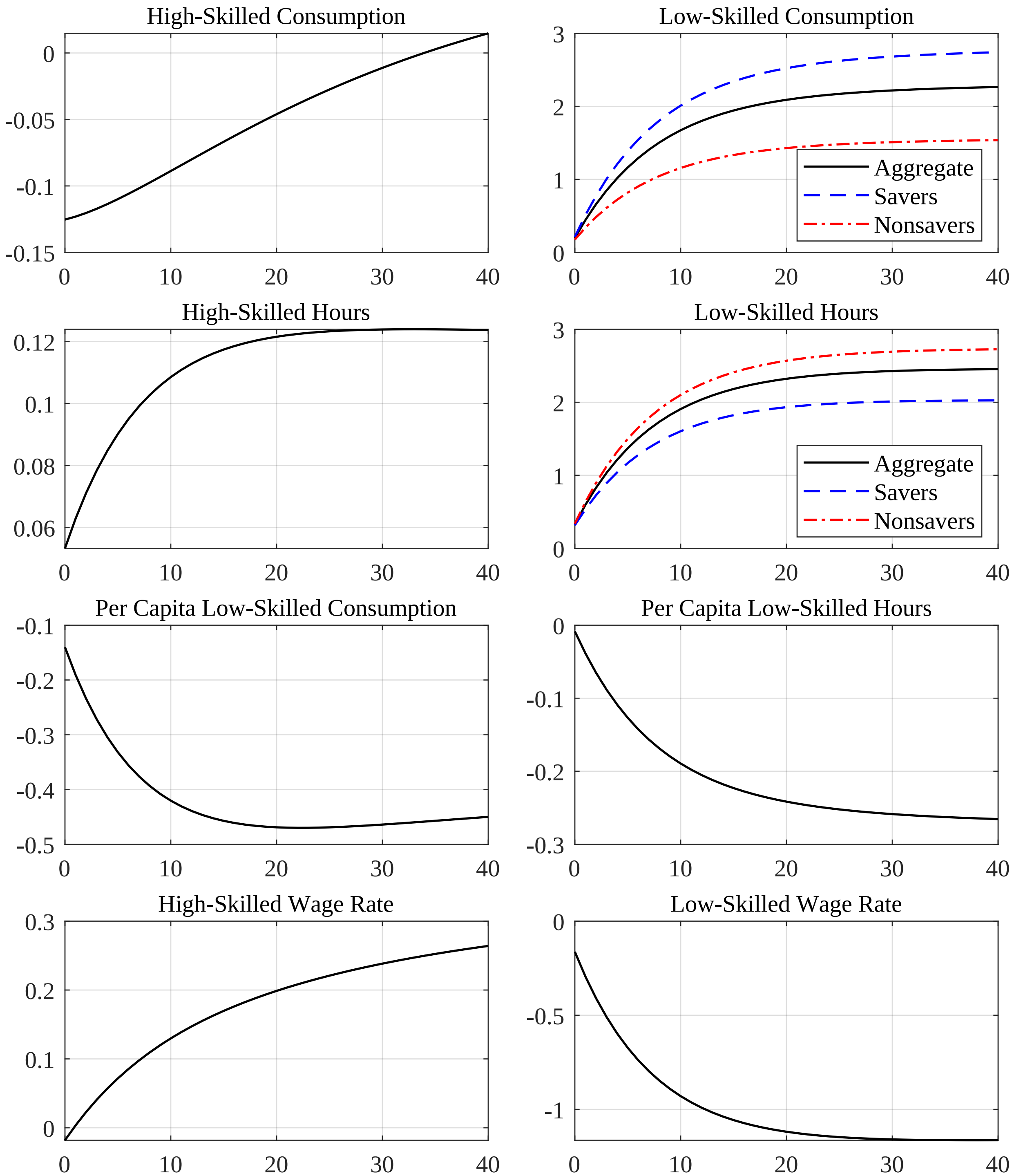
We use our calibrated model to examine the inflationary effects of the 2021–2024 immigration surge. An immigration shock in our model is defined as an increase in the low-skilled population, consistent with the empirical facts documented in Section 3. Figure 10 presents the impulse responses of key aggregate variables. The immigration shock temporarily boosts aggregate population growth, which generates a persistent increase in hours worked and output. This expansion

Figure 10: Responses of aggregate variables to the 2021–2024 immigration surge



Notes: The population growth response is the net annualized aggregate population growth rate. The inflation rate responses are annualized percentage point deviations from steady state. The capital-labor ratio and capital rental rate responses are percent deviations from the detrended steady state. The remaining impulse responses are percent deviations from the pre-shock trend.

Figure 11: Responses of skill-specific variables to the 2021–2024 immigration surge



Notes: The wage rate and per capita responses are in percent deviations from the detrended steady state. The remaining impulse responses are percent deviations from the pre-shock trend.

in labor supply represents the primary disinflationary force of immigration. With a more abundant labor supply, the aggregate capital-labor ratio falls sharply. This raises the rental rate of capital and aggregate investment as firms equip the larger workforce. However, these responses are relatively weak since the new labor is low-skilled and less complementary to capital than high-skilled labor.

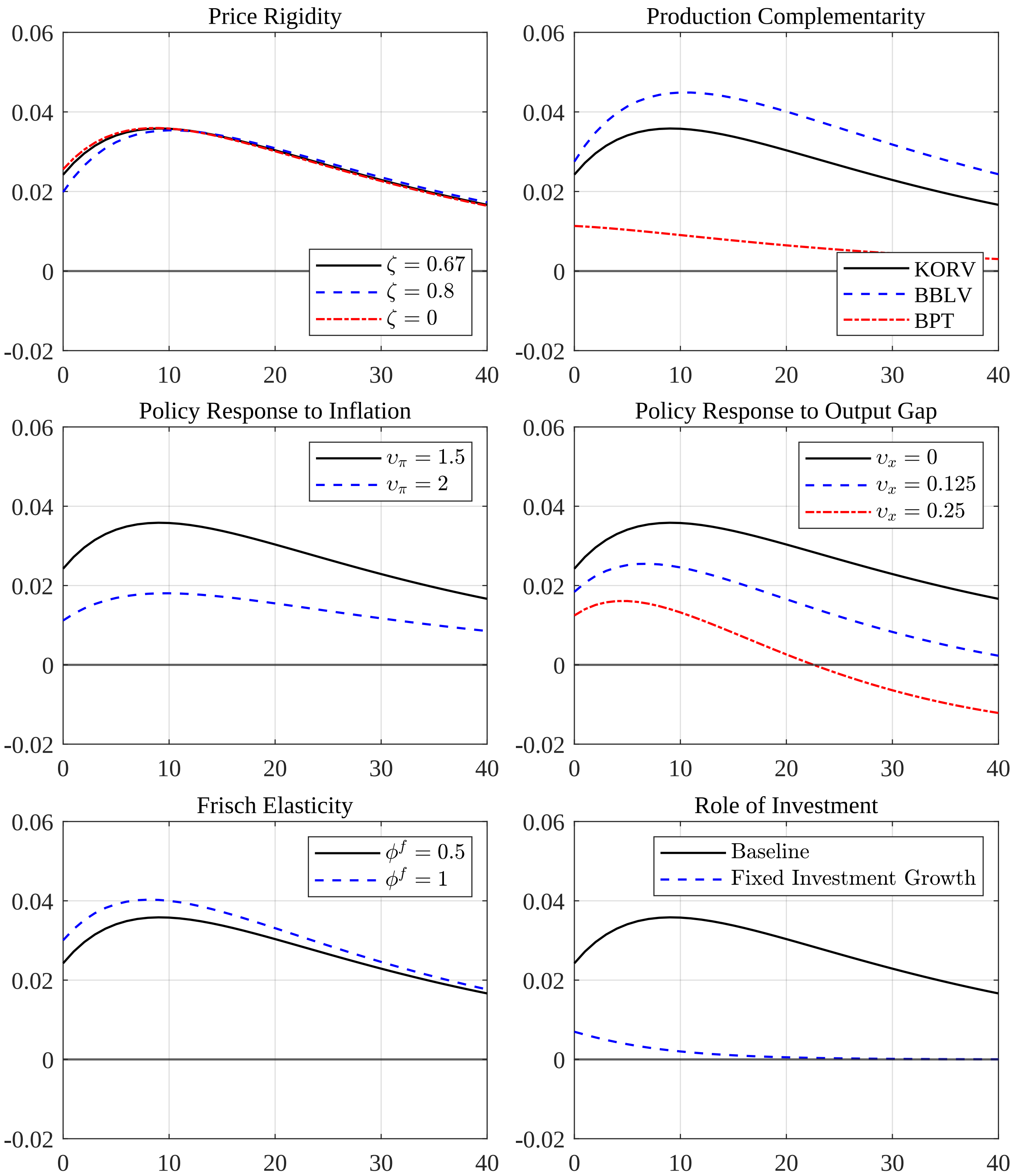
Although the demand-side effects of investment are small, there is a larger increase in aggregate consumption. At first, this result may seem surprising because the influx of low-skilled workers reduces their real wage and both per capita hours and per capita consumption, as shown in Figure 11. However, with a much larger population of low-skilled workers, aggregate low-skilled hours and consumption increase for both savers and nonsavers. The increase in aggregate low-skilled consumption is partially offset by high-skilled households who temporarily reduce their consumption to finance investment, but this response is small due to the weak investment demand and slight increase in high-skilled hours. Therefore, the immigration surge generates a persistent increase in aggregate consumption, providing a strong demand-side effect. In general equilibrium, the demand-side effects of the immigration surge roughly cancel out the disinflationary supply-side effects from the increased labor supply, generating a small but positive aggregate effect on inflation.[18]

Robustness We examine the robustness of the inflation response to alternative calibrations of the model. The results are shown in Figure 12. Across all parameterizations we consider, inflation rises on impact, with the peak response not exceeding 0.1 percentage points at an annualized rate.

In the upper left panel, we consider higher and lower degrees of price stickiness (ζ) to allow for different slopes of the Phillips curve. As shown in Section 2, greater price stickiness flattens the Phillips curve, muting the inflation response to a given output gap. In the upper right panel, we consider alternative elasticities in the production function. Our baseline calibration is based on the empirical estimates in Krusell et al. (2000). Recently, Berlingieri et al. (2024) refined their methodology to account for trends in skill-augmenting productivity, finding a smaller degree of

[18]One might think that the model is unable to generate large inflation responses to other shocks with similar real effects. However, a positive demand shock (e.g., a lower risk premium) generates a notable increase in inflation, and a positive supply shock (a lower price markup) generates a notable decline in inflation. This provides further support for our finding that the small inflation response to the immigration surge was due to offsetting supply and demand effects.

Figure 12: Inflation responses to the 2021–2024 immigration shock under alternative calibrations



Notes: The responses are annualized percentage point deviations from steady state. ζ is the degree of price stickiness, υ_π and υ_x are the monetary responses to the inflation and output gaps, and ϕ^f is the Frisch elasticity of labor supply. KORV, BBLV, and BPT correspond to the capital-skill complementarity estimates in Krusell et al. (2000, $\eta = 0.4, \xi = -0.5$), Berlingieri et al. (2024, $\eta = 0.17, \xi = 0.08$), and Bilbiie et al. (2023, $\eta = 0.89, \xi = -1.63$). When investment growth is fixed, it is set to the trend population growth rate.

capital-skill complementarity, which amplifies the investment response to the immigration surge. In contrast, Bilbiie et al. (2023) estimate a New Keynesian model with Bayesian methods and obtain a much stronger degree of capital-skill complementarity, dampening the investment response.

In the middle panels, we consider alternative monetary policy rules that account for the Fed's dual mandate. Specifically, we generalize the simple Taylor rule in our baseline model to $R_t = R(\Pi_t/\Pi)^{\upsilon_\pi}(y_t^{gap}/y^{gap})^{\upsilon_x}$ and consider alternative responses to the inflation gap (υ_π) and the output gap (υ_x).[19] The bottom left panel shows the impact of the Frisch elasticity of labor supply (ϕ^f). A higher Frisch elasticity makes households' labor supply decisions more sensitive to changes in the wage rate. This strengthens the labor supply response to the immigration-induced wage pressure, creating offsetting supply and demand effects that leave the inflation response largely unchanged.

Finally, the bottom right panel compares the inflation response under our baseline model to a version in which investment growth is fixed at the trend population growth rate ($I_t = \Gamma_N I_{t-1}$). Shutting down the investment response lowers aggregate demand and dampens inflation. However, the differences are relatively small. Capital-skill complementarity limits the return-to-capital response in the baseline model, and some of the reduction in saving is offset by higher consumption.

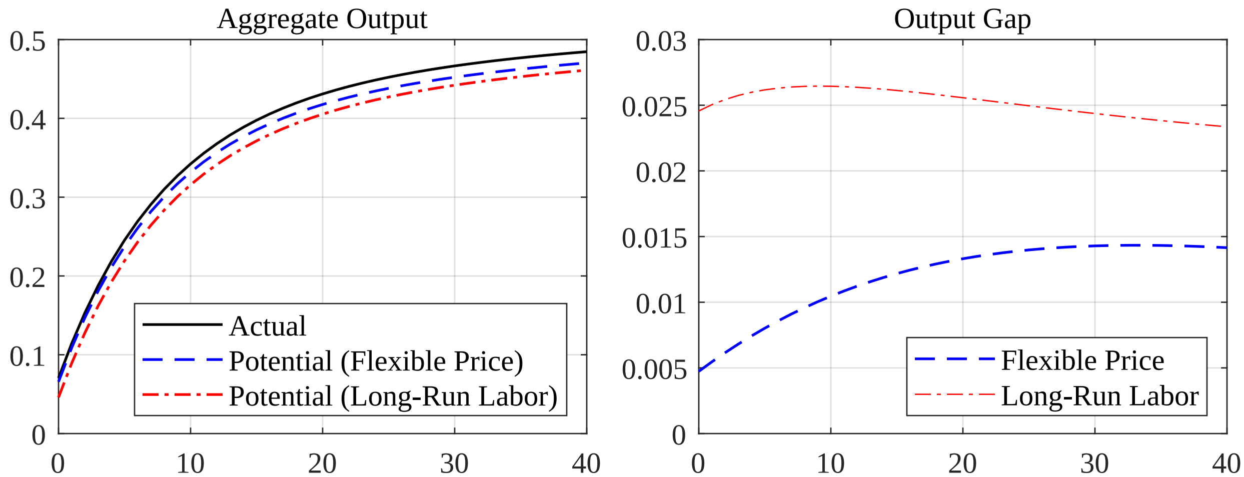
6 POLICY IMPLICATIONS AND EXTENSIONS

In this section, we first examine the monetary policy implications of the 2021–2024 immigration surge. We then examine two extensions of our baseline analysis: one in which the surge was concentrated among high-skilled workers, and one that traces out the effect of the post-2024 immigration reversal.

Monetary Policy Implications Although the model suggests that the immigration surge has little impact on inflation, it has larger effects on economic activity. The influx of workers causes a persistent increase in output, which leads to a temporary increase in the growth rate that could be interpreted as an overheating economy (Figure 13, left panel). However, our model predicts that there

[19] The output gap is defined as the deviation of output from its flexible price analogue (Woodford, 2003).

Figure 13: Policy implications of the 2021–2024 immigration shock



Notes: The output and potential output responses are percent deviations from the pre-shock trend. The output gap response is the percent deviation of output from potential output, where potential output is the level of output under flexible prices or the level that would occur if labor inputs were equal to their long-run values.

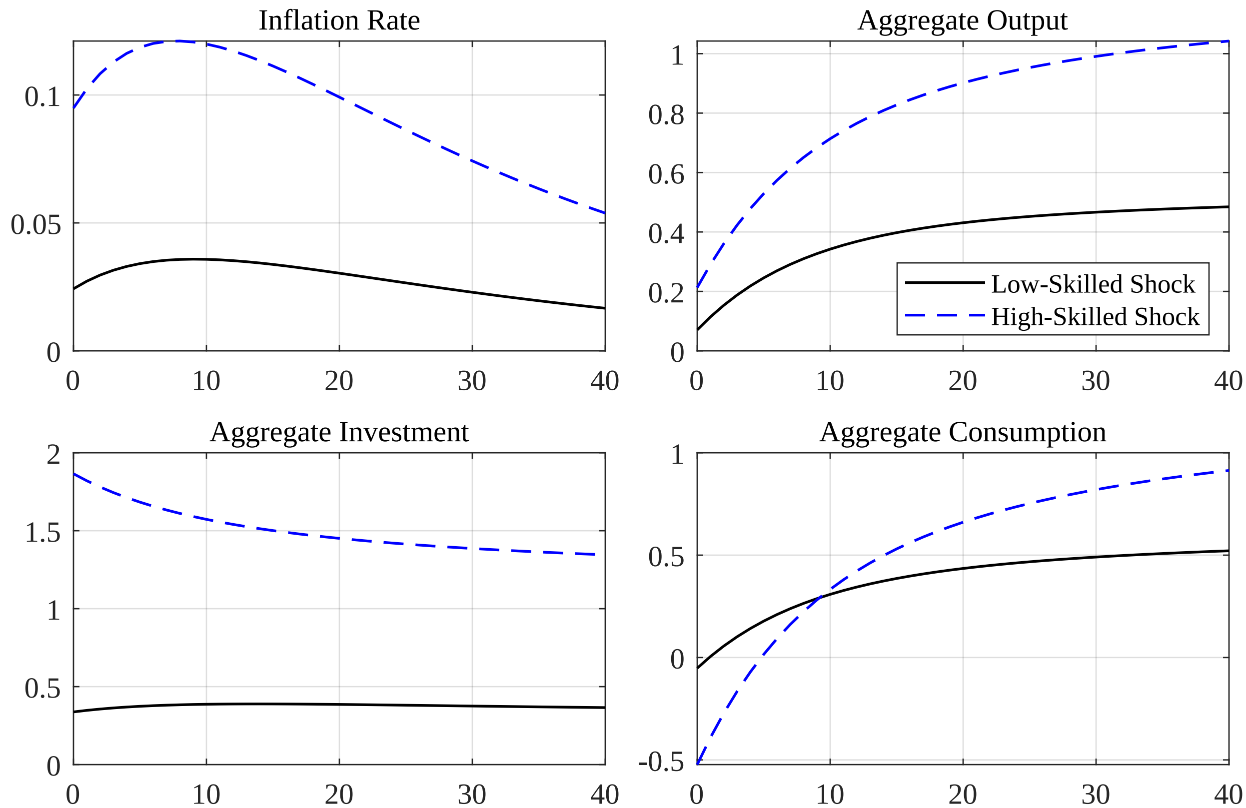
is a roughly one-for-one increase in potential output, so there is little change in the output gap (Figure 13, right panel). This result holds regardless of whether potential output is defined as the level of output that would occur under flexible prices, as is common in the literature, or the level of output that would occur if labor inputs were equal to their long-run values (Kiley, 2013), which is more in line with the definition used by policymakers.[20] The muted responses of inflation and the output gap suggest that policymakers should be careful not to overreact to low-skilled immigration shocks.

Surge in high-skilled immigration Our analysis thus far has focused on the influx of low-skilled workers driven by the 2021–2024 immigration surge. A related question is how high-skilled immigration impacts the economy, given that U.S. immigration inflows had been concentrated among highly educated individuals in the two decades prior to 2021 (Caiumi and Peri, 2024), and that the U.S. public generally supports high-skilled immigration.[21] The literature on this question has

[20] Just as the immigration surge expanded actual and potential GDP, it increased both actual payroll employment and the "break-even" rate of job creation required to maintain a stable unemployment rate. As documented in Cheremukhin (2025), the 2022–2024 immigration surge elevated the break-even rate of job creation by up to 100,000 jobs per month. Similarly, subsequent out-migration, which resulted in a net decline of 548,000 unauthorized immigrants in 2025, operates in the opposite direction. This demographic contraction reduced the breakeven employment threshold by about 40,000 jobs per month (Cheremukhin et al., 2026).

[21] See, for example, the results of a 2018 Pew Research survey (`www.pewresearch.org/global/2019/01/22/majority-of-u-s-public-supports-high-skilled-immigration`).

Figure 14: Impulse responses to a high-skilled and low-skilled immigration shock



Notes: The inflation rate responses are annualized percentage point deviations from steady state. The remaining impulse responses are percent deviations from the pre-shock trend.

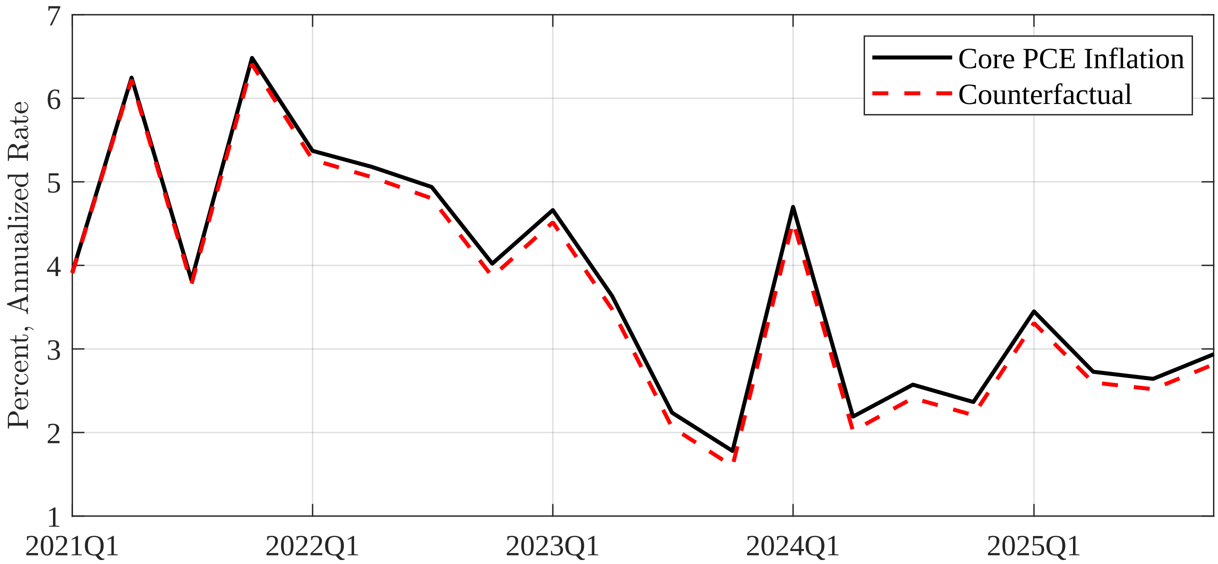
mostly focused on the labor market effects, with little evidence on the inflationary effects. We use our baseline model to shed light on this issue by introducing shocks to the high-skilled population. Analogous to low-skilled population growth, high-skilled population growth evolves according to

$$\ln \Gamma_{h,t} = (1-\rho_N)\ln \Gamma_N + \rho_N \ln \Gamma_{h,t-1} + \sigma_h \epsilon_{h,t}, \quad \epsilon_{h,t} \sim N(0,1),$$

where the standard deviation is scaled by the relative population share (i.e., $\sigma_h = (1-\nu)\sigma_\ell/\nu$).

Figure 14 compares the responses to a high-skilled and low-skilled immigration shock. The high-skilled shock generates a much larger increase in aggregate investment than the low-skilled shock without a compensating decline in aggregate consumption. This strengthens the demand-side effects of the shock and generates a much larger increase in inflation. Our empirical evidence in Section 3 shows that immigrants arriving in 2021–2024 were primarily low-skilled and more

Figure 15: Cumulative effects of the immigration surge and subsequent reversal on Inflation



Notes: Core PCE inflation is measured using the Personal Consumption Expenditures Price Index excluding food and energy. The counterfactual refers to predicted core PCE inflation absent the 2021-2024 unauthorized immigration surge and the subsequent reversal.

likely to work in industries and occupations that require lower skills. These results indicate that if the immigration surge was instead driven by high-skilled workers, the effect on output would have been larger and stronger demand-side effects would have generated a larger increase in inflation.

Post-2024 Immigration Reversal Our analysis so far has focused on the 2021-2024 immigration surge. As shown in Figures 2 and 3, this trend began to sharply reverse in mid-2024. By early 2025, net unauthorized immigration had turned negative, as border enforcement and interior deportations tightened further (Wilson and Zhou, 2026). By construction, our model implies that a negative population growth shock arising from emigration has mirror-image effects relative to a positive shock of the same magnitude. This symmetry is consistent with recent empirical evidence on the local economic effects of low-skilled immigration (e.g., East et al., 2023; Wilson and Zhou, 2026).

However, the effects of the immigration reversal may not immediately appear in macroeconomic aggregates due to the lagged effects of the immigration surge. We illustrate this point through a counterfactual simulation of inflation since 2021. Specifically, we construct a sequence of quarterly population growth shocks from 2021Q1 to 2025Q4, using external estimates of unauthorized immigration based on restricted microdata (Cheremukhin et al., 2026). We then combine these shocks with our baseline impulse response estimates to compute the cumulative effect of immigration on inflation at each point in time.

The counterfactual inflation path, shown in the red dashed line in Figure 15, removes the estimated effects of the immigration shocks. The small gap between the counterfactual path and the actual inflation path suggests that the immigration surge had only a small effect. If anything, inflation would have been slightly lower absent these shocks. This pattern is consistent with our earlier results. During the reversal period, one might expect the counterfactual inflation path to lie above actual inflation, since negative immigration shocks reduce inflation in our model. Instead, the counterfactual path remains slightly below actual inflation, because the earlier positive shocks continue to exert small inflationary effects, even as post-2024 shocks turn negative. This exercise highlights the importance of accounting for the dynamic effects of immigration shocks when assessing the macroeconomic consequences of the recent immigration reversal.

7 DISCUSSION: SECTORAL AND GEOGRAPHIC HETEROGENEITY

Our model abstracts from sectoral and geographic heterogeneity. This allows us to isolate the central mechanism emphasized in the paper: an immigration surge simultaneously increases labor supply and raises aggregate demand through consumption and investment. However, the incidence of these forces need not be uniform across sectors or locations. As shown in Section 3, unauthorized immigrants were disproportionately employed in low-skilled industries and occupations, implying that the shock is not sector neutral. Similarly, although the surge was national in scope, immigrant settlement patterns varied substantially across space. Such heterogeneity would affect relative prices, but not necessarily the transmission of immigration shocks to aggregate inflation.

A useful way to generalize the mechanism from our one-sector model is that inflation depends not only on the aggregate size of demand and supply forces, but also on their sectoral and regional incidence. If immigrant labor supply expands in the same sectors or regions where immigrant demand rises, the supply and demand effects may offset in much the same way as in our aggregate model. In contrast, if immigrant demand is concentrated in sectors with limited short-run supply responses, such as housing, while labor-supply effects occur elsewhere, such as agriculture and leisure and hospitality, relative prices could move more substantially. Consistent with the latter view, recent empirical evidence from Wilson and Zhou (2026) shows that unauthorized immigrant worker flows raised local house prices and rents, with little evidence of an increase in housing supply. At the same time, these inflows increased local employment approximately one-for-one, including in a range of sectors outside housing. This suggests that the same immigration shock can operate as a demand shock in one sector and as a supply shock in another, creating potentially offsetting effects on aggregate inflation.

Input-output linkages add another layer to this sectoral incidence issue. Recent multisector New Keynesian models show that production networks can alter the transmission of shocks to inflation (La'O and Tahbaz-Salehi, 2022; Rubbo, 2023). Afrouzi and Bhattarai (2024), in particular, show that sectoral shocks can have aggregate effects that depend not only on direct expenditure shares, but also on the sector's position in the production network and the price stickiness of connected sectors. In their framework, shocks to upstream or network-central sectors can have larger or more persistent effects on aggregate inflation than their expenditure shares alone would imply. This is relevant for understanding immigration effects, because some more exposed sectors, such as nonresidential construction and warehousing and storage, may be connected to a broader set of downstream and upstream activities.

Incorporating these dimensions into a quantitative model is beyond the scope of this paper, but the general mechanism is clear. A multisector and multi-region extension would replace the aggregate demand-supply forces in our baseline model with a collection of sectoral and local supply and demand disturbances, weighted by expenditure shares, input-output linkages, price stickiness, and local housing supply elasticities. Such a model could generate richer relative-price and local-price dynamics, even if the aggregate inflation response remains small due to offsetting inflationary pressures across sectors and regions. We therefore view our aggregate model as a first step: it captures the central forces induced by an immigration shock, while leaving the sectoral and geographic incidence of those forces, as well as their propagation through production networks and housing markets, as an important direction for future research.

8 CONCLUSION

The 2021–2024 U.S. immigration surge triggered widespread discussion about its macroeconomic impact, particularly on inflation. Despite this attention, the inflationary implications of the immigration surge remain uncertain due to the tension between its disinflationary supply-side forces and its inflationary demand-side pressures. To determine the net effect on inflation, we first combine administrative records with household survey data to provide a complete picture of unauthorized immigrants arriving in the U.S from 2021 to 2024. We document that they tend to be hand-to-mouth consumers and low-skilled workers that complement the existing workforce. In addition, they do not differ from previous immigrants from the same countries. We then build these characteristics into a heterogeneous agent New Keynesian model with capital-skill complementarity to quantify the aggregate effects of the immigration surge. We find that the supply and demand channels of the immigration surge roughly cancel out, causing a negligible response of inflation.

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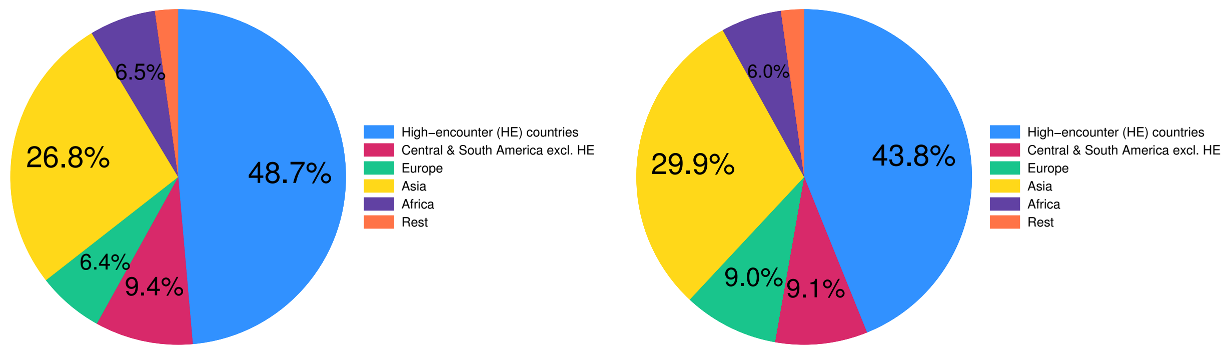
Figure A.1: Composition of the origin of CPS immigrants

(A) Immigrants arriving after 2020 **(B)** Immigrants arriving before 2020



Notes: High-encounter (HE) countries refer to the eleven countries listed by name in Figure 5.
Sources: U.S. Department of Homeland Security; Current Population Survey, January 2022-June 2025.

A HOUSEHOLD SURVEY DATA AND IMMIGRANT COMPOSITION

The Current Population Survey (CPS) is a monthly household survey conducted by the U.S. Census Bureau and the Bureau of Labor Statistics. It is the primary source of labor force statistics in the U.S. and provides current estimates and trends in employment, unemployment, hours, earnings, and other characteristics of the labor force. The Annual Social and Economic Supplement (CPS-ASEC) is conducted annually and contains detailed information on all potential income sources. We use IPUMS CPS microdata developed by Flood et al. (2024) for our empirical analysis.

Two survey questions are used to determine immigrants and their country of origin. First, the CPS asks respondents about their citizenship status: born in the U.S., born in the U.S. outlying, born abroad of American parents, naturalized citizen, or not a citizen. We identify immigrants as those reporting themselves as a naturalized citizen or not a citizen. Second, we identify immigrants' country of origin based on their reported country of birth.

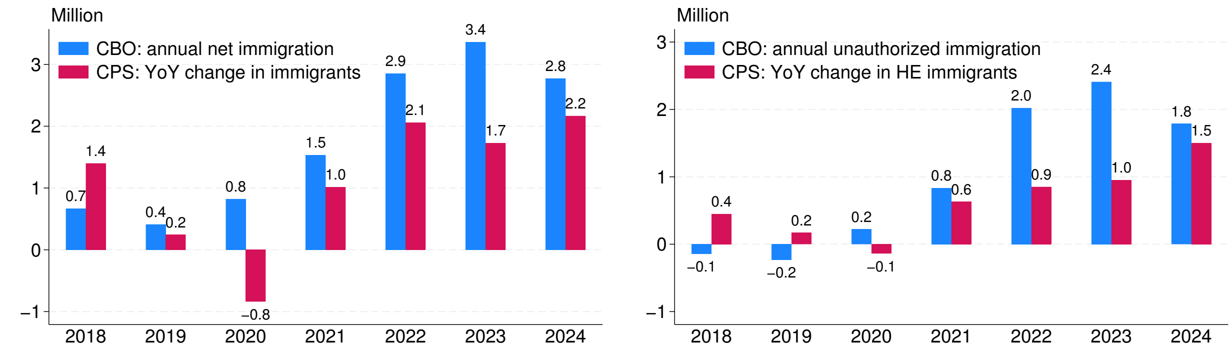
Figure A.1A shows that immigrants from HE countries account for 49% of all new immigrants arriving after 2020, not much different from the composition of existing immigrants (Figure A.1B). This suggests that the CPS likely undercounts unauthorized immigrants, as administrative data on border encounters, visa issuance, and immigration court cases suggest that the 2021–2024 immigration surge was mainly driven by unauthorized immigrants born in HE countries.[22]

This undercounting problem can also be seen by comparing the CBO's estimates of net immi-

[22] A back-of-the-envelope calculation suggests that the share of HE immigrants is at least 63% of all newly arrived immigrants from 2021–2024. This is because (i) unauthorized immigrants account for 70% of U.S. immigration during 2021–2024, according to the CBO, (ii) HE immigrants account for 90% of unauthorized immigration from 2021–2024, according to the DHS and immigration court data, and (iii) the CPS does not distinguish between legal and unauthorized immigrants, so the share of HE legal and unauthorized immigrants would be even higher than 63%.

Figure A.2: Immigration estimates using CBO and CPS data

(A) Total immigration **(B)** Unauthorized immigration



Sources: Congressional Budget Office; Current Population Survey.

gration and unauthorized immigration to those implied by the CPS (Figure A.2). For example, the CPS implies 1.7 million (or 50%) fewer immigrants and 1.4 million (or 58%) fewer unauthorized immigrants in 2023 than estimated by the CBO. Since the labor market characteristics of HE immigrants differ substantially from non-HE immigrants as shown in Section 3.3, focusing on the average new immigrant in the CPS provides a biased picture of unauthorized immigrants.

The Panel Study of Income Dynamics (PSID) is a biennial household survey conducted by the University of Michigan. It contains information on household wealth, income, and expenditures. We use two questions to determine immigrants and their country of origin. First, the survey asks whether or not the respondent (head of the household) was born in a U.S. state. We identify those reporting "no" as immigrants. Second, the survey asks what country or part of the world the respondent's ancestors came from. We use immigrants' answers to this question to determine their country of origin. Similar to the pattern in the CPS, the share of immigrants born in HE countries is 50% among new immigrants and 46% among existing immigrants in the 2015-2023 survey waves.

We measure consumption, wealth, and income in the PSID as in Zhou (2022). Total expenditures consist of (i) nondurable goods, which include food, gasoline, and clothing, (ii) durable goods, which include furniture, auto consumption, and recreation, and (iii) services, which include housing, utility, telephone and internet, education, health, childcare, transportation, and home repairs. We do not include investment expenditures such as vehicle and home purchases or home improvements in the consumption measurement. Household wealth includes: (i) net liquid assets, which are the sum of liquid savings (cash, checking and savings accounts, money market funds, CDs, Treasury bills, and government bonds) and risky assets, net of non-mortgage debt, and (ii) net illiquid assets, which include home equity, IRAs and private annuities, and net values of real estate, farms, business, and other assets. Income refers to total annual family income.

Data sources The data is available from the following sources:

1. Congressional Budget Office population projection,
   https://www.cbo.gov/publication/59697#data
2. Current Population Survey microdata,
   https://cps.ipums.org/cps
3. Panel Study of Income Dynamics,
   https://simba.isr.umich.edu/data/data.aspx
4. Immigration enforcement and legal processes monthly tables,
   https://ohss.dhs.gov/topics/immigration/immigration-enforcement/immigration-enforcement-and-legal-processes-monthly
5. New proceedings filed in immigration court,
   https://trac.syr.edu/phptools/immigration/ntanew
6. Monthly immigrant and nonimmigrant visa issuances,
   https://travel.state.gov/content/travel/en/legal/visa-law0/visa-statistics.html

B MODELS AND DERIVATIONS FOR SECTION 2

B.1 REPRESENTATIVE AGENT MODEL WITH FIXED INVESTMENT GROWTH We begin by considering a representative agent New Keynesian model that facilitates an analytical solution.

The capital stock (K_t) follows a standard law of motion given by

$$K_t = I_t + (1-\delta)K_{t-1}, \tag{B.1}$$

where δ is the depreciation rate and I_t is investment. However, investment growth is fixed, so

$$I_t = \Gamma_N I_{t-1}, \tag{B.2}$$

where Γ_N is the trend population growth rate. Gross population growth, $\Gamma_{N,t} = N_t/N_{t-1}$, follows

$$\ln \Gamma_{N,t} = (1-\rho_N)\ln \Gamma_N + \rho_N \ln \Gamma_{N,t-1} + \sigma_N \epsilon_t, \quad \epsilon_t \sim N(0,1), \tag{B.3}$$

where ϵ_t can be interpreted as a population growth shock due to an increase in immigration. Equations (B.1) and (B.2) imply that the aggregate capital stock and investment are deterministic. However, given that population growth is stochastic, *per capita* capital and investment are stochastic.

Households The representative household's optimization problem is given by

$$\max_{c_t,l_t,b_t} \quad \mathbb{E}_0 \sum_{j=0}^{\infty} \beta^j N_t \ln\left(c_j\left(1-\psi l_j^{1+\theta}\right)\right)$$
$$\text{s.t.} \quad c_t + b_t = w_t l_t + \tfrac{R_{t-1}}{\Gamma_{N,t}\Pi_t} b_{t-1} + d_t,$$

where c_t is consumption, l_t is labor hours, $b_t = {b_t^n}/{P_t}$ is real bond holdings, w_t is the real wage rate, P_t is the price of the consumption good, $\Pi_t = {P_t}/{P_{t-1}}$ is the gross inflation rate, R_t is the gross nominal interest rate, d_t is real dividends, β is the discount factor, σ is the elasticity of intertemporal substitution, θ controls the Frisch elasticity of labor supply, and ψ controls the disutility of labor.

The optimality conditions imply

$$l_t = (1+\theta)\frac{\psi l_t^{1+\theta}}{1-\psi l_t^{1+\theta}}\frac{c_t}{w_t}, \tag{B.4}$$
$$1 = \mathbb{E}_t\left[\Lambda_{t+1}\tfrac{R_t}{\Pi_{t+1}}\right], \tag{B.5}$$

where the stochastic discount factor is given by

$$\Lambda_{t-1,t} = \beta(c_{t-1}/c_t). \tag{B.6}$$

Production Sector As in the baseline model, the production sector has three levels. The bundler's and retailers' problems are unchanged from Section 4. Those equilibrium conditions are given by

$$p_t^* = \frac{\varepsilon}{\varepsilon-1}\frac{X_{1,t}}{X_{2,t}}, \tag{B.7}$$
$$X_{1,t} = p_{w,t}Y_t + \zeta\mathbb{E}_t[\Lambda_{t+1}\Pi_{t+1}^{\varepsilon}X_{1,t+1}], \tag{B.8}$$
$$X_{2,t} = Y_t + \zeta\mathbb{E}_t[\Lambda_{t+1}\Pi_{t+1}^{\varepsilon-1}X_{2,t+1}], \tag{B.9}$$
$$1 = (1-\zeta)(p_t^*)^{1-\varepsilon} + \zeta\Pi_t^{\varepsilon-1}, \tag{B.10}$$

where $p_{w,t}$ is the price of the wholesale good, p_t^* is the (real) optimal reset price, Y_t is final good output, ε is the elasticity of substitution across retails goods, and ζ is the fraction of firms that are unable to reset their price each period.

The wholesaler's optimization problem is given by

$$\max_{L_t} \quad \mathbb{E}_t \sum_{k=t}^{\infty} \Lambda_{t,k}(p_{w,k}Y_{w,k} - w_k L_k - I_k)$$
$$\text{s.t.} \quad Y_{w,t} = K_{t-1}^{\alpha} L_t^{1-\alpha},$$

where L_t is aggregate labor and α is the capital share of income. The optimality condition implies

$$w_t = p_{w,t}(1-\alpha)\frac{Y_{w,t}}{L_t}, \tag{B.11}$$

To develop intuition, it is beneficial to introduce a change of variables in the production function by defining a measure of productivity that collects the exogenous terms in the production process,

$$A_t = K_{t-1}^{\alpha}, \tag{B.12}$$

with wholesaler production rewritten as

$$Y_{w,t} = A_t L_t^{1-\alpha}. \tag{B.13}$$

Monetary policy The central bank sets the gross nominal interest rate according to

$$R_t = R\left(\Pi_t/\Pi\right)^{\upsilon_\pi}, \tag{B.14}$$

where υ_π controls the response to the inflation gap.

Competitive Equilibrium Aggregate supply is given by

$$Y_{w,t} = \Delta_t Y_t, \tag{B.15}$$

where

$$\Delta_t = (1-\zeta)(p_t^*)^{-\varepsilon} + \zeta \Pi_t^{\varepsilon} \Delta_{t-1}. \tag{B.16}$$

Aggregate labor is given by

$$L_t = N_t l_t \tag{B.17}$$

and goods market clearing implies

$$N_t c_t + I_t = Y_t. \tag{B.18}$$

A competitive equilibrium is defined by sequences of quantities $\{c_t, l_t, L_t, N_t, K_t, A_t, I_t, Y_t, Y_{w,t}\}$, prices $\{\Lambda_t, R_t, \Pi_t, p_t^*, X_{1,t}, X_{2,t}, \Delta_t, w_t, p_{w,t}\}$, and exogenous population growth $\Gamma_{N,t}$, such that (B.1)–(B.18) hold, given gross population growth, $\Gamma_{N,t} = {}^{N_t}/_{N_{t-1}}$.

Stationary equilibrium Let lowercase quantities denote per capita variables ($x_t = X_t/N_t$, except $a_t = A_t/N_t^{\alpha}$). The detrended equilibrium system is given by

$$\Gamma_{N,t} i_t = \Gamma_N i_{t-1}$$

$$k_t = i_t + (1-\delta)\, k_{t-1}/\Gamma_{N,t}$$

$$l_t = (1+\theta)\frac{\psi l_t^{1+\theta}}{1-\psi l_t^{1+\theta}}\frac{c_t}{w_t},$$

$$1 = \mathbb{E}_t\left[\Lambda_{t+1}\tfrac{R_t}{\Pi_{t+1}}\right]$$

$$\Lambda_t = \beta\frac{c_{t-1}}{c_t}$$

$$p_t^* = \frac{\varepsilon}{\varepsilon-1}\frac{x_{1,t}}{x_{2,t}}$$

$$x_{1,t} = p_{w,t} y_t + \zeta\mathbb{E}_t[\Lambda_{t+1}\Gamma_{N,t+1}\Pi_{t+1}^{\varepsilon} x_{1,t+1}]$$

$$x_{2,t} = y_t + \zeta\mathbb{E}_t[\Lambda_{t+1}\Gamma_{N,t+1}\Pi_{t+1}^{\varepsilon-1} x_{2,t+1}]$$

$$1 = (1-\zeta)(p_t^*)^{1-\varepsilon} + \zeta\Pi_t^{\varepsilon-1}$$

$$w_t = p_{w,t}(1-\alpha)\tfrac{\Delta_t y_t}{l_t}$$

$$R_t = R\,(\Pi_t/\Pi)^{\upsilon_\pi}$$

$$\Delta_t y_t = a_t l_t^{1-\alpha}$$

$$a_t = (k_{t-1}/\Gamma_{N,t})^{\alpha}$$

$$\Delta_t = (1-\zeta)(p_t^*)^{-\varepsilon} + \zeta\Pi_t^{\varepsilon}\Delta_{t-1}$$

$$c_t + i_t = y_t$$

$$\ln\Gamma_{N,t} = (1-\rho_N)\ln\Gamma_N + \rho_N\ln\Gamma_{N,t-1} + \sigma_N\epsilon_t$$

Log-Linear Equilibrium Define $\hat{x}_t = \ln x_t - \ln x$ and $C = c/y$. The log-linear system is given by

$$\hat{\imath}_t = \hat{\imath}_{t-1} - \hat{\Gamma}_{N,t}$$
$$\hat{k}_t = \tfrac{\Gamma_N-(1-\delta)}{\Gamma_N}\hat{\imath}_t + \tfrac{1-\delta}{\Gamma_N}(\hat{k}_{t-1} - \hat{\Gamma}_{N,t})$$
$$\hat{w}_t - \hat{c}_t = \left[\tfrac{1+\theta}{1-\psi l^{1+\theta}} - 1\right]\hat{l}_t,$$
$$\mathbb{E}_t\hat{\Lambda}_{t+1} + \hat{R}_t - \mathbb{E}_t\hat{\Pi}_{t+1} = 0$$
$$\hat{\Lambda}_t = \hat{c}_{t-1} - \hat{c}_t$$
$$\hat{p}^*_t = \hat{x}_{1,t} - \hat{x}_{2,t}$$
$$\hat{x}_{1,t} = (1-\zeta\beta\Gamma_N)\left(\hat{p}_{w,t} + \hat{y}_t\right) + \zeta\beta\Gamma_N\left(\mathbb{E}_t\hat{\Lambda}_{t+1} + \mathbb{E}_t\hat{\Gamma}_{N,t+1} + \varepsilon\mathbb{E}_t\hat{\Pi}_{t+1} + \mathbb{E}_t\hat{x}_{1,t+1}\right)$$
$$\hat{x}_{2,t} = (1-\zeta\beta\Gamma_N)\hat{y}_t + \zeta\beta\Gamma_N\left(\mathbb{E}_t\hat{\Lambda}_{t+1} + \mathbb{E}_t\hat{\Gamma}_{N,t+1} + (\varepsilon-1)\mathbb{E}_t\hat{\Pi}_{t+1} + \mathbb{E}_t\hat{x}_{2,t+1}\right)$$
$$0 = (1-\zeta)\hat{p}^*_t - \zeta\hat{\Pi}_t$$
$$\hat{w}_t = \hat{p}_{w,t} + \hat{\Delta}_t + \hat{y}_t - \hat{l}_t$$
$$\hat{R}_t = \upsilon_\pi\hat{\Pi}_t$$
$$\hat{\Delta}_t + \hat{y}_t = \hat{a}_t + (1-\alpha)\hat{l}_t$$
$$\hat{a}_t = \alpha(\hat{k}_{t-1} - \hat{\Gamma}_{N,t})$$
$$\hat{\Delta}_t = -\varepsilon(1-\zeta)\hat{p}^*_t + \zeta(\varepsilon\hat{\Pi}_t + \hat{\Delta}_{t-1})$$
$$C\hat{c}_t + (1-C)\hat{\imath}_t = \hat{y}_t$$
$$\hat{\Gamma}_{N,t} = \rho_N\hat{\Gamma}_{N,t-1} + \sigma_N\epsilon_t$$

Derivation of the IS and Phillips Curves First substitute out $\hat{w}_t$, $\hat{\Lambda}_t$, $\hat{p}^*_t$, $\hat{x}_{1,t}$, $\hat{x}_{2,t}$, and $\hat{\Delta}_t$:

$$\hat{\imath}_t = \hat{\imath}_{t-1} - \hat{\Gamma}_{N,t} \tag{B.19}$$
$$\hat{k}_t = \tfrac{\Gamma_N-(1-\delta)}{\Gamma_N}\hat{\imath}_t + \tfrac{1-\delta}{\Gamma_N}(\hat{k}_{t-1} - \hat{\Gamma}_{N,t}) \tag{B.20}$$
$$\hat{p}_{w,t} + \hat{y}_t - \hat{c}_t = \tfrac{1+\theta}{1-\psi l^{1+\theta}}\hat{l}_t, \tag{B.21}$$
$$\hat{c}_t = \mathbb{E}_t\hat{c}_{t+1} - (\hat{R}_t - \mathbb{E}_t\hat{\Pi}_{t+1}) \tag{B.22}$$
$$\zeta\hat{\Pi}_t = (1-\zeta)(1-\zeta\beta\Gamma_N)\hat{p}_{w,t} + \zeta\beta\Gamma_N\mathbb{E}_t\hat{\Pi}_{t+1} \tag{B.23}$$
$$\hat{R}_t = \upsilon_\pi\hat{\Pi}_t \tag{B.24}$$
$$\hat{y}_t = \hat{a}_t + (1-\alpha)\hat{l}_t \tag{B.25}$$
$$\hat{a}_t = \alpha(\hat{k}_{t-1} - \hat{\Gamma}_{N,t}) \tag{B.26}$$
$$C\hat{c}_t + (1-C)\hat{\imath}_t = \hat{y}_t \tag{B.27}$$
$$\hat{\Gamma}_{N,t} = \rho_N\hat{\Gamma}_{N,t-1} + \sigma_N\epsilon_t \tag{B.28}$$

Next, use (B.27) to substitute out consumption from (B.21) and (B.22) to obtain

$$\hat{p}_{w,t} = (1+\eta)\hat{l}_t + \tfrac{1-C}{C}(\hat{y}_t - \hat{\imath}_t), \tag{B.29}$$

$$\hat{y}_t = \mathbb{E}_t\hat{y}_{t+1} - (1-C)\mathbb{E}_t\Delta\hat{\imath}_{t+1} - C(\hat{R}_t - \mathbb{E}_t\hat{\Pi}_{t+1}), \tag{B.30}$$

where $\eta = {}^{(1+\theta)}/_{(1-\psi l^{1+\theta})} - 1$ is the inverse Frisch elasticity and Δ is a first-difference operator. Finally, substitute out $\hat{l}_t$ from (B.29) using (B.25) to obtain

$$\hat{p}_{w,t} = \frac{1+\eta}{1-\alpha}\left(\hat{y}_t - \hat{a}_t\right) + \frac{1-C}{C}\left(\hat{y}_t - \hat{\imath}_t\right). \tag{B.31}$$

From (B.23), the markup is fixed when prices are flexible ($\zeta = 0$). Let asterisks denote the flexible price economy. The flexible price level of output is given by

$$\hat{y}_t^* = \frac{C(1+\eta)}{(1-C)(1-\alpha)+C(1+\eta)}\hat{a}_t + \frac{(1-C)(1-\alpha)}{(1-C)(1-\alpha)+C(1+\eta)}\hat{\imath}_t,$$

where $\hat{\imath}_t = \hat{\imath}_t^*$ since investment only depends on current and past population growth. Therefore,

$$\hat{p}_{w,t} = \frac{(1-C)\left(1-\alpha\right)+C(1+\eta)}{C(1-\alpha)}\widehat{gap}_t,$$

where $\widehat{gap}_t = \hat{y}_t - \hat{y}_t^*$ is the output gap.

We can now write the Phillips curve as

$$\hat{\Pi}_t = \kappa\widehat{gap}_t + \beta\Gamma_N\mathbb{E}_t\hat{\Pi}_{t+1}, \tag{PC}$$

where $\kappa = \frac{(1-\zeta)(1-\zeta\beta\Gamma_N)}{\zeta}\frac{(1-C)(1-\alpha)+(1+\eta)C}{C(1-\alpha)}$. Higher trend population growth flattens the Phillips curve but increases the sensitivity to expected inflation. For $C = \Gamma_N = 1$ and $\alpha = 0$, the Phillips curve reduces to the textbook equation in Galí (2015).

To derive the investment-saving curve, first note that the natural rate is given by

$$\hat{r}_t^* = \frac{1+\eta}{(1-C)(1-\alpha)+C(1+\eta)}\mathbb{E}_t\Delta\hat{a}_{t+1} - \frac{(1-C)(\alpha+\eta)}{(1-C)(1-\alpha)+C(1+\eta)}\mathbb{E}_t\Delta\hat{\imath}_{t+1}.$$

Therefore, writing (B.30) in terms of the output gap implies

$$\widehat{gap}_t = \mathbb{E}_t\widehat{gap}_{t+1} - C(\hat{R}_t - \mathbb{E}_t\hat{\Pi}_{t+1} - \hat{r}_t^*). \tag{IS}$$

A population growth shock acts as a natural rate shock with accompanying supply-side, $\hat{a}_t$, and demand-side, $\hat{\imath}_t$, effects. To determine the macroeconomic response to a population growth shock, we must sign the natural rate response, which requires solutions for productivity growth and investment growth. Investment at time t and $t+1$ is easy to define

$$\hat{\imath}_t = -\hat{\Gamma}_{N,t}, \quad \mathbb{E}_t \hat{\imath}_{t+1} = -(1+\rho_N)\hat{\Gamma}_{N,t} \quad \Rightarrow \quad \mathbb{E}_t \Delta \hat{\imath}_{t+1} = -\rho_N \hat{\Gamma}_{N,t}.$$

To define productivity, we must first define the per capita level of capital in the current period,

$$\hat{k}_t = \frac{\Gamma_N - (1-\delta)}{\Gamma_N}\hat{\imath}_t - \frac{1-\delta}{\Gamma_N}\hat{\Gamma}_{N,t} = -\frac{\Gamma_N - (1-\delta)}{\Gamma_N}\hat{\Gamma}_{N,t} - \frac{1-\delta}{\Gamma_N}\hat{\Gamma}_{N,t} = -\hat{\Gamma}_{N,t},$$

which implies that

$$\hat{a}_t = -\alpha\hat{\Gamma}_{N,t}, \quad \mathbb{E}_t \hat{a}_{t+1} = -\alpha\left(1+\rho_N\right)\hat{\Gamma}_{N,t} \quad \Rightarrow \quad \mathbb{E}_t \Delta \hat{a}_{t+1} = -\alpha\rho_N \hat{\Gamma}_{N,t}.$$

Therefore, the natural rate is given by

$$\hat{r}^*_t = -\rho_N \frac{C\alpha - \eta(1-\alpha-C)}{(1-C)(1-\alpha)+C(1+\eta)}\hat{\Gamma}_{N,t}.$$

An increase in population growth reduces the natural rate as long as $\rho_N > 0$ and $\frac{1}{\eta} > \frac{1-\alpha-C}{C\alpha}$.

Model Dynamics We can express inflation and the output gap in terms of the natural rate by guessing and verifying that $\hat{\Pi}_t = \omega_\pi \hat{r}^*_t$ and $\widehat{gap}_t = \omega_x \hat{r}^*_t$. Plugging the guess into (PC) and (IS) implies

$$\omega_\pi = \kappa\omega_x + \beta\Gamma_N\rho_N\omega_\pi,$$
$$\omega_x = \rho_N\omega_x - C((\upsilon_\pi - \rho_N)\omega_\pi - 1),$$

given that $\hat{R}_t = \upsilon_\pi \hat{\Pi}_t$. Solving for the two unknown coefficients implies

$$\omega_x = \frac{C(1-\beta\Gamma_N\rho_N)}{(1-\rho_N)(1-\beta\Gamma_N\rho_N)+C(\upsilon_\pi-\rho_N)\kappa},$$
$$\omega_\pi = \frac{\kappa C}{(1-\rho_N)(1-\beta\Gamma_N\rho_N)+C(\upsilon_\pi-\rho_N)\kappa},$$

which are both positive as long as $\upsilon_\pi > 1$ and $\beta\Gamma_N\rho_N < 1$. In this case, higher population growth lowers the natural rate, inflation, and the output gap.

B.2 REPRESENTATIVE AGENT MODEL WITH VARIABLE INVESTMENT GROWTH

Remove (B.2). The wholesale firm chooses K_t, to obtain

$$1 = \mathbb{E}_t[\Lambda_{t,t+1}(R^k_{t+1} + 1 - \delta)]$$

where

$$R^k_t = \alpha p_{w,t}\left(\frac{K_{t-1}}{L_t}\right)^{\alpha-1} = \alpha p_{w,t}\left(\frac{k_{t-1}}{l_t\Gamma_{N,t}}\right)^{\alpha-1}.$$

The rest of the model remains unchanged.

B.3 TWO-AGENT MODEL WITH FIXED INVESTMENT GROWTH There are N_t households, where $N_{ns,t}$ are non-savers and $N_{s,t}$ are savers. Saver population growth is fixed at Γ_N, while

$$\ln \Gamma_{ns,t} = (1-\rho_N)\ln \Gamma_N + \rho_N \ln \Gamma_{ns,t-1} + \sigma_n \epsilon_{ns,t}, \quad \epsilon_{ns,t} \sim N(0,1). \tag{B.32}$$

Define $\nu_t = N_{s,t}/N_t$ as the saver population share. This share can be written recursively as

$$\nu_t = (\Gamma_N/\Gamma_{N,t})\nu_{t-1}, \tag{B.33}$$

where

$$\Gamma_{N,t} = \Gamma_N \nu_{t-1} + \Gamma_{ns,t}(1-\nu_{t-1}). \tag{B.34}$$

Savers The representative saver's optimization problem is given by

$$\begin{aligned} \max_{c_{s,t},l_{s,t},b_{s,t}} \quad & \mathbb{E}_0 \sum_{j=0}^{\infty} \beta^j \ln\left(c_{s,j}\left(1-\psi l_{s,j}^{1+\theta}\right)\right) \\ \text{s.t.} \quad & c_{s,t} + b_t = w_t l_{s,t} + \tfrac{R_{t-1}}{\Gamma_N \Pi_t} b_{t-1} + d_t, \end{aligned}$$

The optimality conditions imply

$$l_{s,t} = (1+\theta)\frac{\psi l_{s,t}^{1+\theta}}{1-\psi l_{s,t}^{1+\theta}}\frac{c_{s,t}}{w_t}, \tag{B.35}$$

$$1 = \mathbb{E}_t\left[\Lambda_{t+1}\tfrac{R_t}{\Pi_{t+1}}\right], \tag{B.36}$$

where

$$\Lambda_t = \beta(c_{s,t-1}/c_{s,t}) \tag{B.37}$$

Non-savers The representative non-saver's optimization problem is given by

$$\begin{aligned} \max_{c_{ns,t},l_{ns,t}} \quad & \mathbb{E}_0 \sum_{j=0}^{\infty} \beta^j \ln\left(c_{ns,j}\left(1-\psi l_{ns,j}^{1+\theta}\right)\right) \\ \text{s.t.} \quad & c_{ns,t} = w_t l_{ns,t}. \end{aligned} \tag{B.38}$$

The optimality conditions imply

$$1 = (1+\theta)\frac{\psi l_{ns,t}^{1+\theta}}{1-\psi l_{ns,t}^{1+\theta}}. \tag{B.39}$$

Competitive Equilibrium Aggregate labor is given by

$$L_t = N_{ns,t} l_{ns,t} + N_{s,t} l_{s,t} \tag{B.40}$$

and goods market clearing implies

$$N_{ns,t}c_{ns,t} + N_{s,t}c_{s,t} + I_t = Y_t. \tag{B.41}$$

A competitive equilibrium is defined by sequences of quantities, $\{l_{ns,t}, c_{ns,t}, l_{s,t}, c_{s,t}, L_t, N_t, N_{ns,t}, N_{s,t}, K_t, A_t, I_t, Y_t, Y_{w,t}, \nu_t\}$, prices, $\{\Lambda_t, R_t, \Pi_t, p_t^*, X_{1,t}, X_{2,t}, \Delta_t, w_t, p_{w,t}\}$, and growth rates, $\{\Gamma_{ns,t}, \Gamma_{N,t}\}$, such that (B.1), (B.2), (B.7)-(B.16), and (B.32)-(B.41) are satisfied, given the aggregate population, $N_t = N_{ns,t} + N_{s,t}$, non-saver population growth, $\Gamma_{ns,t} = N_{ns,t}/N_{ns,t-1}$, and aggregate population growth, $\Gamma_{N,t} = N_t/N_{t-1}$.

Stationary equilibrium The detrended equilibrium system is given by

$$\ln \Gamma_{ns,t} = (1-\rho_N)\ln \bar{\Gamma}_N + \rho_N \ln \Gamma_{ns,t-1} + \sigma_{ns}\epsilon_{ns,t} \tag{B.42}$$

$$\nu_t = (\bar{\Gamma}_N/\Gamma_{N,t})\nu_{t-1} \tag{B.43}$$

$$\Gamma_{N,t} = \bar{\Gamma}_N \nu_{t-1} + \Gamma_{\ell,t}(1-\nu_{t-1}) \tag{B.44}$$

$$\Gamma_{N,t} i_t = \Gamma_N i_{t-1} \tag{B.45}$$

$$l_{s,t} = (1+\theta)\tfrac{\psi l_{s,t}^{1+\theta}}{1-\psi l_{s,t}^{1+\theta}}\tfrac{c_{s,t}}{w_t} \tag{B.46}$$

$$1 = \mathbb{E}_t\left[\Lambda_{t+1}\tfrac{R_t}{\Pi_{t+1}}\right] \tag{B.47}$$

$$\Lambda_t = \beta\tfrac{c_{s,t-1}}{c_{s,t}} \tag{B.48}$$

$$c_{ns,t} = w_t l_{ns,t} \tag{B.49}$$

$$1 = (1+\theta)\tfrac{\psi l_{ns,t}^{1+\theta}}{1-\psi l_{ns,t}^{1+\theta}} \tag{B.50}$$

$$p_t^* = \tfrac{\varepsilon}{\varepsilon-1}\tfrac{x_{1,t}}{x_{2,t}} \tag{B.51}$$

$$x_{1,t} = p_{w,t}y_t + \zeta\mathbb{E}_t[\Lambda_{t,t+1}\Gamma_{N,t+1}\Pi_{t+1}^{\varepsilon}x_{1,t+1}] \tag{B.52}$$

$$x_{2,t} = y_t + \zeta\mathbb{E}_t[\Lambda_{t,t+1}\Gamma_{N,t+1}\Pi_{t+1}^{\varepsilon-1}x_{2,t+1}] \tag{B.53}$$

$$1 = (1-\zeta)(p_t^*)^{1-\varepsilon} + \zeta\Pi_t^{\varepsilon-1} \tag{B.54}$$

$$k_t = i_t + (1-\delta)k_{t-1}/\Gamma_{N,t} \tag{B.55}$$

$$w_t = (1-\alpha)p_{w,t}\left(\tfrac{k_{t-1}}{l_t\Gamma_{N,t}}\right)^{\alpha} \tag{B.56}$$

$$R_t = \bar{R}(\Pi_t/\bar{\Pi})^{\upsilon_\pi} \tag{B.57}$$

$$\Delta_t y_t = a_t l_t^{1-\alpha} \tag{B.58}$$

$$a_t = (k_{t-1}/\Gamma_{N,t})^{\alpha} \tag{B.59}$$

$$\Delta_t = (1-\zeta)(p_t^*)^{-\varepsilon} + \zeta\Pi_t^{\varepsilon}\Delta_{t-1} \tag{B.60}$$

$$c_t = \nu_t c_{s,t} + (1-\nu_t)c_{ns,t} \tag{B.61}$$

$$l_t = \nu_t l_{s,t} + (1-\nu_t)l_{ns,t} \tag{B.62}$$

$$c_t + i_t = y_t \tag{B.63}$$

Table B.1: Parameter values for the representative agent and two-agent models

Parameter	Description	Value	Source
Production			
α	Capital income share	0.38	Updated Fernald (2014) Data
ε	Goods Elasticity of Substitution	6	20% Markup, Galí (2015)
ζ	Probability of Changing Prices	0.667	3Q Duration, Galí (2015)
δ	Capital Depreciation Rate	$1.1^{1/4} - 1$	Depreciation, Fixed Assets
Households			
β	Subjective discount factor	$1.01^{-1/4}$	1% Annual Real Rate
ψ	Labor Preference Weight	2.95	Work 1/3 of Total Hours
θ	Labor Preference Elasticity	1.25	Frisch Elasticity of 0.5
ν*	High-Skilled Population Share	0.81	Baseline Model Targets
Monetary Policy			
υ_π	Monetary Response to Inflation	1.5	Galí (2015); Taylor (1993)
Π	Inflation Target	1	2% Annual Inflation Rate
Demographics			
Γ_N	Steady-State Population Growth	$1.0065^{1/4}$	CBO Demographic Outlook
ρ_N	Immigration Shock Persistence	0.875	CBO Demographic Outlook

*Parameter only applies to the two-agent model.

B.4 MODEL PARAMETERS Table B.1 describes the model parameters used to generate Figure 1. The values are identical to those used in the baseline model, except there is no trend inflation ($\Pi = 1$) and α is directly set rather than an implied target. For the two-agent model, $\nu = \nu^b + (1 - \vartheta^b)(1 - \nu^b)$, where a b superscript denotes the corresponding value from the baseline model. The utility preference parameters, θ and ψ, are set to target an aggregate Frisch elasticity of labor supply of 0.5 and a steady-state aggregate hours share of $1/3$, consistent with the baseline model.

C Baseline Model Stationary Equilibrium

Let lowercase quantities denote per capita variables. A stationary competitive equilibrium is defined by sequences of quantities $\{l_{h,t},\, c_{h,t},\, l_{\ell s,t},\, c_{\ell s,t},\, l_{\ell n,t},\, c_{\ell n,t},\, l_{\ell,t},\, c_{\ell,t},\, c_t,\, k_t,\, i_t,\, y_t,\, \nu_t\}$, prices $\{\Lambda_{h,t},\, \Lambda_{\ell s,t},\, R_t,\, \Pi_t,\, p_t^*,\, \Delta_t,\, w_{h,t},\, w_{\ell,t},\, R_t^k,\, p_{w,t},\, x_{1,t},\, x_{2,t}\}$, and growth rates $\{\Gamma_{\ell,t},\, \Gamma_{N,t}\}$, such that

$$\ln\Gamma_{\ell,t} = (1-\rho_N)\ln\Gamma_N + \rho_N\ln\Gamma_{\ell,t-1} + \sigma_{\ell N}\epsilon_{\ell,t} \tag{C.1}$$

$$\nu_t = \tfrac{\Gamma_N}{\Gamma_{N,t}}\nu_{t-1} \tag{C.2}$$

$$\Gamma_{N,t} = \Gamma_N\nu_{t-1} + \Gamma_{\ell,t}(1-\nu_{t-1}) \tag{C.3}$$

$$c_{\ell,t} = (1-\vartheta)c_{\ell s,t} + \vartheta c_{\ell n,t} \tag{C.4}$$

$$l_{\ell,t} = (1-\vartheta)l_{\ell s,t} + \vartheta l_{\ell n,t} \tag{C.5}$$

$$l_{h,t} = (1+\theta)\tfrac{\psi l_{h,t}^{1+\theta}}{1-\psi l_{h,t}^{1+\theta}}\tfrac{c_{h,t}}{w_{h,t}} \tag{C.6}$$

$$1 = \mathbb{E}_t\left[\Lambda_{h,t+1}\tfrac{R_t}{\Pi_{t+1}}\right] \tag{C.7}$$

$$\Lambda_{h,t} = \beta\left(\tfrac{1-\psi l_{h,t}^{1+\theta}}{1-\psi l_{h,t-1}^{1+\theta}}\right)^{1-\sigma}\left(\tfrac{c_{h,t-1}}{c_{h,t}}\right)^{\sigma} \tag{C.8}$$

$$l_{\ell s,t} = (1+\theta)\tfrac{\psi l_{\ell s,t}^{1+\theta}}{1-\psi l_{\ell s,t}^{1+\theta}}\tfrac{c_{\ell s,t}}{w_{\ell,t}} \tag{C.9}$$

$$1 = \mathbb{E}_t\left[\Lambda_{\ell s,t+1}\tfrac{R_t}{\Pi_{t+1}}\right] \tag{C.10}$$

$$\Lambda_{\ell s,t} = \beta\left(\tfrac{1-\psi l_{\ell s,t}^{1+\theta}}{1-\psi l_{\ell s,t-1}^{1+\theta}}\right)^{1-\sigma}\left(\tfrac{c_{\ell s,t-1}}{c_{\ell s,t}}\right)^{\sigma} \tag{C.11}$$

$$c_{\ell n,t} = (1-\phi)w_{\ell,t}l_{\ell n,t} \tag{C.12}$$

$$1 = (1-\phi)(1+\theta)\frac{\psi l_{\ell n,t}^{1+\theta}}{1-\psi l_{\ell n,t}^{1+\theta}} \tag{C.13}$$

$$p_t^* = \tfrac{\varepsilon}{\varepsilon-1}\tfrac{x_{1,t}}{x_{2,t}} \tag{C.14}$$

$$x_{1,t} = p_{w,t}y_t + \zeta\mathbb{E}_t[\Lambda_{h,t+1}\Gamma_{N,t+1}\Pi_{t+1}^{\varepsilon}x_{1,t+1}] \tag{C.15}$$

$$x_{2,t} = y_t + \zeta\mathbb{E}_t[\Lambda_{h,t+1}\Gamma_{N,t+1}\Pi_{t+1}^{\varepsilon-1}x_{2,t+1}] \tag{C.16}$$

$$1 = (1-\zeta)(p_t^*)^{1-\varepsilon} + \zeta\Pi_t^{\varepsilon-1} \tag{C.17}$$

$$k_t = i_t + (1-\delta)k_{t-1}/\Gamma_{N,t} \tag{C.18}$$

$$w_{\ell,t} = p_{w,t}\tfrac{\Delta_t y_t}{(1-\nu_t)l_{\ell,t}}\tfrac{(1-\mu)((1-\nu_t)l_{\ell,t})^{\eta}}{(1-\mu)((1-\nu_t)l_{\ell,t})^{\eta}+\mu((1-\chi)(\nu_t l_{h,t})^{\xi}+\chi(k_{t-1}/\Gamma_{N,t})^{\xi})^{\eta/\xi}} \tag{C.19}$$

$$w_{h,t} = p_{w,t}\tfrac{\Delta_t y_t}{\nu_t l_{h,t}}\tfrac{\mu((1-\chi)(\nu_t l_{h,t})^{\xi}+\chi(k_{t-1}/\Gamma_{N,t})^{\xi})^{\eta/\xi}}{(1-\mu)((1-\nu_t)l_{\ell,t})^{\eta}+\mu((1-\chi)(\nu_t l_{h,t})^{\xi}+\chi(k_{t-1}/\Gamma_{N,t})^{\xi})^{\eta/\xi}}\tfrac{(1-\chi)(\nu_t l_{h,t})^{\xi}}{(1-\chi)(\nu_t l_{h,t})^{\xi}+\chi(k_{t-1}/\Gamma_{N,t})^{\xi}} \tag{C.20}$$

$$R_t^k = p_{w,t}\tfrac{\Delta_t y_t}{k_{t-1}/\Gamma_{N,t}}\tfrac{\mu((1-\chi)(\nu_t l_{h,t})^{\xi}+\chi(k_{t-1}/\Gamma_{N,t})^{\xi})^{\eta/\xi}}{(1-\mu)((1-\nu_t)l_{\ell,t})^{\eta}+\mu((1-\chi)(\nu_t l_{h,t})^{\xi}+\chi(k_{t-1}/\Gamma_{N,t})^{\xi})^{\eta/\xi}}\tfrac{\chi(k_{t-1}/\Gamma_{N,t})^{\xi}}{(1-\chi)(\nu_t l_{h,t})^{\xi}+\chi(k_{t-1}/\Gamma_{N,t})^{\xi}} \tag{C.21}$$

$$1 = \mathbb{E}_t[\Lambda_{h,t+1}(R_{t+1}^k + 1 - \delta)] \tag{C.22}$$

$$R_t = R(\Pi_t/\Pi)^{\upsilon_\pi} \tag{C.23}$$

$$(\Delta_t y_t)^{\eta} = (1-\mu)((1-\nu_t)l_{\ell,t})^{\eta} + \mu\Big((1-\chi)(\nu_t l_{h,t})^{\xi} + \chi(k_{t-1}/\Gamma_{N,t})^{\xi}\Big)^{\eta/\xi} \tag{C.24}$$

$$\Delta_t = (1-\zeta)(p_t^*)^{-\varepsilon} + \zeta\Pi_t^{\varepsilon}\Delta_{t-1} \tag{C.25}$$

$$c_t = \nu_t c_{h,t} + (1-\nu_t)c_{\ell,t} \tag{C.26}$$

$$c_t + i_t = y_t - \phi(1-\nu_t)w_{\ell,t}l_{\ell,t} \tag{C.27}$$

Frisch Elasticity Type-i households receive utility flows from consumption, $c_{i,t}$, and disutility from labor, $l_{i,t}$, with nonseparable preferences,

$$u\left(c_{i,t}, l_{i,t}\right) = \frac{\left(c_{i,t}\left(1-\psi l_{i,t}^{1+\theta}\right)\right)^{1-\sigma}}{1-\sigma},$$

where hours worked provide total labor income $w_{i,t}l_{i,t}$. Equating the marginal cost and benefit of working yields the type-i household's labor supply curve,

$$w_{i,t}\lambda_{i,t} = c_{i,t}^{1-\sigma}\left(1-\psi l_{i,t}^{1+\theta}\right)^{-\sigma}(1+\theta)\psi l_{i,t}^{\theta},$$

where $\lambda_{i,t}$ is the household's marginal utility of wealth,

$$\lambda_{i,t} = c_{i,t}^{-\sigma}\left(1-\psi l_{i,t}^{1+\theta}\right)^{1-\sigma}.$$

To derive the Frisch elasticity, log-linearize the labor supply curve and marginal utility of wealth,

$$\hat{w}_{i,t} + \hat{\lambda}_{i,t} - (1-\sigma)\hat{c}_{i,t} = \left[\theta + \sigma(1+\theta)\frac{\psi l_i^{1+\theta}}{1-\psi l_i^{1+\theta}}\right]\hat{l}_{i,t},$$

$$\hat{\lambda}_{i,t} = -\sigma\hat{c}_{i,t} - (1-\sigma)(1+\theta)\frac{\psi l_i^{1+\theta}}{1-\psi l_i^{1+\theta}}\hat{l}_{i,t}.$$

The Frisch elasticity is the wage elasticity of labor supply conditional on the marginal utility of wealth being held fixed. Setting $\hat{\lambda}_{i,t} = 0$ and combining the two log-linear equations implies

$$\sigma\hat{w}_{i,t} = \left[\sigma\theta + (2\sigma-1)(1+\theta)\frac{\psi l_i^{1+\theta}}{1-\psi l_i^{1+\theta}}\right]\hat{l}_{i,t},$$

so the steady-state Frisch elasticity is given by

$$\phi_i^f = \frac{\sigma}{\sigma\theta + (2\sigma-1)(1+\theta)\psi l_i^{1+\theta}/(1-\psi l_i^{1+\theta})} = \frac{\sigma}{\sigma\theta + (2\sigma-1)w_i l_i/c_i}.$$

The aggregate Frisch elasticity, which is used to calibrate the model, is given by

$$\phi^f = \nu\phi_h + (1-\nu)((1-\vartheta)\phi_{\ell s} + \vartheta\phi_{\ell n}).$$