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Labor Market Dynamics and Public Assistance Programs: Evidence from an Estimated Model of SNAP Participation

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Abstract

We develop and estimate a dynamic model of household labor supply and SNAP participation that explains two empirical puzzles: incomplete program take-up despite substantial benefits, and minimal employment effects of SNAP work requirements despite the constraints they impose. Our model incorporates detailed program rules, labor market frictions, and heterogeneous participation costs, revealing that eligible households may rationally forgo benefits when facing administrative barriers to participation and uncertain future employment. Exploiting our model estimates, we perform policy experiments finding that more stringent work requirements lead to dramatic reductions in participation (from 10% to 2.3%) without increasing employment levels or participants' selfsufficiency. While more stringent work requirements do not seem to be effective in our population, other policies do. An increase in benefits would lead to better labor market outcomes, while a lower benefit reduction rate would be one of the most effective policies to increase take-up.

JEL classification

C63, D10, H53, I38, J22, J64

Keywords

search and matching, SNAP, work requirements, structural estimation, household labor supply, administrative costs, means-tested programs

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1 Introduction

Policymakers face two perennial challenges with public assistance programs: how to maximize take-up among households that are eligible to receive benefits and how to provide meaningful benefits while maintaining work incentives. Program goals generally include reduced poverty and improved health, education, and economic stability among the target populations. Yet there is a need to balance supporting recipients in times of need against encouraging self-sufficiency so as to control program costs and reduce future dependency. As the largest nutrition assistance initiative in the United States and one of the nation's most significant poverty alleviation programs, the Supplemental Nutrition Assistance Program (SNAP) has confronted both challenges for decades.

The literature studying these challenges is vast. Many contributions document incomplete take-up, pointing out substantial variation across demographic and socioeconomic groups of households and across locations.[1] Many others focus on the challenge of both providing assistance and promoting self-sufficiency.[2] Because self-sufficiency necessitates generating labor income, this portion of the literature rightly focuses on the interaction between the program and the labor market.[3]

However, the literature and related policy debate often overlook a fundamental point about SNAP: individuals and households make decisions based not only on their current situations but also on future expected outcomes.[4] In the presence of positive

[1]The SNAP take-up rate, defined as the percentage of households eligible for program benefits who choose to participate in the program, was about 82% nationally before the COVID-19 pandemic (2018 to 2020) and about 88% right after (in 2022—the most recently published estimates by the U.S. Department of Agriculture (Virgil and Rahimi 2024)). Although these rates are generally higher than those for other public assistance programs, they mask substantial variation across groups of households. In 2022, SNAP take-up rates ranged from 55% among elderly individuals to 95% among individuals with no earned income. For general reviews and more information, see for example Ko and Moffitt (2020); Currie (2006).

[2]While the program strives to increase take-up to address participants' unmet food needs, SNAP is designed with several features that promote work and self-sufficiency. When determining program eligibility and benefit allotments, households receive an earned income deduction that acts as a work incentive by allowing participants to retain more of their benefits as their earnings increase. The gradual decrease in benefit amounts as earnings rise discourages working less than traditional program benefit cliffs. Additionally, labor force participation is encouraged through work requirements for more work-ready populations. SNAP also offers employment and training services that support labor market participation through job search assistance, work readiness activities, education, and occupational skills training, with the goal of reducing employment barriers and facilitating transitions into unsubsidized work.

[3]See for example, Cook and East (2024, 2023); Gray et al. (2023); Harris (2021); Hoynes and Schanzenbach (2012).

[4]The importance of dynamic considerations to evaluate welfare program has a long tradition. For an early survey advocating for this view, see Keane and Wolpin (2002a). For applications, see

costs to participate in a program, an eligible household may decide not to participate today if one of its members expects to find a job (or higher-paying job) tomorrow that will render them ineligible. Pushing this household to participate to reach a 100% take-up rate would not be worthwhile, unless participation costs were effectively zero. At the same time, requiring individuals to work in order to receive benefits can have unintended consequences. In a labor market affected by frictions, agents may cut short their searches and accept jobs that are not a good match for them just to receive program benefits. These "bad matches" may actually reduce self-sufficiency when compared to matches realized in a world where agents can search optimally and find jobs that provide long-term self-sufficiency and eliminate the need to rely on the program in the future.

To address these issues, we develop a dynamic model of household labor supply and endogenous SNAP participation in an environment that recognizes labor market frictions and agents' forward looking behavior. Specifically, household members simultaneously search for jobs and choose whether to participate in SNAP,which is carefully parameterized to incorporate the program's main institutional features. To provide quantitative results and perform counterfactual policy exercises, we estimate the model on household data extracted from the 2018 Panel of the *Survey of Income and Program Participation* (SIPP) and obtain estimates of the model's structural parameters. We validate the model by exploiting the drop in the maximum benefit level that occurred in 2013 when the benefit increase from the American Recovery & Reinvestment Act of 2009 expired.

We make four contributions to understanding the relationship between SNAP participation and labor supply. First, we show that incomplete take-up can be fully explained by reasonable estimates of the costs faced by households when participating in the program. Our model allows us to identify and estimate two costs: a one-time take-up cost paid to apply to the program and a flow participation cost paid to remain on the program. The estimates indicate that the second cost has a much larger impact: removing it would increase take-up in our sample from 67.9% to 96.9%. These results are in line with previous contributions that have focused on administrative costs to explain the lack of full take-up.[5] They also provide an alternative explanation to other

for example Blau and Robins (1986); Keane and Wolpin (2002b); Swann (2005); Fang and Silverman (2009); Blundell et al. (2016). However, empirical applications focusing on SNAP are relatively few and those that exist bundle SNAP (or food stamp) with other welfare programs, see for example the influential contributions by Keane and Wolpin (2010); Chan (2013); Low et al. (2022).

[5]See for example, Finkelstein and Notowidigdo (2019); Deshpande and Li (2019); Homonoff and Somerville (2021); Giannella et al. (2024).

contributions attributing low take-up rates to information frictions.[6]

Second, our counterfactual policy experiments show that imposing stringent work requirements generates a large reduction in benefit provision without increasing employment levels. The only noticeable employment effects are composition effects in jobs accepted: the wage distribution of employed individuals moves to the left after stricter work requirements are introduced. Under the most stringent work requirement policy—benefits provided only if the head of household and the spouse are both employed—the proportion of SNAP participants in the entire population drops from 10% to 2.3% without producing any employment increase. The only impact is on employment composition: workers remaining on SNAP begin to accept lower wages. For example, the proportion of male workers on SNAP earning less than $10/hour more than doubles. These low-paying jobs have a limited impact as far as increasing self-sufficiency, as shown by an increase in the program reentry rate under the policy. These results provide behavioral foundations for previous empirical analyses that also find large negative impacts on program participation but limited positive employment effects when work requirements are introduced or tightened.[7] One important mechanism that our household search model highlights in explaining these results is the interaction of labor supply decisions of multiple adults within the same household unit. Most eligible households in our sample already have at least one member employed full-time, relegating any labor supply adjustments to secondary earners. But secondary earners are typically women who are mothers. For this group of potential workers increasing labor supply is costly and more a function of other institutional features, such as child care services, than of work requirement policies. This is an additional mechanism for previously observed low labor supply responses that have instead been attributed to low labor force attachment among the SNAP-eligible population (Gray et al. 2023; Han 2022), where high rates of disability also bound the elasticity of labor supply among this population in general (Cook and East 2023).

Third, increasing SNAP benefits from their current levels leads to better labor market outcomes both in terms of higher labor force participation and higher wages. The reason for this counterintuitive result is the presence of frictions in the labor market, which imply that searching for a job is costly. SNAP benefits help to offset some of these costs, leading to better labor market outcomes. This is particularly

[6]See for example, Daponte et al. (1999); Finkelstein and Notowidigdo (2019).

[7]Some relevant examples include: for SNAP, Cook and East (2023), Harris (2021), Vericker et al. (2023), Cook and East (2024), Gray et al. (2023), Hagstrom (1996); for other assistance programs, Chan et al. (2024), Sommers et al. (2020).

evident in "after SNAP" wages—wages individuals receive after exiting the program. For example, an increase of 50% in the maximum SNAP benefits leads to a 1.3% increase in after-SNAP wages for women.

Finally, we estimate that a reduction in the benefit reduction rate—the amount by which the SNAP benefit is reduced as a function of earned income—would be one of the most effective policies to increase SNAP participation. Without any penalty for additional earned income, the overall share of households in our population on SNAP would increase to 13.2% (from 10% at benchmark) and the take-up rate to 84.7% (from 67.9% at benchmark). Once again, the impact on men's employment level is negligible. However, the impact on wages is positive: the lower the benefit reduction rate, the higher the wage accepted off SNAP, on SNAP and after SNAP. The lack of impact on employment levels but significant impact on wages results from the two channels linking the labor market and the benefit reduction rate working in opposite directions. On one side, reducing the benefit reduction rate incentivizes employment by punishing a worker less for earning more. On the other side, reducing the benefit reduction rate disincentivizes employment by providing higher SNAP benefits, all else being equal.

Previous literature confirms the disconnect between the responsiveness of SNAP participation and labor supply to policy changes that we have found in our policy experiments. Klerman and Danielson (2011); Dorn et al. (2013); Gordon et al. (2017), among others, all find that take-up rates are highly sensitive to policy design and administrative features. At the same time, Cook and East (2023, 2024); Gray et al. (2023); Harris (2021) find that labor supply exhibits relatively weak responsiveness to these same policy design features. The overarching question emerging from this literature is whether work-promoting requirements can enhance employment without undermining program access. Many existing studies provide only a partial answer, as they devote relatively little attention to the dynamic interplay between SNAP participation choices, labor market decisions, and program rules and policies. Our dynamic model of labor market and SNAP participation decisions addresses this gap by accounting for optimal household responses to policy changes. Our counterfactual experiments not only confirm these prior results but also identify the economic channels through which these effects operate.

Previous contributions—such as Homonoff and Somerville (2021) and Giannella et al. (2024)—have identified administrative "sludge" costs as an important source of incomplete program take-up. Related work by Deshpande and Li (2019) and Finkelstein and Notowidigdo (2019) focuses specifically on administrative hurdles associated with enrollment and recertification. Our model allows a rich parameterization of these administrative costs. Our estimation and counterfactual results indicate that such costs play a central role in preventing otherwise eligible households from receiving SNAP benefits.

Our work builds upon a substantial theoretical and empirical literature on public assistance programs and labor supply.[8] Early theoretical work by Besley and Coate (1992) formalized the trade-off between providing safety net benefits and avoiding work disincentives. Corresponding empirical literature documents the work disincentives inherent in means-tested programs, with evidence that income effects explain much of the causal relationship between government assistance and work (Autor et al. 2017; Fetter and Lockwood 2018). A complementary strand of research studies whether work requirements can help circumvent this trade-off by promoting employment. In the context of traditional welfare programs, several studies find that work requirements increase employment and program exit but decrease total income, as many households exit without employment (Fang and Keane 2004; Grogger and Karoly 2005; Card and Hyslop 2005; Chan and Moffitt 2018). Our approach allows us to go beyond employment and program participation outcomes to analyze unobserved but important measures, namely household welfare, which Autor et al. (2017) find does not increase for low earners under a policy of rapid job placement for the unemployed. Our results also speak to the macro-level evidence on SNAP participation as in Ganong and Liebman (2018), who show that a one percentage point increase in unemployment raises enrollment by 15%, and Currie et al. (2001), who attribute declining participation in the 1990s to both transaction costs from program reform and lower overall unemployment. With respect to the literature estimating dynamic models to study public assistance programs and labor supply, we identify the unique features and impacts of the SNAP program, and assume a non-competitive labor market characterized by search frictions. Both features are essential for explaining important empirical findings. Most of this literature also ignores that decisions are jointly taken by spouses at the household level (Swann (2005); Keane and Wolpin (2010); Chan (2013)) while we consider the decisions of spouses jointly searching and participating in the labor market. Low et al. (2022) is a notable exception, not only providing a sophisticated household interaction model but also allowing for endogenous household formation and dissolution. Still, they only consider SNAP coupled with other welfare programs.

To summarize, the main differences in our approach with respect to the exist-

[8]For an early influential contribution, see Keane and Moffitt (1998); for surveys, see Moffitt (2002); Blank (2002); Chan and Moffitt (2018).

ing SNAP literature are the following. First, while most empirical studies exploit cross-sectional variation in program rules or age-based eligibility cutoffs, we ground our analysis in a dynamic behavioral model with rich household-level heterogeneity, including flexible family size—an important feature since approximately 40% of SNAP households include children and benefit allotments are larger with each additional household member. Households frequently transition in and out of the program, and many participants who exit SNAP remain eligible—patterns that are difficult to explain with static models (Gray 2019). Second, unlike studies that attribute incomplete take-up to information frictions, we demonstrate that rational households with perfect information may optimally choose non-participation when facing program costs and uncertain future labor market prospects. For these results, it is crucial to build our model on prior contributions taking into account that labor supply decisions are made at the household level.[9] Our dynamic framework allows households to make optimal choices based on current program eligibility, expected future labor market outcomes, and participation costs. This explains why eligible households may rationally choose not to participate: if an individual expects to find a job that will soon render them ineligible, paying the upfront application cost may not be optimal even with full program information. Third, we provide one of the few contributions that can evaluate policy experiments accounting for households' optimal reactions. We accomplish this by simulating the full model under different policy scenarios, which also allows us to successfully reproduce participation measures important to Congress and State policymakers, including the SNAP entry rate (how many eligible households enter the program) and exit rate (how many participants leave the program), or the replacement and turnover rates (how caseloads change over time).

The remainder of the paper proceeds as follows. Section 2 discusses the relevant institutional details of the SNAP program. Section 3 develops our joint model of household job search and program participation. Section 4 describes the construction of our estimation sample and presents summary statistics. Section 5 outlines our identification and estimation strategy. Section 6 presents parameter estimates and evaluates model fit. Section 7 conducts counterfactual experiments to assess the effects of changing program parameters. Section 8 concludes with a summary and discussion of our findings.

[9] For contributions within the labor market search literature, see Dey and Flinn (2008); Guler et al. (2012); Flabbi and Mabli (2018); for contributions on welfare program and labor supply, see for example Hagstrom (1996); Low et al. (2022); Chan et al. (2024).

2 Institutional Context

This section describes the key features of the SNAP program. We focus particularly on program elements that affect both labor supply and program participation—including work requirements, administrative burdens, and benefit calculations. These institutional features motivate our modeling choices in Section 3 and inform the counterfactual policy experiments we conduct in Section 7.[10]

2.1 Program Background and Eligibility

SNAP is among the largest poverty alleviation programs in the United States. In 2017—the year of our empirical analysis—an average of 42.1 million people (20.8 million households) received SNAP benefits each month, with the program costing the federal government $68 billion a year.[11] Benefits are fully federally funded, while administrative costs are shared with states.

Eligibility for the program is determined at the household level and is based primarily on financial need determined by standards for a household's gross and net monthly incomes, with additional categorical restrictions. Spouses living together, as well as parents and children under the age of 22 who live together, must apply as a single unit. Households without elderly or disabled members must have gross monthly income below 130% of the federal poverty level (FPL) and net income below 100% of the FPL. In 2017, these thresholds were $2,633 and $2,025 per month, respectively, for a family of four. About 81% of participating households had gross income below the poverty line, and 38% below half of the FPL (Cronquist and Lauffer 2019).

Households' net incomes are determined by subtracting deductions permitted under SNAP from their monthly gross incomes. All households are eligible for a standard deduction but additional deductions are applied based on specific household circumstances. For instance, households with earned income receive a deduction equal to 20 percent of total earnings, and those with dependents may deduct out-of-pocket childcare expenses incurred while working, seeking employment, or attending school. Other deductions apply to medical costs, shelter costs, and legally obligated child support payments made to non-household members.[12]

[10]Except where noted, program statistics are drawn from Cronquist and Lauffer (2019). We use the 2017 fiscal year program structure because our analysis sample is drawn from this time period.

[11]As we explain in Section 4, we focus on 2017 to avoid impacts from the COVID pandemic. More recent data confirm the size and importance of the program: In 2024, an average of 41.7 million people (22.6 million households) received SNAP benefits each month, with the program costing the federal government $100 billion.

[12]Shelter costs include rent, mortgage payments, and utility bills. A comprehensive overview of

In our model, we capture these institutional features by introducing a detailed eligibility and benefit function that includes both standard and household-specific deductions.

2.2 Application and Recertification Process

Households must formally apply for SNAP and undergo a certification process to determine eligibility. Applications require documentation of household composition; income (earned and unearned); employment status; expenses such as rent, utilities, childcare, and medical; and assets, with approval and benefit provision typically required within 30 days.[13] Once approved, participants must periodically recertify their eligibility, generally every 12 months.

The initial SNAP application and recertification processes share many similarities but differ in purpose and required documentation. At application, households generally complete the same application form and provide supporting documents including driver's licenses, pay stubs, benefit letters, housing and utility bills, Social Security cards, and proof of child care, medical, and other types of expenses. Additionally, most applicants must complete an interview with a caseworker by phone or in-person. The recertification paperwork and procedures tend to vary more across SNAP households depending on their characteristics and on whether their circumstances changed since application. Completing the recertification form generally takes less time and the required documentation is less than the initial application. The recertification interview may be waived or streamlined as well. These administrative processes introduce participation costs, which may partly explain the well-known incomplete take-up of the program. Indeed, previous studies suggest that even small barriers, such as documentation requirements and recertification frequency, can significantly reduce participation (Mabli 2015; Deshpande and Li 2019; Finkelstein and Notowidigdo 2019; Homonoff and Somerville 2021; Giannella et al. 2024).

In our model, we capture these institutional features by incorporating both a one-time program administration cost for initial application and a flow utility cost for remaining on SNAP, reflecting the ongoing burden of program compliance and recertification.

SNAP eligibility criteria and income deductions is provided by Monkovic and Ward (2025).

[13] Or within seven days for expedited cases of extreme need.

2.3 Benefit Calculation and Labor Supply Incentives

SNAP benefits are delivered monthly via Electronic Benefits Transfer (EBT) cards, which function like debit cards for food purchases at authorized retailers. The SNAP *maximum monthly allotment* is a monetary benefit intended to provide participating households an amount that, together with their own resources, allows them to have access to a healthy diet. For example, in 2017, the maximum monthly benefit for a family of four was $649. SNAP benefit allotments increase with household size and decrease as household income increases. The benefit formula assumes households will spend 30% of their net income on food, with benefits reduced by 30 cents for each additional dollar of net income. This benefit structure creates a complex set of work incentives. While the program includes an earned income deduction to partially offset the benefit reduction rate, the implicit marginal tax rate on earnings can still discourage additional work effort, particularly among households near the eligibility threshold.[14]

Our model is designed to fully account for these work incentives and labor supply interactions by allowing both program participation decisions and labor supply decision to be determined jointly and endogenously. In the empirical application, we use the 2017 maximum benefit levels with a 30% benefit reduction rate, applying a standard deduction based on household size calculated using the means from the SNAP quality control data. Additional deductible expenses are modeled as unobserved household heterogeneity, allowing us to capture the substantial variation in benefit levels observed in the data.

2.4 Work-promoting policies and work requirements

SNAP includes a tiered set of work-related requirements designed to promote employment among recipients. These work requirements fall into three categories: general work requirements for work registrants, stricter rules for Able-Bodied Adults Without Dependents (ABAWDs), and participation mandates associated with the SNAP Employment and Training (E&T) program. The requirements include: accepting suitable work, not voluntarily leaving employment without good cause, and participating in employment services if required.

As such, these requirements seem a crucial feature to incorporate into a model of the interaction between program participation and the labor market. However,

[14] The guidance document reporting maximum monthly allotments as a function of household size is available here.

many SNAP recipients are exempt from them due to age, caregiving responsibilities, disability, or employment. In addition, nearly half of counties received waivers during the years of our analysis and many ABAWDs satisfy their work requirements through participation in SNAP E&T activities. Due to these features, and the relative low number of ABAWDs in our sample, we have decided to not separately model these requirements but to consider them part of the bundle of participation and certification costs pertaining to the program.[15]

3 Model

The structure of SNAP creates complex incentives that affect both participation and labor supply decisions. Income eligibility limits, recertification processes, and benefit phase-outs all shape household decision-making in ways that simple static models may not fully capture. We develop a dynamic model of household labor supply and SNAP participation that explicitly incorporates these features to analyze their effects on labor force participation and program participation, and to evaluate potential policy reforms. In Section 5, we also show that such a unified framework can be identified and estimated on US nationally-representative, longitudinal data. In Section 6, we present the estimation results. While the empirical specification used for estimation closely follows the theoretical model presented in this section, it allows for greater heterogeneity in selected parameters. The objective of this section is to highlight the core economic mechanisms of the model while minimizing notation and abstracting from non-essential sources of parameter heterogeneity.

The first feature of our model is to allow for search frictions in the labor market. Search frictions are one of the most popular ways to model labor market dynamics since they tractably formalize the many non-competitive characteristics affecting the market and provide a foundation for the presence of equilibrium unemployment.[16] Frictions and dynamic considerations affect SNAP participation through two channels. First, an unemployed agent may not accept the first job offer she receives because she realizes that she may find a better job by searching a little longer. The lack of sufficient

[15]In principle, ABAWDs are also subject to a time-limited benefit rule. Unless they meet specific work requirements, they should only receive SNAP for three months in a 36-month period. However, a mix of SNAP E&T programs, difficulty of enforcement involving retrospective reviews of compliance, and waivers related to economics conditions reduces time-limited benefit loss to a negligible proportion.

[16]For a review of empirical contributions, see Eckstein and Van den Berg (2007); for a more theoretically oriented review, see Rogerson et al. (2005). Search models of the labor market are also used for a variety of policy evaluations, for example those related to the minimum wage (Flinn 2006), payroll taxation (Bobba et al. 2022), health insurance (Dey and Flinn 2005), affirmative action (Flabbi 2010), and labor law enforcement (Meghir et al. 2015).

income while searching may make an active agent eligible for SNAP. Second, an agent who is eligible for SNAP but expects to find a job soon that would substantially reduce benefits or eliminate eligibility altogether may rationally choose not to incur the cost of applying. This inherently dynamic consideration may help to explain the less-than-full take-up rate observed in the data.

The second feature is to recognize that both labor supply decisions and SNAP participation decisions are are taken at the household level.[17] To this end, we model households comprised of couples where both members can simultaneously search in the labor market and can influence each other's labor market choices.[18] In addition, we carefully specify program eligibility and benefit determination as a function of both spouses' labor market states and choices.

The third feature is to provide, in a stylized manner, a very rich treatment of the complex institutional features related to SNAP. We allow benefits and eligibility to depend not only on labor market states and income but also on the presence and number of dependents. We model the deductions used to compute SNAP benefits by including not only standard program rules but also unobserved (to the econometrician) components that capture the large benefit heterogeneity observed in the data borne from detailed deduction policies. Finally, we model program participation costs by introducing not only an explicit one-time cost paid to *apply* to the program (capturing take-up cost or certification costs) but also the flow cost that needs to be paid to *remain* on the program (capturing participation or recertification costs).[19] As discussed in Section 2.2, participants face both costs and it is important to differentiate between them since they produce different impacts on labor market choices.

3.1 Environment

We model a stationary environment in continuous time. Households are composed of two infinitely-lived agents who pool income and maximize a common utility function, consistent with a unitary model. Agents discount the future at rate ρ and belong to

[17]The importance of household-level decisions for labor supply is one of the foundations of household economics, going back at least to the influential 1981 *Treatise* by Gary Becker (Becker 1981). Within the labor market search literature, household-level decisions are rarely modeled, but a number of contributions now exist that do so. See for example García-Pérez and Rendon (2020); Flabbi and Mabli (2018); Dey and Flinn (2008) for estimated models, and Guler et al. (2012) for a methodological discussion.

[18]The simpler case, where households are composed of only one member, can be nested as a special case of our household search model.

[19]For evidence on take-up costs, see Deshpande and Li (2019); Finkelstein and Notowidigdo (2019); for evidence on participation costs, see Homonoff and Somerville (2021); Giannella et al. (2024).

one of two individual types, which we refer to as *husbands* and *wives*.[20] Individuals of the same type share the same structural parameters, which may differ across types. The specific type-dependent parameters are described in the empirical specification of the model (Section 5); to simplify notation, we abstract from this heterogeneity in the present section.[21]

Households also include k children, where $k \in \{0, 1, 2, ..., K\}$. While children are considered members of the household, they do not participate as decision-making agents, though their presence affects the household's utility. Households may experience changes in the number of children due to stochastic shocks. A "positive" shock increases the number of children by one, while a "negative" shock decreases the number of children by one. These shocks occur at Poisson rates π_0 and π_1, respectively.[22]

Each agent in the household can occupy one of three labor market states: employment, unemployment, and out of the labor force. These states are defined as follows:

- **Employment**: When agents are employed, they receive an hourly wage w and must work the h hours specified by their labor contract. They receive job offers at Poisson rate λ_e, and their job may be terminated at Poisson rate η. Offers are extracted from distributions denoted by the cumulative distribution function (cdf) $F(w, h)$. We denote an agent in this state with the indicator $d_e = 1$.

- **Unemployment**: When agents are unemployed, they receive an hourly income transfer t_u and allocate a proportion s of their time to job search. This search effort results in job offers arriving at Poisson rate λ_u. As in the previous state, offers are extracted from distributions denoted by $F(w, h)$. The time investment necessary to achieve this offer rate is specific to each agent and follows the cdf $R(s)$, with $s \in (0, 1)$. An agent in this state is denoted by the indicator $d_u = 1$.

[20]The terminology *husbands* and *wives* may refer to actual husbands and wives but may apply more generally. The key features of the model are that spouses are in a sufficiently stable relationship to share resources, that SNAP eligibility and benefit levels are determined at the household level, and that the two types capture systematic differences between men and women in labor market behavior. In our estimation sample, households include both married and cohabiting couples.

[21]The justification for gender-specific structural parameters in the empirical application is straightforward: gender differentials in the labor market are widespread and persistent, and gender-specific parameters allow us to estimate their sources.

[22]While fertility decisions are clearly endogenous, modeling and identifying endogenous fertility processes is notoriously challenging and requires a longer time horizon than is available in our data. It is also not the focus of our work. Accordingly, we assume a simple exogenous fertility process. For an example of work that successfully identifies an endogenous fertility process, see Rasul (2008); for a review of recent developments, see Doepke et al. (2023).

- **Out of the Labor Force**: When agents are out of the labor force, they receive an hourly income transfer t_o and do not receive job offers. They are only affected by fertility shocks. This state is indicated by $d_o = 1$.

SNAP benefits are provided to households that decide to participate in the program (an endogenous decision) *and* are eligible to receive benefits (a means-tested policy feature not directly affected by household decisions). We denote the amount of SNAP benefits received by $b = b(k, I, I', d)$, making explicit the dependence on the number of children in the household (k), the labor incomes of the husband and wife (I and I'), and the deductions allowed by the policy (d). Specifically, the SNAP benefit function is defined as:

$$b = \max\{0, [B(k) - 0.3(I + I' - d)]\} \tag{3.1}$$

$$d = f_d(k, I, I') + \epsilon \tag{3.2}$$

where $B(k)$ is the *maximum monthly allotment* set by the program, 0.3 is the fixed coefficient for benefit reduction as a function of household income,[23] and d is the household-specific deduction allowed by the program. All three of these components and their structure are modeled exactly as mandated by the SNAP program. But the actual amount of the deduction d is too complex and heterogeneous to be fully characterized in a stylized model. Therefore, we simplify its definition as shown in equation (3.2). The deduction is mainly a function of the number of children and of household income: this is the observable component $f_d(k, I, I')$ that we define following program rules.[24] But the deduction also includes additional household-specific components such as shelter costs exceeding some thresholds or benefits for elderly or disabled members, as discussed in Section 2.3. We capture this heterogeneity by adding an unobserved component to the deduction function, denoted by ϵ and distributed in the population following the cdf $Q(\epsilon)$ with $\epsilon > 0$. The component ϵ is fully observed by the household but not by the econometrician. It is time-invariant and household-specific.

To receive benefits, households face two costs: a one-time cost paid to apply to the program (take-up cost or certification cost), which we denote with O; and a flow cost that needs to be paid to remain in the program (participation cost or recertification

[23] As discussed in Section 2.3, the benefit formula assumes households will spend 30% of their net income on food, resulting in benefits reduced by 30 cents for each dollar of net income. This formula also automatically imposes the eligibility requirements (the *Income Eligibility Standards*) because any household with income above the eligibility threshold receive zero b.

[24] See the empirical specification in equation (5.1)).

cost), which we denote with ξ. As discussed in Section 2.2, these costs include the administrative burden of participating in the program, sometimes defined as "sludge" that discourages participation instead of "nudging" it. But these costs may also be of a different nature, such as the stigma or psychological costs associated with receiving social assistance. Given the variety of costs involved, we introduce them in the model in the most general way possible, as utility costs. Another important characteristic of these costs is that they may be heterogeneous in the population, as a result of different household composition, specific administrative requirements, and different individual preferences with respect to sludge. While it would be desirable to allow both costs to be fully heterogeneous in the population, we are faced with the constraint that neither one is observable. We have therefore decided to allow for heterogeneity only in the cost that is more likely to vary in the population due to variation in administrative requirements: the participation cost (or recertification cost).[25] Our final parameterization is as follows: the one-time, take-up cost O is assumed to be homogeneous in the population; while the flow, participation cost ξ is assumed to be heterogeneous in the population and distributed according to the cdf $G(\xi)$, with $\xi > 0$. Both costs are assumed to be time-invariant. We denote households that have applied for SNAP benefits with the indicator $a = 1$. Households receive SNAP benefits if they apply ($a = 1$) and are entitled to a positive benefit ($b > 0$).

Within this environment, households make dynamic decisions regarding labor supply, job search, and SNAP participation to maximize the objective function:

$$E_0 \int_0^\infty e^{-\rho t}[u(c, l, l', \xi)]dt \tag{3.3}$$

where c represents consumption, and l and l' represent leisure for the wife and husband, respectively. The flow utility function and its constraints are specified as follows:

$$u(c, l, l', \xi) \quad = \quad (1 - 2\alpha_k) \ln c + \alpha_k \ln l + \alpha_k \ln l' - a\mathbb{1}_{\{b>0\}}\xi \tag{3.4}$$

where:

$$\begin{aligned} c &= I + I' + ab \\ I &= d_e wh + d_u t_u + d_o t_o \\ l &= 1 - h - s. \end{aligned}$$

[25]See for example Gray (2019) on the importance and heterogeneity of the administrative costs faced to remain in the program.

The model could be solved under a more general utility function than the one specified in (3.4), however we prefer to anticipate the specific utility function we will use in the empirical application. Identification issues lead us to use a log specification characterized only by the parameters weighting the public good component (consumption) and the private goods component (leisure). Since child care needs may affect the value of non-working time, we allow the weight on leisure to depend on the presence and number of children k. The flow cost of participating in SNAP (ξ) is separable and common to the household. Assuming that the household is risk averse is common and is consistent with empirical evidence[26] but it has important implications. As previous literature has shown,[27] if the household were risk neutral, then the influence of the labor market state of one spouse on the labor market decisions of the other spouse would be greatly reduced.

3.2 Value functions

The value functions can be written in recursive form. They are defined over the labor market state of each spouse, the household SNAP participation status, the presence and number of children k, the search costs for both spouses s, s', the sludge flow cost ξ, and the deduction component ϵ. Table 3.1 summarizes the notation used to define the household value functions over the spouses' labor market states.

Table 3.1: Value Functions' Notation.

		Wife		
		Out of LF	Unemployed	Employed
	Out of LF	$Z[k,a]$	$R[s,k,a]$	$Q[w,h,k,a]$
Husband	Unemployed	$R[s',k,a]$	$U[s,s',k,a]$	$T[w,h,s',k,a]$
	Employed	$Q[w',h',k,a]$	$T[w',h',s,k,a]$	$V[w,h,w',h',k,a]$

NOTE: Each value function is defined conditioning on ξ (sludge), and ϵ (deduction). We drop the conditioning on them to ease notation.

The arguments of the value functions always include the number of children k and the SNAP status a. In addition, they include the variables that are relevant for the specific labor market state under consideration. For example, V is a function of

[26]Within the household search literature, García-Pérez and Rendon (2020); Guler et al. (2012); Dey and Flinn (2008) all reject linearity. Flabbi and Mabli (2018) estimate a value of the parameter of their CRRA utility function quite close to the one corresponding to a log specification.

[27]Dey and Flinn (2008) are the first to make this point in the context of an estimated household search model; Guler et al. (2012) provides the most complete discussion of the issue and a set of general proofs.

$\{wh, w'h'\}$ because in this state both spouses are working at a specific combination of wages and hours. To ease notation, we do not explicitly write the conditioning on the time-invariant household-specific components ξ and ϵ. To ease the discussion, we present in the main text of the paper only a selection of the value functions listed in Table 3.1, relegating the rest to Appendix C.

We first analyze the simplest case possible, a household that does not participate in SNAP ($a = 0$), where neither spouse participates in the labor market (value function denoted by Z), and where no children are present ($k = 0$):

$$\begin{aligned}(\rho + \pi_1) Z[0,0] &= (1 - 2\alpha_k) \ln(2t_0) \\ &+ \pi_1 \max \left\{ \begin{array}{c} Z[1,0], R[s,1,0], R[s',1,0], U[s,s',1,0], \\ Z[1,1] - O, R[s,1,1] - O, \\ R[s',1,1] - O, U[s,s',1,1] - O \end{array} \right\}\end{aligned} \tag{3.5}$$

This household receives as the flow value of consumption only the income transfer t_0, enjoys full leisure ($l = 1, \ln l = 0$) and neither receives any SNAP benefit ($b = 0$) nor sustains any program utility cost ($\xi = 0$). The only shock that the household can receive is a positive child shock, whereby a child joins the household. Following such a shock, agents make two joint decisions, as reflected in the continuation-value maximization problem. First, they revisit their labor supply decisions. Either agent may choose to supply labor, transiting to the U or R states. This change may occur because the presence of a child changes the value of leisure relative to consumption.[28] Second, they revisit their SNAP participation decision. The presence of a child may make the household eligible or may increase the SNAP benefit enough to make participation optimal. In making this choice, households account for the fixed application cost O. Finally, because labor supply and SNAP participation decisions are made jointly, agents may adjust both margins simultaneously. For example, they may move from a state of no participation and no SNAP ($Z[1,0]$) to a state of participation in both the labor market and SNAP ($U[s,s',1,1]$).

We now analyze a more complex case in order to further clarify the interaction between labor market decisions and SNAP participation decisions. We consider a household that receives SNAP benefits ($a = 1, b > 0$), where both spouses are looking

[28] Recall from equation (3.4) that the relative weights α depend on the number of children k.

for a job (value function denoted by U), and where some children are present ($k > 0$):

$$
\begin{aligned}
(\rho + \pi_0 + \pi_1 + 2\lambda_u) U[s, s', k, 1] = (1 - 2\alpha_k)\ln(2t_u + b) + \alpha_k \ln(1 - s) \\
+ \alpha_k \ln(1 - s') - \xi \\
+ \pi_0 \max\{U[s, s', k-1, a], Z[k-1, a], R[s', k-1, a], R[s, k-1, a]\}_{a \in \{0,1\}} \\
+ \pi_1 \max\{U[s, s', k+1, a], Z[k+1, a], R[s', k+1, a], R[s, k+1, a]\}_{a \in \{0,1\}} \\
+ \lambda_u \int \max\left\{U[s, s', k, 1], \{Q[w, h, k, a], T[w, h, s', k, a]\}_{a \in \{0,1\}}\right\} dF(w, h) \\
+ \lambda_u \int \max\left\{U[s, s', k, 1], \{Q[w', h', k, a], T[w', h', s, k, a]\}_{a \in \{0,1\}}\right\} dF(w', h')
\end{aligned}
\tag{3.6}
$$

In this state, the household's flow value of consumption consists of the income transfer t_u received by each spouse and the SNAP benefit b. The household enjoys the amount of leisure remaining after time devoted to job search ($l = 1 - 1, l' = 1 - s'$), and incurs the utility cost ξ associated with continued participation in SNAP. As before, the household may receive a fertility shock π_1; however, because children are already present, it may also receive a shock π_0 that reduces the number of children. Both shocks can affect labor market states, potentially inducing one or both spouses to quit searching. As denoted by the index a, these shocks may also trigger exit from SNAP, either because eligibility requirements are no longer satisfied or because the household decides the benefits are not worth the costs of continued participation. In addition to child-related shocks, each spouse may receive job offers while searching. When a spouse receives an offer, the household decides whether the offer should be accepted. As shown in the literature,[29] if one spouse accepts the offer, the other spouse may also decide to change their labor market state as a result. Suppose the first spouse receives an acceptable offer, then the other spouse may decide to continue searching, leading to a transition from the $U[s, s', k, 1]$ to $T[w, h, s', k, 1]$. But, given the increase in family income, the other spouse may also decide to quit searching and leave the labor force, leading to a transition from $U[s, s', k, 1]$ to $Q[w', h', k, 1]$. Differing from previous literature, if one spouse accepts an offer, the SNAP benefits and requirements are also affected, leading to a possible exit from the program. Agents fully anticipate this possibility, which is why the decision incorporates states without SNAP participation—$Q[w, h, k, 0]$ and $T[w, h, s', k, 0]$—into the choice set.

Another informative case about the interaction between labor market decisions and SNAP participation is that of a household were both spouses are working (value

[29]See for example, Dey and Flinn (2008); Guler et al. (2012); Flabbi and Mabli (2018).

function denoted by V). Assume this household has no children ($k = 0$) but participates in the SNAP program ($a = 1, b > 0$).

$$
\begin{aligned}
(\rho + \pi_1 + 2\lambda_e + 2\eta)V[w,h,w',h',0,0] &= (1-2\alpha_k)\ln(wh + w'h' + b) \qquad (3.7)\\
&\quad +\alpha_k \ln(1-h) + \alpha_k \ln(1-h') - \xi \\
+\pi_1 \max &\left\{ \begin{array}{c} V[w,h,w',h',1,a], T[w,h,s',k,a], T[w',h',s,k,a], \\ U[s,s',k,a], Q[w,h,k,a], Q[w',h',k,a], \\ R[s,k,a], R[s',k,a], Z[k,a] \end{array} \right\}_{a\in\{0,1\}} \\
+\lambda_e \int \max &\left\{ \begin{array}{c} V[w,h,w',h',0,0], \\ \left\{ V[\tilde{w},\tilde{h},w',h',0,a], T[\tilde{w},\tilde{h},s,0,a], Q[\tilde{w},\tilde{h},0,a] \right\}_{a\in\{0,1\}} \end{array} \right\} dF(\tilde{w},\tilde{h}) \\
+\lambda_e \int \max &\left\{ \begin{array}{c} V[w,h,w',h',0,0], \\ \left\{ V[w,h,\tilde{w},\tilde{h},0,a], T[\tilde{w},\tilde{h},s',0,a], Q[\tilde{w},\tilde{h},0,a] \right\}_{a\in\{0,1\}} \end{array} \right\} dF(\tilde{w},\tilde{h}) \\
+\eta &\left\{ \begin{array}{c} T[w',h',s,0,a], Q[w',h',0,a], U[s,s',k,a], \\ R[s,k,a], R[s',k,a], Z[k,a] \end{array} \right\}_{a\in\{0,1\}} dF(\tilde{w},\tilde{h}) \\
+\eta &\left\{ \begin{array}{c} T[w,h,s',0,a], Q[w,h,0,a], U[s,s',k,a], \\ R[s,k,a], R[s',k,a], Z[k,a] \end{array} \right\}_{a\in\{0,1\}} dF(\tilde{w},\tilde{h})
\end{aligned}
$$

This household's flow value of consumption consists of labor income—given by the product of hourly wages (w, w') and hours worked (h, h')—augmented by the SNAP benefit b. The household enjoys the leisure remaining after work ($l = 1-h, l' = 1-h'$), and incurs the utility cost ξ associated with continued SNAP participation. As before, the household may experience a fertility shock π_1 (but not π_0 since no children are present). The fertility shock has potentially wide-ranging implications for labor market behavior: either spouse may choose to leave their current job to search for a better one or to exit the labor market altogether. These decisions, together with the presence of children, may in turn affect the household's decision to remain on SNAP. Consequently, when a fertility shock occurs, the household's choice set includes all eighteen possible labor market states listed in Table 3.1.[30]

In addition to fertility-related shocks, each spouse may receive job offers while employed. As discussed above, acceptance of an offer by one spouse may induce the other spouse to remain employed, quit their job and search, or exit the labor force. Any such change in labor market status may lead to exit from SNAP, either

[30]Table 3.1 includes nine states which expand to eighteen once SNAP participation is taken into account. In enumerating these states, we hold the number of children fixed and assume that the household actually qualifies for some SNAP benefits in the pre-shock state.

endogenously—if the household determines that the benefit b does not justify the utility cost ξ—or exogenously, if the new labor market state renders the household ineligible for benefits.

Finally, each spouse may receive a shock terminating their current job. Upon termination, the affected spouse must leave their job but may choose either to resume searching or to exit the labor force. Exiting the labor force is an option because, at the time the job was originally accepted, the other spouse may not have been at their current job. Moreover, job loss by one spouse may induce the other spouse to endogenously leave their job as well. The intuition mirrors the previous case: when the husband had originally accepted the current job, the wife could have been in a different state than the one she found herself in as a result of the termination shock.[31]

Thus far, we have discussed three of the classes of value function characterizing the model. The remaining three, $R[s,k,a], Q[w,h,k,a], T[w,h,s',k,a]$, are derived analogously and are presented in Appendix C.

3.3 Optimal Decision Rules

An important motivation for our model is the recognition that labor supply and SNAP participation decisions are jointly determined at the household level. The discussion of optimal decision rules below clarifies the mechanisms through which these interactions operate.

Conditional on a given household labor market state, households face two distinct SNAP-related decisions. The first concerns *entering* the program and involves paying the fixed application cost O in exchange for the flow monetary benefit b, net of the flow utility cost ξ. The second concerns *remaining* on the program, and entails paying the flow cost ξ in order to continue receiving the benefit b.

To illustrate the entry decision, consider a household that is *not* participating in SNAP in a state where both spouses are unemployed searchers and the number of children is k, denoted $U[s,s',k,0]$. A first step involves comparing the household's current utility with the utility of entering the program, $U[s,s',k,1]$, taking into account the fixed take-up cost O. If $U[s,s',k,1] - O > U[s,s',k,0]$, the household will participate in SNAP. However, the new benefit b, moderated by the sludge cost

[31]Although it may appear counterintuitive that one spouse may leave their current job following the other's job loss, this outcome is possible because the effect of one spouse's wage on the other's reservation wage is theoretically ambiguous. Under risk aversion, the higher wage of one spouse has two opposite effects on the reservation wage of the other spouse: It may increase it because it supports consumption during search, but it may also lower it by reducing the expected gains of searching for a higher wage. See Flabbi and Mabli (2018); Dey and Flinn (2008) for a more detailed discussion.

ξ—all part of the value function $U[s, s', k, 1]$ as shown in equation (3.6)—may alter labor supply incentives, potentially inducing one or both spouses to cease job search and exit the labor force. The household, then, needs to solve:

$$\max \{U[s, s', k, 0], U[s, s', k, 1] - O, R[s, k, 1] - O, R[s', k, 1] - O, Z[k, 1] - O\} \quad (3.8)$$

The household evaluates the current state—both spouses unemployed not participating in SNAP—against the prospect of receiving SNAP benefits. Importantly, entry into SNAP simultaneously induces the household to re-optimize labor supply choices, illustrating that SNAP participation *and* labor supply are jointly determined decisions at the household level.

To describe the decision to remain on the program, consider a household participating in SNAP in which the wife is employed at a job characterized by $\{w, h\}$, the husband is an unemployed searcher, and the number of children is k; this state is denoted by $T[w, h, s', k, 1]$. If the husband receives a job offer $\{\tilde{w}, \tilde{h}\}$, the household then jointly evaluates whether to accept the offer and whether to continue participating in SNAP. If accepting the offer and remaining on SNAP yields higher value—that is, if $V[w, h, \tilde{w}, \tilde{h}, k, 1] > T[w, h, s', k, 1]$—the household the offer and stays on the program.

Alternatively, it may be optimal to accept the offer while exiting SNAP. For example, if $V[w, h, \tilde{w}, \tilde{h}, k, 0] > V[w, h, \tilde{w}, \tilde{h}, k, 1] > T[w, h, s', k, 1]$, the additional income from the husband reduces SNAP benefits sufficiently that they no longer outweigh the utility cost ξ. In this case, the household accepts the job offer but chooses to leave SNAP, leading to an *endogenous* exit from the program. A similar transition may occur for *exogenous* reasons if the husband's earnings are high enough to make the household ineligible for SNAP altogether. In both cases, the household transitions from $T[w, h, s', k, 1]$ to $V[w, h, \tilde{w}, \tilde{h}, k, 0]$, underscoring once again that SNAP participation status is jointly determined with labor market decisions. The full maximization problem faced by the household is given by:

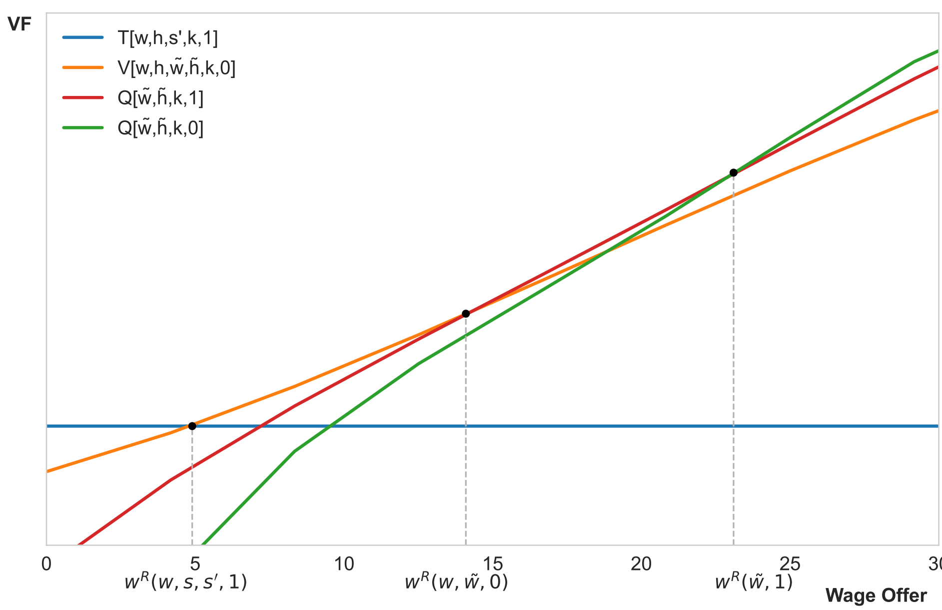
$$\max \left\{ \begin{array}{c} T[w, h, s', k, 1], \\ \left\{V[w, h, \tilde{w}, \tilde{h}, k, a], T[\tilde{w}, \tilde{h}, s, k, a], Q[\tilde{w}, \tilde{h}, k, a]\right\}_{a \in \{0,1\}} \end{array} \right\} \quad (3.9)$$

where the first row represents the status quo, and the second row enumerates all the possible labor market states to which the household may transition if the husband accepts the job offer. Each potential transition explicitly accounts for the possibility of a change in SNAP participation status.

Conditional on a given SNAP participation status, the household's optimal labor supply and decisions to accept or remain in a given job are similar to those studied in the household search literature.[32]

Because the value of states in which spouses are employed is increasing in wages, it is even possible to characterize optimal behavior using standard reservation values and gain some intuition about optimal decision rules by looking at the graphical representation of relevant value functions.

Figure 3.1: Value Functions as functions of Husband's Wage Offers



NOTE The specific arguments of the value functions reported in the figure are: wife's wage $w = 16.67$; wife's hours: part-time $h = 0.3$; three children $k = 3$; low search values $s = 0.3, s' = 0.3$; low SNAP participation cost $\xi = 0.018$; medium deduction $\epsilon = 1.386$. All the other parameters are set at the estimated values reported in Section 6.

Figure 3.1 provides a useful illustration of these mechanisms. We consider a household initially in state $T[w, h, s', k, 1]$: the wife is working at a job $\{w, h\}$, the

[32]A key result in this literature is that optimal decision rules depend critically on the utility function assumptions. In models with risk-neutral agents, individual and household search models yield identical reservation values and decision rules (Dey and Flinn 2008; Guler et al. 2012). When agents are risk averse or when additional factors, such as health insurance (Dey and Flinn 2008) or savings (García-Pérez and Rendon 2020), enter the decision problem, household search generates different optimal rules. In particular, one spouse's decisions depend on the labor market state of the other spouse (Flabbi and Mabli 2018). This is the case in our model due to risk aversion (see equation (3.4)) and the presence of jointly determined SNAP benefits.

husband is searching for work and devotes a fraction s' of his time to search, the household has k children, and it is currently participating in SNAP ($a = 1$). The vertical axis reports the value of the corresponding value function while the horizontal axis reports wage offers $\tilde{w}$ received by the husband.[33] All value functions V and Q are increasing in the husband's wage because they denote states where the husband is working and therefore receives a specific wage. By contrast, the value of the initial state T is constant because it denotes a state where the husband is searching and not yet attached to a specific wage. As a result, the value functions V and Q intersect the value function T, generating indifference points and reservation values.

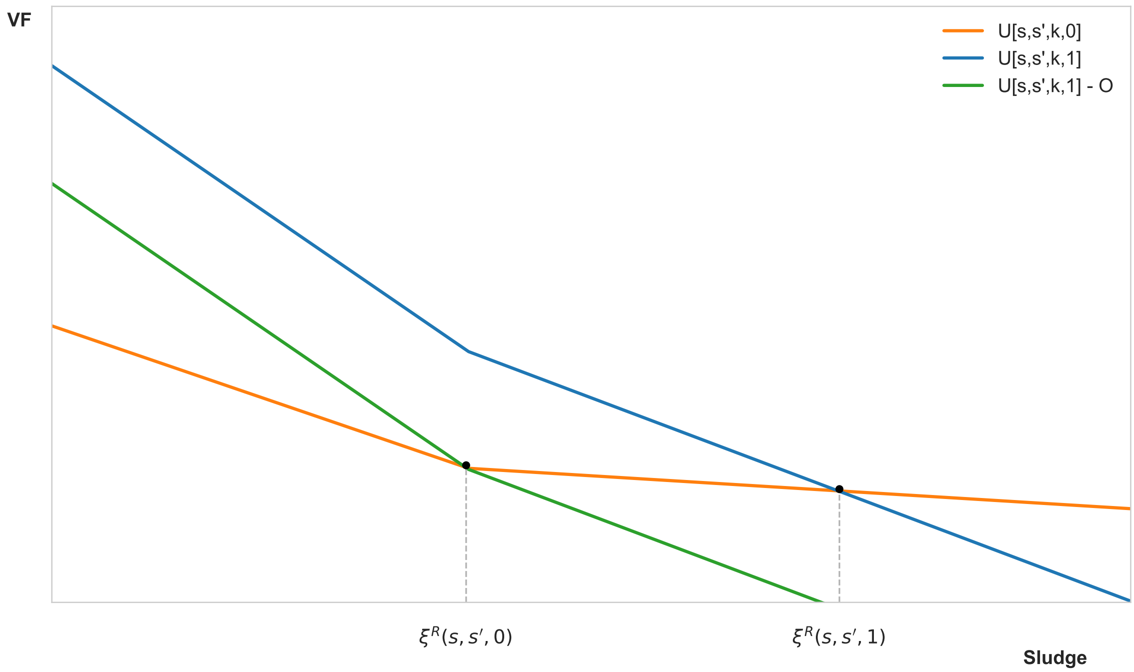
The first relevant threshold is $w^R(w, s, s', 1)$, defined as the wage offer at which the household is indifferent between remaining in the current state and transitioning to a state in which the husband works and the wife continues to work at her current job. For any wage offer to the husband such that $\tilde{w} > w^R(w, s, s', 1)$, the household strictly prefers to abandon the current state—this is a standard result in household search models. What is novel in our context is that, for wages higher than $w^R(w, s, s', 1)$ but lower than $w^R(w, \tilde{w}, 0)$, the household optimally exits SNAP upon accepting the job. For wage offers just above the reservation value $w^R(w, s, s', 1)$, this exit is endogenous: although the household could continue receiving SNAP benefits, the associated participation cost ξ is high enough to induce them to exit the program. For higher wage offers approaching $w^R(w, \tilde{w}, 0)$, exit becomes exogenous, as the increase in household income eliminates eligibility altogether.[34]

This example illustrates that changes in the husband's labor market status implies a change in SNAP participation. Importantly, SNAP participation is non-monotonic in the husband's accepted wage. For wage offers between $w^R(w, \tilde{w}, 0)$ and $w^R(w, \tilde{w}, 1)$, the husband accepts the job while the wife endogenously exits employment and leaves the labor force. As a result of this change, the household continues to qualify for SNAP and remains on the program. However, for sufficiently high wage offers—above $w^R(\tilde{w}, 1)$—the husband accepts the job, the wife quits her job, and the household nonetheless becomes ineligible for SNAP due to high income.

[33]To simplify the discussion, we report only the case where the job offers to the husband require full-time work.

[34]This distinction could be shown formally by plotting the value function $V[w, h, \tilde{w}, \tilde{h}, k, 1]$, which we omit avoid cluttering the figure.

Figure 3.2: Value Functions as functions of the Flow Cost of Participating in SNAP



NOTE The specific arguments of the value functions reported in the figure are: two children $k = 2$; low search values $s = 0.3, s' = 0.3$; medium SNAP participation cost $\xi = 0.069$; medium deduction $\epsilon = 1.386$. All the other parameters are set at the estimated values reported in Section 6.

These results depend critically on whether the household was *already* on SNAP, that is, on being in a state in which the fixed cost O has already been paid. If the household were initially off SNAP, optimal decision rules would differ. Figure 3.2 illustrates this point by plotting the value functions as a function of the flow participation cost ξ. To simplify the discussion, consider a starting state in which both spouses are searching. The vertical axis again reports the value of the corresponding value function, while the horizontal axis now represents ξ, which is heterogeneous across households. The figure displays three value functions: the value of not participating in SNAP ($U[s, s', k, 0]$), the value of participating ($U[s, s', k, 1]$), and the net value of entering SNAP after paying the fixed cost $U[s, s', k, 1] - O$.

All three values are monotone decreasing in ξ since it is a net cost, but the SNAP participation values ($a = 1$) decline more steeply, reflecting their greater sensitivity to participation costs ξ. These differences in slopes generate reservation values in ξ. Consider a household initially off SNAP where the husband is working and the wife is searching. Assume that the husband loses his job and the household moves to a state where they are both searching. If the participation cost is sufficiently low ($\xi < \xi^R(s, s', 0)$), the household enters SNAP despite the fixed cost O. If ξ exceeds this threshold ($\xi^R(s, s', 0) < \xi$), the household does *not* enter the program. Notably, households with intermediate participation costs ($\xi^R(s, s', 0) < \xi < \xi^R(s, s', 1)$) would remain on SNAP if they had been enrolled prior to the job loss. Thus, observationally identical households (those with the same labor market state and number of children) may differ in SNAP participation solely due to differences in *prior* labor market state and program participation histories. This mechanism highlights the strongly dynamic nature of joint labor market and SNAP participation decisions.

In summary, the optimal decision rules in the model reveal several key mechanisms. First, labor market and SNAP participation decisions are jointly determined, as SNAP affects the returns to work through benefits and costs, while labor market outcomes shape eligibility and benefit levels. Second, households account for both current benefits and option values when deciding whether to participate in SNAP. Third, fixed application costs generate state dependence in participation. Fourth, the link between the labor market and SNAP is magnified when two members of the household are current or potential labor market searchers. Together, these mechanisms help explain observed patterns of incomplete take-up and transitions into and out of SNAP in both our data and the broader empirical literature.

3.4 Equilibrium

We focus exclusively on the steady state equilibrium of the model. This equilibrium incorporates all optimal decision rules over labor force participation, job acceptance, and SNAP participation across household types and states. Because these decisions are dynamic, households transition across all possible labor market states, SNAP participation statuses (and associated benefit levels), and numbers of children. Our analysis therefore concentrates on the invariant distributions over these states and variables.

Given that the value functions are defined over multiple continuous variables and that the model features multidimensional household-level heterogeneity, characterizing the equilibrium analytically through reservation values is impractical and uninformative. Instead, we solve for the equilibrium numerically via direct comparisons of value functions. The value functions are obtained by solving the fixed point defined by the Bellman equations (3.5)–(3.7) and (C.1)–(C.3), computed over discrete values of wages and of variables characterizing households' heterogeneity.[35]

Nevertheless, it is useful to provide a formal definition of the steady state equilibrium:

Definition 1. *Given:*

1. *The primitive parameters* $\{\rho, \pi_0, \pi_1, \lambda_e, \eta, t_u, \lambda_u, t_o, O, \alpha_k\}$*;*

2. *The distributions of: wage offers* $F(w, h)$*, search time* $R(s)$*, SNAP flow cost* $G(\xi)$*, deduction's stochastic component* $Q(\epsilon)$*;*

3. *The institutional features: gross benefit function* $B(k)$ *and deduction function* $f_d(k, I, I')$*;*

the ***steady state equilibrium*** *is a set of value functions*

$$\{Z[k, a], R[s, k, a], U[s, s', k, a], Q[w, h, k, a], T[w, h, s', k, a], V[w, h, w', h', k, a]\}$$

that jointly satisfies: the Bellman equations (3.5)–(3.7) *and* (C.1)–(C.3)*; the optimal decision rules described in Section 3.3; the invariant distribution of individuals across labor market states; the invariant distribution of the number of children across households; and the invariant distributions of SNAP participants and SNAP benefits provided.*

4 Data

To estimate the model, we use Wave 1 of the 2018 *Panel of the Survey of Income and Program Participation* (SIPP). The SIPP records monthly measures of employment status, earnings, hours, and SNAP participation for each household member in the sample. The combination of longitudinal labor market information for both spouses and detailed program participation records makes the SIPP uniquely well-suited for estimating our dynamic household search model. Its monthly granularity allows us to capture short-term employment transitions and SNAP participation dynamics, which are critical for modeling household job search and SNAP take-up. Each wave of the SIPP Panel contains retrospective monthly records for the previous calendar year; Wave 1 of the 2018 SIPP covers calendar year 2017.[36] We focus on calendar year 2017

[35] More details on the discretization and the solution method are provided in Section 5 and in Appendix B.

[36] See https://www.census.gov/programs-surveys/sipp/data/datasets/2018-data/2018.html for details and to access the raw data.

because it is the most recent year available not affected by the COVID pandemic. Given the model's emphasis on steady state behavior, estimating it on data influenced by a large aggregate shock would be inappropriate.

4.1 Estimation Sample

From the raw SIPP data, we extract the estimation sample most likely to capture the economic and policy mechanisms central to our analysis. We focus on couples in a relatively stable relationship, who are of prime-age, with relatively low levels of educational attainment. These are the agents most affected by SNAP work requirements and benefit phase-out rules. We exclude self-employed individuals, retirees, and students to ensure that observed employment transitions reflect job search and labor supply decisions rather than self-employment income smoothing, educational enrollment, or retirement-related labor force exits.

Specifically, we keep households with two married or cohabiting adults without college degrees who are between the ages of 18-59. We further require that no adult household member is disabled, on active military duty, currently self-employed, enrolled in school, or retired. We exclude the small number of households with multiple SNAP units and households receiving significant income from other transfer programs.[37] The final estimation sample is a consecutive 12-month panel for 1,965 couples.

4.2 Descriptive Statistics

Tables 4.1 and 4.2 present some relevant descriptive statistics extracted from the estimation sample. The first Table focuses on cross-sectional moments, while the second reports statistics about the dynamics of individuals over time.

[37]For a detailed description of the estimation sample construction, see Appendix B.

Table 4.1: Descriptive Statistics by Household Labor Market State: Cross-Sectional Moments

Household	**HH**	**SNAP**		**Children**		**Husband Employed**			**Wife Employed**		
State	**Share**	**Share in Program**	**Mean Benefit**	**Share with**	**Mean Number**	**Full-Time Share**	**Mean Wage**	**St. Dev. Wage**	**Full-Time Share**	**Mean Wage**	**St. Dev. Wage**
		$\mathbb{P}[a=1,b>0]$	$\mathbb{E}[b \vert a=1,b>0]$	$\mathbb{P}[k>0]$	$\mathbb{E}[k]$	$\mathbb{P}[h' \geq 35 \vert d'_e=1]$	$\mathbb{E}[w' \vert d'_e=1]$	$\mathbb{SD}[w' \vert d'_e=1]$	$\mathbb{P}[h \geq 35 \vert d_e=1]$	$\mathbb{E}[w \vert d_e=1]$	$\mathbb{SD}[w \vert d_e=1]$
$Z[k,a]$	0.0081	0.625	300.8	0.688	1.41	—	—	—	—	—	—
$R[s,k,a]$	0.0031	0.167	540.0	0.667	1.79	—	—	—	—	—	—
$Q[w,h,k,a]$	0.0198	0.256	339.2	0.718	1.30	—	—	—	0.85	17.7	17.4
$R[s',k,a]$	0.0107	0.429	361.7	0.857	2.23	—	—	—	—	—	—
$U[s,s',k,a]$	0.0020	0.750	317.3	0.750	1.83	—	—	—	—	—	—
$T[w,h,s',k,a]$	0.0239	0.277	326.6	0.872	1.53	—	—	—	0.72	16.4	10.7
$Q[w',h',k,a]$	0.2865	0.149	353.6	0.790	1.86	0.97	24.2	21.2	—	—	—
$T[w',h',s,k,a]$	0.0351	0.203	298.7	0.754	1.62	0.99	19.7	11.9	—	—	—
$V[w,h,w',h',k,a]$	0.6107	0.053	285.7	0.639	1.21	0.95	24.8	21.4	0.79	18.7	16.5

NOTE: Number of households = 1,965. We use the value function notation reported in Table 3.1 to label the household states: Z= both spouses out of the labor force; R= one spouse out of the labor, the other unemployed; Q= one spouse out of the labor, the other employed; U= both spouses unemployed; T= one spouse unemployed, the other employed; V= both spouses employed. Variables denoted by $'$ refer to the husband. M and SD denote, respectively, mean and standard deviation.

Starting with the cross-sectional moments,[38] Table 4.1 reports in the first column the distribution of households over labor market states: in about 61% of households, both spouses are employed ($V[w, h, w', h', k, a]$ state); and in about 29% of households, the husband is employed and the wife is out of the labor force ($Q[w', h', k, a]$ state). Each of other combinations cover between 2% and 3% of the sample, with the cases where the husband is not participant being limited to just a dozen households. Employment patterns reveal substantial differences between male and female spouses. The combination of an employed husband with a non-employed wife covers about 32% of the sample; the opposite combination covers only about 4% of the sample. Prevalence of full-time and wage moments also support systematic difference by gender. When men work, almost all of them work full-time (column 5); when women do (column 7), they work full-time between 85% of the time (when the husband is out of the labor force) and 72% of the time (when the husband is unemployed). When both spouses work, men earn on average 14% more. An employed man married (or cohabiting) with a woman out of the labor force makes on average 37% more than an employed woman married (or cohabiting) with a man out of the labor force (24.80$ versus 17.70$).

As shown in Column 2, SNAP participation varies substantially across household labor market states. Approximately 75% of households in which both spouses are unemployed participate in SNAP, compared with only 5% of households in which both spouses are employed. Column 3 shows that average SNAP benefits among participants also differ markedly by household state, ranging from approximately $540 per month for households in which the husband is out of the labor force and the wife is unemployed ($R[s, k, a]$ state) to about $285 per month for households in which both spouses are employed.

Additional statistics not reported in the Table indicate that mean hourly wages are substantially lower among SNAP participants. Husbands receiving SNAP earn, on average, $7.63 less per hour than husbands not receiving SNAP ($16.23 versus $23.86), while employed wives on SNAP earn $3.14 less per hour than their non-SNAP counterparts ($14.71 versus $17.85). These patterns are consistent with both program eligibility rules and households' endogenous participation decisions. The estimated model in the next section allows us to assess the relative importance of these two channels.

Household composition, particularly the presence and number of children, is another potentially important determinant of SNAP participation and labor supply decisions.

[38] Values are taken from the first month in the reference period: January 2017.

The average number of children is weakly correlated with household labor market state, with the notable exception that households in which both spouses are employed have the fewest children on average.

Table 4.2: Descriptive Statistics by Household Labor Market State: 3-Month Transition Frequencies

	SNAP		**Husband Employed**						**Wife Employed**					
Household	**Entry**	**Exit**	**Overall**		**On SNAP**		**Off SNAP**		**Overall**		**On SNAP**		**Off SNAP**	
State	**Rate**	**Rate**	**Entry**	**Exit**	**Entry**	**Exit**	**Entry**	**Exit**	**Entry**	**Exit**	**Entry**	**Exit**	**Entry**	**Exit**
$Z[k,a]$	0.000	0.034	0.132	—	0.121	—	0.141	—	0.047	—	0.052	—	0.042	—
$R[s,k,a]$	0.000	0.000	0.229	—	0.176	—	0.278	—	0.314	—	0.294	—	0.333	—
$Q[w,h,k,a]$	0.048	0.096	0.059	—	0.064	—	0.057	—	—	0.037	—	0.106	—	0.009
$R[s',k,a]$	0.038	0.017	0.435	—	0.414	—	0.450	—	0.036	—	0.017	—	0.050	—
$U[s,s',k,a]$	0.115	0.125	0.357	—	0.125	—	0.500	—	0.357	—	0.438	—	0.308	—
$T[w,h,s',k,a]$	0.039	0.054	0.393	—	0.348	—	0.409	—	—	0.032	—	0.022	—	0.035
$Q[w',h',k,a]$	0.009	0.040	—	0.015	—	0.027	—	0.013	0.026	—	0.232	—	0.027	—
$T[w',h',s,k,a]$	0.012	0.070	—	0.026	—	0.070	—	0.019	0.290	—	0.384	—	0.274	—
$V[w,h,w',h',k,a]$	0.004	0.039	—	0.012	—	0.020	—	0.012	—	0.020	—	0.031	—	0.020

NOTE: Number of households = 1,965. We use the value function notation reported in Table 3.1 to label the household states: Z = both spouses out of the labor force; R = one spouse out of the labor, the other unemployed; Q = one spouse out of the labor, the other employed; U = both spouses unemployed; T = one spouse unemployed, the other employed; V = both spouses employed. Variables denoted by $'$ refer to the husband. Conditional entry/exit columns refer to rates conditional on being on SNAP or not on SNAP.

Table 4.2 reports moments describing agents' dynamics. We measure transitions at three-month intervals,[39] tracking changes in both SNAP participation and employment status. As in the previous Table, all the moments are calculated conditional on the household's labor market state. Columns 1 and 2 show that SNAP entry and exit are highly correlated with labor market status: households in which both spouses are unemployed ($U[s, s', k, a]$ state) exhibit the highest rates of both SNAP entry and exit, while households in which both spouses are employed ($V[w, h, w', h', k, a]$ state) have among the lowest entry rates but still experience a nontrivial exit rate.

With respect to labor market dynamics, we report transitions into and out of employment.[40] As expected, transitions into employment occur more frequently from job search states than from out-of-the-labor-force states. When searching, husbands transition to employment at higher rates than wives, with one exception: when both spouses are searching (the $U[s, s', k, a]$ state), they enter employment at similar rates.

5 Identification

This Section discusses how the structural parameters of the model described in Section 3 can be identified by the data described in Section 4. The key challenge is separately identifying household preferences, labor market opportunities, and SNAP participation costs while accounting for selection into both employment and program participation.

5.1 Empirical specification

As discussed in Section 3.1, job offers are characterized by an hourly wage w and a weekly hours requirement h. In the empirical implementation, we restrict the hours requirement to two discrete options—full-time or part-time–to reduce computational costs. Because the distribution of hours worked in the data is highly concentrated around these two categories, we view this simplification as entailing only a minor loss in capturing observed heterogeneity. Without loss of generality, we normalize an agent's time allotment to 1, leading to full-time work being $h = 0.5$ and part-time work $h = 0.3$. We denote the probability that a job offer is full-time offer by p_{FT} for wives and p'_{FT} for husbands.

[39] Transitions are calculated based on all 3–month intervals in the calendar year (e.g. month 1 to 4, month 2 to 5, etc.).

[40] We restrict attention to these transitions to simplify the presentation of descriptive statistics; richer moments capturing additional labor market dynamics are used in estimation.

As discussed in Section 4.2, the data records only accepted wages, not offered wages. Under this limitation, the model is not identified unless the wage offer distribution is *recoverable*[41] (Flinn and Heckman 1982). We adopt the most common recoverable distribution used in this context[42] and assume that the wage offer distributions $F(w, h)$ are gender-specific lognormal distributions, with parameters $\{\mu, \sigma\}$ for wives and $\{\mu', \sigma'\}$ for husbands.

Search costs represent time-invariant heterogeneity specific to each agent. Because these costs are not directly observed, we treat them as unobserved heterogeneity in the empirical specification. Given limited identifying information in the data and to further reduce computational burden, we assume only two discrete search-cost types: high cost types, for whom searching to receive offers at rate λ_u requires the same time investment as full-time work ($s = 0.5$); and low cost types, for whom it requires the same time investment as part-time work ($s = 0.3$). The probabilities of being a high-cost type are denoted with p_{HS} for wives and p'_{HS} for husbands.

To capture variation in childcare needs and opportunity costs, we allow each spouse's preferences over consumption and leisure to vary with the presence and number of children. Allowing the relative value of non-market time to vary is a reduced-form way to reflect that "leisure" may in part represent time devoted to childcare and development. After exploring alternative specifications, we adopt a parsimonious approach in which the relative value of leisure takes on two possible values: one, $\{\alpha_0, \alpha'_0\}$ when the household has at most one child, and $\{\alpha_1, \alpha'_1\}$ when the household has two or more children.

SNAP benefits are modeled according to equation (3.1), which closely mirrors the program's benefit formula. As described in Section 2.3, the maximum monthly allotment $B(k)$ is reduced by household income net of allowable deductions. We take both the schedule $B(k)$ and the benefit reduction rate directly from the program parameters in effect in 2017.[43] We model the deduction as in equation (3.2). Given the complexity of SNAP rules, the household-specific deduction d depends on both observable and unobservable components. The observable components and their impacts, denoted by the function $f_d(k, I, I')$, are taken directly from the program's

[41] A distribution is recoverable if observing its truncation and its point of truncation are enough to uniquely determine it.

[42] For a review, see Eckstein and Van den Berg (2007); for a recent contribution see Bobba et al. (2022).

[43] See the memorandum providing the fiscal year 2017 Cost-of-Living Adjustments (COLA) to the Supplemental Nutrition Assistance Program (SNAP) maximum allotments, income eligibility standards, and deductions, published under the Food and Nutrition Act of 2008, as amended.

regulations and takes the following form:

$$f_d(k, I, I') = 0.2(I + I') + \sum_{s=0}^{3} \beta_s \mathbb{1}_{\{k=s\}} + \\ 41.48\mathbb{1}_{\{I>0, I'>0, k>0\}} + 4.32\mathbb{1}_{\{I>0, I'=0\, k>0\}} + \\ 4.32\mathbb{1}_{\{I=0, I'>0, k>0\}} + 1.64\mathbb{1}_{\{I=0, I'=0, k>0\}} \tag{5.1}$$

where β_s denotes the standard deductions reported by the USDA for fiscal year 2017 (\$157 for zero to one child, \$168 for two children, \$197 for three children). The employment-based terms capture average dependent care deductions calculated using SNAP Quality Control data. The unobserved component, denoted by ϵ in (3.2), captures additional deductions such as medical expenses, child support, and excess shelter costs that are not observed in our data. We assume ϵ follows a negative exponential distribution $Q(\epsilon)$ with parameter γ_ϵ. As discussed in Section 5, this parsimonious one-parameter specification facilitates identification even in the absence of direct information on the full household-specific deductions.

Direct SNAP costs consist of a one-time application cost O and a recurring flow cost ξ. As discussed in Section 3.1, ξ is household-specific and heterogeneous, but it is not directly observed in the data. We therefore adopt the same strategy used for other unobserved components and assume that its distribution $G(\xi)$ follows a negative exponential distribution with parameter γ_ξ.

5.2 Identification

The first set of parameters to be identified comprises labor market parameters governing wage offer distributions $\{\mu, \sigma, \mu', \sigma', p_{FT}, p'_{FT}\}$ and the transitions across labor market states $\{\lambda_u, \lambda'_u, \lambda_e, \lambda'_e, \eta, \eta', p_{HS}, p'_{HS}\}$. As shown by Flinn and Heckman (1982), these parameters are identified in an *individual* search model using accepted wages and observed hazard rates, provided that the wage offer distribution is a *recoverable* distribution. The same identification strategy is extended by Dey and Flinn (2008) and Flabbi and Mabli (2018) to the case of a *household* search model under the additional condition that moments describing the joint labor market states of spouses are available. In our setting, wage offers are assumed to belong to a recoverable distribution (the lognormal), accepted wages are observed conditional on gender and hours regime, transitions across labor market states are observed, and all labor market information is jointly observed for both spouses. These features allow us to directly apply these existing identification results to recover all labor market parameters.

The second set of parameters to be identified is the utility parameters, comprising the utility weights on leisure $\{\alpha_0, \alpha_0', \alpha_1, \alpha_1'\}$ and the flow utility of unemployment and nonparticipation $\{t_u, t_o\}$. The utility weights α capture the trade-off between consumption and leisure and therefore play a central role in labor supply decisions. Given the structure of the utility function and the unitary model of the household assumption, variation in labor supply along both the extensive margin (participation) and the intensive margin (full time/part time) across household types is sufficient for identification. Sharp differences in labor supply between husbands and wives provide additional information to separately identify male and female preferences. Moreover, how these patterns vary with the number of children identifies the dependence of preferences on family size, allowing separate identification of $\{\alpha_0, \alpha_0'\}$ from $\{\alpha_1, \alpha_1'\}$.

As in a large class of similar search models, the flow utility value in unemployment t_u cannot be separately identified from the discount rate ρ; we can only identify the locus of their feasible combinations consistent with the equilibrium equations defining the value of unemployment.[44] Following the literature, we calibrate the discount rate in order to recover the flow utility value in estimation,[45] while the flow value of nonparticipation t_o is identified using analogous equilibrium equations. Finally, because search-cost heterogeneity is time invariant, the steady state share of nonparticipants provides additional information to identify the proportion of high search cost individuals.

The third set of parameters consists of $\{\pi_0, \pi_1\}$, which govern the evolution of household size. As discussed in Section 3.1, these parameters define a simple, exogenous process which changes the number of children in the household. Since we directly observe the number of children for the same household multiple times and the process is assumed exogenous, observed transitions in the number of children are sufficient to identify these parameters.

The fourth and final set of parameters to the unobserved components of SNAP participation: $\{O, G(\xi), Q(\epsilon)\}$. This parameterization has not previously been included in a fully-developed search model of the labor market and therefore requires a novel identification strategy. Fortunately, the SIPP provides rich information on program participation and benefit amounts which, combined with detailed labor market data, enables identification.

[44]Unlike in individual search models, the household search environment multiplies such equations since one spouse's unemployment status can be paired with different labor market states of the other spouse. This larger set of equations helps to identify both t_u and t_o.

[45]We assume an annual discount rate of 5%.

The application cost O is time-invariant and homogeneous in the population. Its primary role is to facilitate or deter program entry, implying that the share of eligible households that do *not* participate in SNAP is directly informative about its magnitude. We therefore match the overall take-up rate among eligible households in our sample using an aggregate moment extracted from the SNAP Quality Control Data.[46] Because households form expectations about future labor market opportunities and benefit eligibility, persistence in SNAP participation provides additional identifying variation.

The flow cost ξ of remaining on SNAP is time-invariant but heterogeneous in the population. Identification comes from households facing similar eligibility conditions but making different participation decisions across a range of spousal labor market states and household sizes, reinforcing the empirical identification of the distribution. In practice, the role of this cost exhibits a "threshold crossing" pattern: households participate if the cost is sufficiently low and do not otherwise, motivating the use of a simple one-parameter exponential distribution $G(\xi)$ with parameter γ_ξ.

Finally, identification of the unobserved deduction component ϵ relies on variation in benefit amounts among participating households with similar eligibility characteristics. Here the richness of the SIPP data is crucial because we observe not only if a household participates in the program but also the benefit amount it receives if it does participate. The issue with using this information for identification is similar to the one encountered for the wage offer distributions: we observe the amount received only among households in the program, which is a truncation of the primitive distribution of potential benefit amounts in the population. We then apply the same strategy used for wage offers and assume a recoverable distribution for the unobserved components of the deduction. Given the more limited empirical variation in benefits relative to wages, we assume a recoverable one-parameter exponential distribution with parameter γ_ϵ) instead of the two-parameter lognormal distribution used for the wage offers.

6 Estimation

6.1 Estimation Method

We estimate the model's structural parameters using simulated method of moments (SMM) (McFadden 1989; Newey and McFadden 1994). Defining the entire parameter

[46] We target a take-up rate of 61.8% calculated from the SNAP Quality Control (QC) database for households with a married head and children present.

vector as Θ, the SMM the estimator $\hat{\Theta}$ is defined as:

$$\hat{\Theta} = \underset{\Theta}{\text{argmin}} \; [M_R(\Theta) - m_N]' \, W^{-1} \, [M_R(\Theta) - m_N] \,, \tag{6.1}$$

where m_N is an appropriately chosen vector of sample moments computed from the estimation sample of size N and $M_R(\Theta)$ is the corresponding vector of moments computed from a simulated sample of size R, generated from the steady state equilibrium of the model at parameter vector Θ. We construct the weighting matrix W as a diagonal matrix with entries equal to the inverse variance of each corresponding moment, estimated by bootstrapping the sample 200 times with replacement. While not achieving efficiency, adding this weighting matrix assigns more weight to moments with lower sample variability and reduces the computational burden by harmonizing the moments' scale.

Our estimation targets 144 moments. The moments are chosen consistently with the identification strategy discussed in Section 5. The full list of moments is provided in a set of Tables in Appendix D. Here, we summarize the main categories and refer to the relevant tables.

Cross-sectional labor market conditions for each spouse are summarized by three moments from the accepted wage distributions and by the distribution of individuals across the four labor market states, all conditional on SNAP participation (Tables D.1, D.2). Labor market dynamics for each spouse are captured by transition rates across labor market states, again conditional on SNAP participation (Table D.6). Joint household labor market moments include the distribution across the sixteen possible combinations of spouses' labor market states, conditional on SNAP participation (Table D.3); measures of household labor force participation by SNAP status and presence of children (Table D.4); and transitions across household labor markets states, conditional on SNAP participation (Table D.7).

SNAP participation is characterized by the overall take-up rate among eligible households and by SNAP entry and exit rates (Table D.8); by SNAP participation rates for households and spouses, as well as the mean and standard deviation of the amount of benefit amounts, conditional on labor market states and the number and age of children (Table D.5). Finally, to describe changes in demographic characteristics over time, we match transitions of children entering and exiting the household, conditional on children's age (Table D.8).

To minimize equation (6.1), we first apply a bounded global derivative-free optimization algorithm (particle swarm optimization) to generate credible starting values for the parameters. We then obtain point estimates by applying the simplex method of local derivative-free optimization, which modifies the Nelder-Mead algorithm. Full details of the estimation procedure are presented in Appendix D.

6.2 Parameter Estimates

Our estimated model reveals substantial heterogeneity in labor market opportunities and preferences across household members, while also highlighting the importance of program participation costs in explaining SNAP take-up patterns. We first discuss the parameter estimates and their economic interpretation, then evaluate the model's ability to match key empirical patterns.

The parameter estimates reported in Table 6.1 fall into three broad groups: labor market opportunities, SNAP program costs and benefits, and household preferences and types. Standard errors are estimated by bootstrapping the sample with replacement and rerunning the model 100 times.

Labor market parameters

Estimated wage offer distributions exhibit sizable gender differences in labor market opportunities. The point estimates for $\{\mu, \sigma, \mu', \sigma'\}$ imply that the mean offered wage is \$9.05 per hour for husbands and \$7.78 for wives, both lower than typical estimates from the broader population reflecting our focus on SNAP-eligible households. Consistent with existing job search literature, job offer arrival rates while unemployed ($\lambda'_u = 0.428$ for husbands, $\lambda_u = 0.311$ for wives) and the on-the-job arrival rates are lower than the arrival rates in unemployment.

We also estimate pronounced gender differences in work hours requirements: 93.4% of offers to husbands are full-time compared to 70.0% for wives. Search-cost heterogeneity differs sharply by gender as well; only 1.8% of husbands are classified as high search-cost types versus 65.0% of wives. These disparities account for a substantial share of the observed gender gap in labor force participation rates across household members. As we show below, preference heterogeneity also plays an important role.

Household preferences

The utility weights on leisure vary substantially by gender and presence of children. For households without children or with one child, the leisure weight for wives ($\alpha_0 = 0.104$) is nearly ten times larger than for husbands ($\alpha'_0 = 0.011$). With two or more children, both weights increase markedly to $\alpha_1 = 0.484$ for wives and $\alpha'_1 = 0.303$

for husbands. Together with labor market parameters, these preference estimates are central not only in explaining gender differences in labor market outcomes but also for understanding the transmission of policy changes. As we show in Section 7, labor supply adjustments to SNAP program parameters operate primarily through wives' participation decisions, consistent with the fact that most husbands in the estimation sample remain in the labor force.

Demographic parameters

Demographic transition rates indicate that household composition changes relatively slowly, with arrival rates for both increases ($\pi_1 = 0.025$) and decreases ($\pi_0 = 0.032$) in household size implying an average duration of about 3 years between the arrival or departure of a child.

SNAP parameters

Estimated participation costs are economically meaningful, consistent with an important role for administrative or "sludge" costs in explaining incomplete take-up. The extent to which these costs account for observed participation gaps needs to be evaluated in equilibrium, which we address in Section 7. Here we summarize the magnitude of the point estimates.

The estimated application cost O is 0.020. Because O is a one-time cost incurred upon program entry, it is naturally interpreted relative to differences in value functions. When deciding whether to enter SNAP (see equation (3.8)), households compare value the value of participating to the value of not participating net of 0. For a typical household with both spouses unemployed, 0 corresponds to 18.3% of the increase in value from SNAP participation, ($U[s, s', k, 1]$-$U[s, s', k, 0]$). [47] For households with higher earnings or different labor market configurations, the relative magnitude 0 can be larger. For example, for the household in Figure 3.1–three children, the wife is working at a relative low wage (about $17 an hour), and the husband is searching for a job–the implied application cost exceeds 50 percent of the increase in value from participation.[48]

The flow cost ξ to participate in SNAP should instead be compared to utility values since it is a flow cost directly entering the utility function (see equation (3.4)). It is modeled as heterogeneous with exponential distribution parameter estimated

[47] The "typical" household we are considering here is the same as in Figure 3.1, see figure note for details.

[48] Specifically, $\frac{T[w,h,s',3,1]-T[w,h,s',3,0]}{O} = 0.56$.

to be equal to 56.18, implying an average cost of 0.018. This mean corresponds to approximately 1.1% of the average utility from consumption across all households, and about 2.3% among SNAP participants, who have lower consumption on average.

Finally, we estimate the distribution of the unobserved deduction component ϵ (see equation (3.2)). The exponential parameter estimate equal to 0.248 implies an average unobserved component of the deduction of about \$4 an hour, accounting for 69.6% of total deductions d among SNAP participants. To gauge the credibility of the implied scale of the overall deduction, we compare our results with aggregate results reported in Cronquist and Genser White (2019). Their report states that the ratio of average total deductions to average household income for all SNAP households is about 62% in fiscal year 2018. In our simulated sample, the corresponding ratio is 68%, suggesting a similar overall scale. Heterogeneity is also substantial: roughly one quarter of households have an unobserved deduction component below \$1, which is about 32% of their average deduction.

Table 6.1: Parameter Estimates

Description	**Notation**	**Estimate (SE)**
Labor Market Parameters		
Job offer arrival rate when unemployed (husband)	λ'_u	0.428 (0.100)
Job offer arrival rate when unemployed (wife)	λ_u	0.311 (0.075)
On-the-job offer arrival rate (husband)	λ'_e	0.226 (0.035)
On-the-job offer arrival rate (wife)	λ_e	0.238 (0.031)
Arrival rate for job termination (husband)	η'	0.005 (0.000)
Arrival rate for job termination (wife)	η	0.006 (0.001)
Wage offer distribution location parameter (husband)	μ'	2.041 (0.220)
Wage offer distribution scale parameter (husband)	σ'	0.567 (0.085)
Wage offer distribution location parameter (wife)	μ	1.903 (0.134)
Wage offer distribution scale parameter (wife)	σ	0.544 (0.054)
Probability a job offer is full-time (husband)	p'_{FT}	0.934 (0.008)
Probability a job offer is full-time (wife)	p_{FT}	0.700 (0.021)
Probability of being high search cost (husband)	p'_{HS}	0.018 (0.007)
Probability of being high search cost (wife)	p_{HS}	0.650 (0.159)
Utility Parameters		
Utility weight on leisure with 0-1 kids (husband)	α'_0	0.011 (0.001)
Utility weight on leisure with 0-1 kids (wife)	α_0	0.104 (0.008)
Utility weight on leisure with 2-3 kids (husband)	α'_1	0.303 (0.007)
Utility weight on leisure with 2-3 kids (wife)	α_1	0.484 (0.003)
Flow utility value in unemployment	t_u	1.425 (0.138)
Flow utility value of nonparticipation	t_o	0.454 (0.066)
Demographic Parameters		
Arrival rate for a decrease in household size	π_0	0.032 (0.001)
Arrival rate for an increase in household size	π_1	0.025 (0.001)
SNAP Parameters		
Parameter for unobserved participation cost	γ_ξ	56.18 (10.26)
Parameter for unobserved income deductions	γ_ϵ	0.248 (0.031)
Application cost	O	0.020 (0.007)

NOTE: Bootstrap standard errors based on 100 replications in parentheses.

6.3 Model Fit and Validation

The estimated model successfully reproduces key patterns of labor market outcomes and SNAP participation observed in the data and performs well in an out-of-sample validation exercise that leverages an institutional change benefit generosity.

In-sample model fit

Table 6.2 shows that the model captures substantial differences in labor market outcomes between by SNAP status and gender. For husbands, the model closely matches both wage levels and employment patterns conditional on SNAP status. Among SNAP participants, the model predicts a mean wage of \$16.17 (versus \$16.23 in the data) and a full-time employment rate of 75.1% (versus 72.1%). For SNAP non-participants, it generates higher wages (\$25.41 versus \$23.86) and higher full-time employment (95.6% versus 91.5%), accurately reflecting positive selection into employment. The model underpredicts husbands' non-participation in the labor force among SNAP participants (4.3% versus 10.1%), suggesting it may understate barriers to employment for a subset of households.

For wives, the model captures the markedly weaker labor market attachment, especially among SNAP participants. It matches the high rate of labor force non-participation among wives receiving SNAP (55.7% versus 49.5% in data) and reproduces the sharp differences in full-time employment between SNAP participants (17.5% versus 25.5%) and non-participants (54.3% versus 54.6%). The model understates wages for wives in SNAP (\$12.55 versus \$14.71) but closely matches wages for wives off SNAP (\$18.69 versus \$17.85).

Table 6.3 indicates that the model also matches SNAP participation patterns across household types. It accurately reproduces the overall take-up rate among eligible households (64.9% versus 61.8%) and captures how participation varies with household size and employment status. The model matches the sharp gradient in SNAP participation by employment status–participation is much higher among non-employed households than among those with both spouses working full-time–though it overpredicts participation among households with neither spouse employed, suggesting that non-monetary participation costs for this group may be understated.

Table 6.4 reports labor market and program transition dynamics. The model generates job-finding and job-loss rates broadly consistent with the data but overpredicts transitions from unemployment to employment, particularly for husbands on SNAP. It also predicts higher SNAP entry and exit rates than observed. The predicted six-month entry rate is 2.4% (versus 1.2% in data) and the exit rate is 19.6% (versus 8.1%). Despite these levels, the model reproduces the qualitative pattern that exits are much more common than entries.

Finally, the fit on each of the moments we include in the quadratic form (6.1) is provided in Tables D.1 through D.8 in Appendix D. The overall good fit of the model is reflected across these more granular moments.

Table 6.2: Model Fit: Labor Market Outcomes by SNAP Status

	On SNAP		Off SNAP	
	Data	Model	Data	Model
Husbands				
Mean wage	\$16.23	\$16.17	\$23.86	\$25.41
Labor Market State:				
Full-time	0.721	0.751	0.915	0.956
Part-time	0.058	0.067	0.036	0.014
Unemployed	0.120	0.139	0.027	0.011
Out of labor force	0.101	0.043	0.023	0.019
Wives				
Mean wage	\$14.71	\$12.55	\$17.85	\$18.69
Labor Market State:				
Full-time	0.255	0.175	0.546	0.543
Part-time	0.163	0.176	0.137	0.120
Unemployed	0.087	0.093	0.035	0.032
Out of labor force	0.495	0.557	0.283	0.305

Table 6.3: Model Fit: SNAP Participation by Household Type

	Data	Model
Overall Participation		
SNAP take-up rate among eligible	0.618	0.649
By Household Size		
Households with 0-1 kids	0.050	0.051
Households with 2-3 kids	0.179	0.184
By Employment Status		
Both employed full-time	0.071	0.062
One employed full-time	0.159	0.169
Neither employed	0.625	1.000

Table 6.4: Model Fit: Quarterly Transition Rates

Labor Market Transitions (3-month)	On SNAP		Off SNAP	
	Data	Model	Data	Model
Employment to Unemployment				
Husbands	0.019	0.025	0.010	0.015
Wives	0.018	0.014	0.012	0.015
Unemployment to Employment				
Husbands	0.333	0.554	0.444	0.503
Wives	0.461	0.489	0.386	0.346

SNAP Transitions (6-month)	Data	Model
Entry rate	0.012	0.024
Exit rate	0.081	0.196

Out-of-sample model validation

On November 1, 2013, the temporary SNAP benefit increase enacted under the American Recovery & Reinvestment Act of 2009 expired, reducing maximum benefits nationwide by approximately 5.5% (Dean and Rosenbaum 2013). This shift in program parameters creates a natural out-of-sample model validation opportunity. We can construct a sample based on the 2014 SIPP that is analogous to our estimation sample and estimate the effect of the benefit reduction using the following linear specification:

$$y_{i,t} = \beta_0 + \beta_1 \times After_t + \mathbf{X}\beta + \epsilon_{i,t} \tag{6.2}$$

where $y_{i,t}$ is a policy outcome and $After_t$ is an indicator for whether the household is observed after the reduction in benefits. The $\mathbf{X}\beta$ are controls for each category of household size.[49] The estimation sample constructed for the 2014 data contains 1,824 households.[50]

We estimate Equation (6.2) using the 2014 SIPP sample, simulate outcomes under our estimated model parameters, and impose the same 5.5% reduction in the maximum SNAP benefit from November 2013. Comparing simulated and empirical estimates allows us to assess whether the model reproduces the observed policy response. That is, we compare if what our model predicts would have happened as a result of the policy is, in fact, what actually happened as observed in the post-policy data.

Figure 6.1 plots 90% confidence intervals for the point estimate of β_1 in Equation (6.2) based on pooling the "before" and "after" months and clustering standard errors at the household level for five binary outcomes: household SNAP participation, male employment on and off SNAP, and female employment on and off SNAP. For each outcome, the intervals on the left (blue) convey estimates based on the sample constructed from 2014 SIPP, and those on the right (red) represent estimates based on the simulated households generated from our model. The model correctly generates a policy effect on the SNAP participation rate of the same direction and magnitude as occurs in the data, with a 5.5% reduction in the maximum benefit leading to just under a 1 percentage-point decrease in SNAP participation. The model also matches the sample in estimating statistically insignificant employment effects that are also small in magnitude.

Taken together, the results indicate that, while abstracting from some institutional detail, the model captures core mechanisms governing both labor supply and program

[49] Adding fixed effects for state of residence does not affect the policy parameter estimates.

[50] Because of potential seam bias (Bennett et al. 2022) we limit our sample to Wave 2 of the 2014 SIPP, covering calendar year 2014. We set Q1 2014 as the "before" period, under the assumption that absent any labor market shocks, most households will wait until recertification is required (roughly every 6 months, depending on household characteristics and location) to re-evaluate their SNAP decision.

participation decisions. Its fit across multiple dimensions and its performance in an out-of-sample policy validation exercise provides confidence in its use to evaluate counterfactual policies, particularly for studying differential responses by gender and SNAP status and the distinct roles of primary and secondary earners.

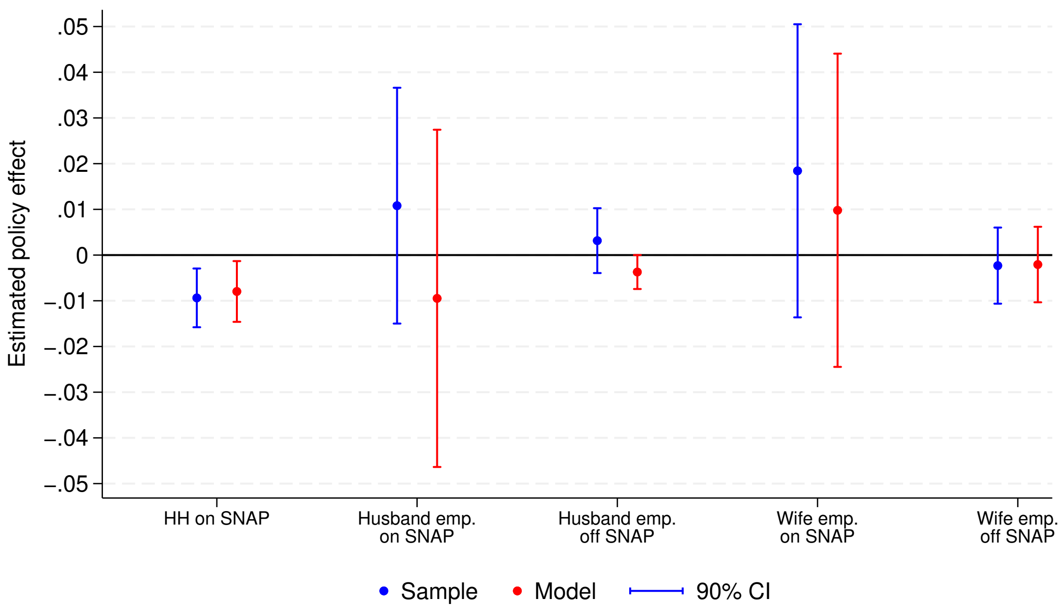


Figure 6.1: NOTE: The figure shows OLS estimates of β_1 in Equation (6.2) for five separate binary outcomes, with 90% confidence intervals based on standard errors clustered at the household level. The intervals on the left for each outcome are for the 2014 SIPP sample, and those on the right are based on the simulated households generated from the model. The plotted effects represent the estimated percentage-point impact of the policy on SNAP participation and individual employment rates.

7 Policy Experiments

Using the estimated model, we can evaluate the impact of policy changes on SNAP participation and labor market outcomes, taking into account the agents' optimal reactions to the new environment. Our model accounts for differential selection into the SNAP program and the labor market induced by various policy changes. As a result, we can evaluate not only level effects such as whether more households participate in SNAP but also composition effects such as which types of households are participating in SNAP. The findings in this section underscore that composition effects are crucial for understanding policy impacts.

We focus on three sets of policy experiments designed to limit access to SNAP and promote self-sufficiency. First, we study the impact of a policy currently at the center of the SNAP policy debate: imposing more stringent work requirements. Second, we examine two of the most important aspects of the SNAP program: the amount of SNAP benefits offered to participants and the SNAP benefit reduction rate that reduces benefits for each additional dollar of income a household earns. These program parameters are grounded in the White House's Executive Order requiring a re-evaluation of the Thrifty Food Plan—the low-cost food plan on which SNAP benefit allotments are based.[51] Third, we evaluate the impact of eliminating the application and participation costs.

7.1 More Stringent Work Requirements

Mandating that certain beneficiaries engage in employment or work-related activities to maintain eligibility—referred to as "work requirements"—has been a focal point of U.S. safety net policy debates, from the passage of the Personal Responsibility and Work Opportunity Reconciliation Act of 1996 which imposed requirements on TANF recipients and amended the Food Stamp Act to include requirements for specific populations of SNAP participants, to Medicaid expansion and adoption of demonstration waivers in select states between 2012 and 2020.

The debate about whether public assistance serves as a mechanism to support health coverage, food security, and employment or as a contract conditional on personal responsibility and labor force participation continues today, particularly in SNAP. While work requirements in Medicaid have historically been deemed through judicial review as being contrary to the objectives of the Medicaid program related to health coverage, SNAP work mandates have maintained bipartisan support and statutory permanence. As of November 1, 2025, all states in the U.S. are required to implement stricter federal SNAP work requirements due to changes enacted by H.R.1, including no longer being able to use broad waivers to exempt SNAP participants deemed able to work, and increasing the age of participants susceptible to work requirements.

We run a variety of different counterfactual experiments[52] but focus here on an extreme case: the requirement that all adults in the household (the two spouses, in our case) need to be employed in order to receive SNAP benefits. The post-policy values are extracted from the new steady state obtained by solving the model at the original estimated and institutional parameters, but stipulating that only working households can receive SNAP benefits. Table 7.1 reports the main results, comparing the pre-

[51]See Executive Order 14002: *Economic Relief Related to the COVID-19 Pandemic*, 1/22/2021.
[52]Complete results are available in Appendix E.

policy environment (columns 1, 3, and 5, denoted by *Bench.*) with the post-policy environment (columns 2, 4, and 6, denoted by *Work Req.*).

Imposing more stringent work requirements substantially reduces the proportion of households receiving SNAP benefits. The overall participation rate (total number of SNAP recipients/total number of households) moves from 10% at benchmark to 2.3% after the policy is imposed. The reduction is particularly strong for households with more than one child (from 18.3% to 2.5%). The reduction reflects that many households become ineligible after work requirements are imposed: the share of eligible households decreases 80 percent, from 14.5% in absence of work requirements to 3.3% after the policy is implemented. However, the reduction in take-up rate also plays a role: conditioning on the number of children, take-up decreases for both households with 0 to 1 children and households with 2 to 3 children (the overall take-up rate slightly increases due to composition effects over the two groups of households.)

As shown in Fig 7.1, imposing stricter work requirements also leads to a reduction in SNAP benefits: Very few households now receive the full benefit amount, and the overall benefit distribution shifts markedly to lower benefit amounts. This reflects that SNAP participants with the highest benefits are typically those with the least amount of income, including earned income. Once participants are required to work, their benefit is lower due to the higher income.

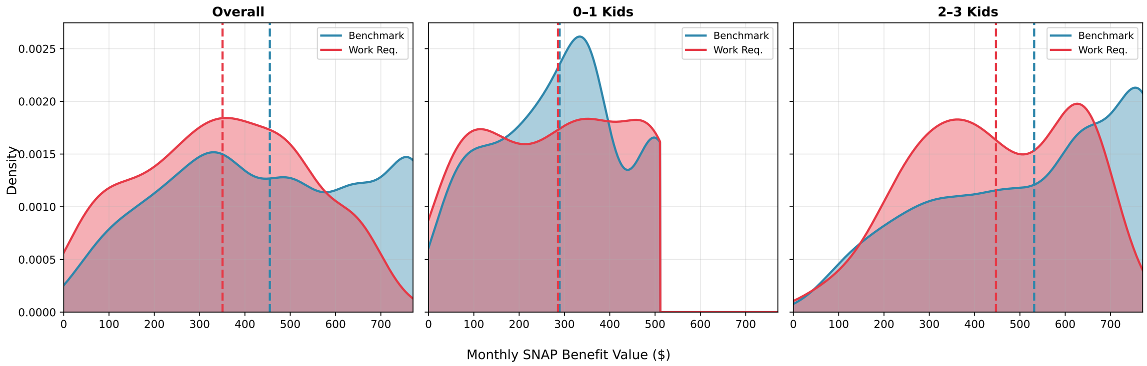
SNAP work requirements are intended to promote self-sufficiency among SNAP participants, thereby reducing program costs for taxpayers. This is reflected in both a lower entry rate and higher exit rate: the 6-month entry rate into SNAP is reduced by more than half, to less than 1%, while the 6-month exit rate from SNAP increases by more than a percentage point, to 6.6%. The reductions in the percentage of households participating in SNAP and the corresponding reduction in average SNAP benefits translates into lower program costs. However, this reduction is offset by a substantial increase in the rate of re-entry into the program to 19.5%, a value 23% higher than in the benchmark economy. Thus, while the policy reduces the SNAP caseload overall, it creates inefficiencies related to higher SNAP administrative costs related to participants having to leave the program, lose their job, and subsequently re-enter the program.

Table 7.1: Counterfactual experiments with work requirements by household composition

	All Households		0-1 Kids		2-3 Kids	
	Bench.	Work Req.	Bench.	Work Req.	Bench.	Work Req.
SNAP						
Share on SNAP	0.100	0.023	0.051	0.023	0.183	0.025
Share eligible for SNAP	0.148	0.033	0.061	0.028	0.292	0.041
Take-up rate	0.679	0.700	0.836	0.797	0.624	0.594
Average benefit	454.95	350.61	289.35	285.76	531.47	447.18
Entry rate	0.005	0.001	0.033	0.000	0.010	0.016
Replacement rate	0.043	0.044	0.087	0.051	0.022	0.033
Exit rate	0.053	0.066	0.100	0.066	0.031	0.065
Reentry rate	0.158	0.194	0.160	0.211	0.157	0.172
Turnover rate	1.479	1.721	1.498	1.815	1.456	1.624
Labor Market						
Husbands						
Labor Market State:						
Employed	0.956	0.955	0.966	0.965	0.937	0.937
Unemployed	0.010	0.023	0.014	0.024	0.003	0.020
Out of labor force	0.022	0.023	0.009	0.011	0.040	0.042
Mean Wages:						
Off SNAP	25.40	24.86	24.85	24.73	26.50	25.09
On SNAP	16.17	11.79	15.02	11.47	16.67	12.26
After SNAP	17.22	16.07	17.39	15.74	17.00	16.50
Wives						
Labor Market State:						
Employed	0.632	0.625	0.789	0.781	0.369	0.373
Unemployed	0.038	0.039	0.048	0.051	0.021	0.020
Out of labor force	0.331	0.336	0.163	0.169	0.610	0.607
Mean Wages:						
Off SNAP	18.69	18.77	18.72	18.81	18.58	18.61
On SNAP	12.54	10.62	11.62	10.78	13.67	10.40
After SNAP	12.79	13.07	12.86	13.08	12.68	13.05
Lifetime Utility						
Mean (% change)	0.000	-0.556	0.000	-0.347	0.000	-0.837
CV (% change)	0.000	6.021	0.000	3.817	0.000	7.320

NOTE: The benchmark is the model simulated at estimated values. Share on SNAP = n. of households (hhs) receiving SNAP benefits/total n. of hhs; take-up rate = n. of hhs receiving SNAP benefits/total n. of eligible hhs. Entry rate, replacement rate and exit rate are at 3 months. Reentry rate is over 1 year after SNAP spell. Turnover rate is over 1 year. Wages on SNAP and off SNAP are received while in the program or not. Wages after SNAP are received the year after exiting SNAP. CV denotes the coefficient of variation.

Figure 7.1: Histograms of SNAP Benefits Received with and without Work Requirements, by Household Size



Note Density plots show the distribution of monthly SNAP benefits among participating households. The benchmark scenario represents the steady state for households simulated from the estimated parameter values. The work requirements scenario counterfactually limits SNAP eligibility to households where all adults are employed. The dashed vertical lines show mean benefit levels.

Although SNAP work requirements are intended to promote work among low-income households, there are negligible impacts on employment rates. Moreover, household members generally accept lower-paying jobs both on and off the program, undermining the original intent of the policy to connect SNAP participants with better jobs. As shown in the middle panel of Table 7.1, neither husbands nor wives work more under the work requirements policy than in the benchmark environment. Even for the group with a large potential to increase labor supply and employment (women with more than one child), the overall employment rate barely moves (from 36.9% at benchmark to 37.3% under the policy).

Although the overall number of spouses working does not change, there are non-trivial reductions in wages on and off the program. The average wage decreases by almost $5 per hour among males participating in SNAP and by almost $2 per hour among females participating in the program. Figure 7.2 shows accepted hourly wages of husbands and wives receiving SNAP: both distributions shift to the left, markedly so for husbands. For example, the proportion of employed husbands on SNAP earning less than $10/hour more than doubles, from 15.6% to 37.6%. Additionally, the average wage accepted after leaving the program also decreases for males. It increases for females by $0.28. Average wages received off SNAP follow a similar pattern, with a $0.54 decrease for males a negligible increase of $0.08 for females. Thus, if the threat of losing SNAP benefits has any labor market incentive, it is to induce individuals to accept lower-paying jobs. This effect is responsible for the higher reentry rate reported above: among households losing SNAP benefits due to job termination, many quickly accept a low-paying job, allowing them to qualify for SNAP benefits again but keeping them from becoming self-sufficient.

As shown in the bottom panel of Table 7.1, the overall impact of the policy, including lower share of SNAP participation, lack of change in employment, and general reductions in average wages, makes household worse off: their welfare over their lifetime is about half a percentage point lower than benchmark.[53]

The combination of a large reduction in benefits and no increase in employment reflects an important mechanism that our households search model is able to capture. Most eligible households already have at least one spouse employed. The incentives needed to induce the other spouse to work are large and, given the importance of children in determining the labor supply of wives, are likely different in nature from a reduction in SNAP benefits. By estimating a model that integrates joint labor market decisions of spouses and endogenous participation in the program, we are able to quantitatively assess how strong these incentives are. In the demographic group constituting our estimation sample, even the most stringent work requirement policy cannot sufficiently induce more labor supply and employment. At most, it induces some individuals to accept lower-quality jobs. These results are consistent with the previous empirical literature documenting that work requirements have significant participation effects but generate limited employment responses (Cook and East 2024, 2023; Gray et al. 2023).

[53]For the formal definition of our lifetime utility measure, see Appendix D.1.

Figure 7.2: Histograms of Wages among SNAP Participants with and without Work Requirements

NOTE: Histograms show the distribution of hourly wages among employed agents separately for husbands and wives. The benchmark scenario represents the steady state for households simulated from the estimated parameter values. The work requirements scenario counterfactually limits SNAP eligibility to households where all adults are employed. The dashed vertical lines show mean wages

7.2 Varying SNAP Benefits

As we discussed in Section 2.3, the amount of SNAP benefits that households receive varies greatly and depends on a large set of factors. We focus on two main factors to study how changes to core parts of the SNAP benefit determination formula lead to changes in job search behavior and SNAP participation: the *maximum monthly SNAP allotment* denoted by $B(k)$ in equation (3.1), which is the maximum monetary benefit that an eligible household can potentially receive, and the SNAP benefit reduction rate that reduces benefits for each additional dollar of net income earned by the household. In the model, we have used the 30% rate implied by the SNAP benefit formula.

Maximum Benefit

Table 7.2 presents the effects of changing the maximum SNAP benefit.[54] In each column, we report the percentage change with respect to the benchmark value. For

[54]This is the *maximum monthly allotment* that we denote with $B(k)$ in equation (3.1).

example, the first column corresponds to a 75% *decrease* in the maximum monthly allotment with respect to the benchmark, and the last column corresponds to a 500% *increase* with respect to the benchmark. We experiment with a much larger range of increases than decreases because they generate some interesting results, as we discuss below.

The top panel of Table 7.2 shows that more generous benefits induce higher participation and take-up, while less generous benefits lead to lower participation and take-up. This monotonicity is observed on all variables. Decreasing the maximum benefit by 25% leads to a significant decrease in the average benefit received (from about $455 per month in the benchmark to $370 per month) but entry rates and exit rates remain quite stable. Overall SNAP participation is reduced by about 30%. Increasing the maximum benefit by a similar proportion leads to similar impacts but in the opposite direction. Increasing the maximum benefit by a much larger amount lead to very significant changes, creating a much larger share of participants, which on average receive much higher benefits. In turn, this leads to a high persistence of households in the SNAP-recipient state.

Policymakers may expect reductions in SNAP benefits to incentivize work as benefits become less generous and the eligibility criteria remain constant. However, the opposite is true starting from current values. The middle panel of Table 7.2 shows that labor force participation decreases for women and is basically unchanged for men when we decrease the current benefits by 25%, 50% and 75%. Average wages decrease, particularly for those working while participating in SNAP or in the year after they exit the program. Thus, decreases in benefit amounts lead to worse labor market outcomes and, for some, lower participation in the labor market. The reason for this counterintuitive result is the presence of frictions in the labor market. Frictions imply that the process of finding a job is costly. SNAP benefits act as support to offset some of these search costs, leading to better labor market outcomes, which in turn lead agents at the margin to enter the market. Confirmation of this mechanism is given by the large reduction in "after SNAP" wages: having SNAP support allows agents to search a little longer, and to end up with a better job.

On the opposite side, we do not observe any disincentive on labor supply for a relative mild benefit increase: increasing benefits by 25% leaves the distribution of labor market states and wages almost unaffected. But much larger benefit increases start to have the expected effect. For large increases (200% or 500%), we observe significant labor supply effects: the proportion of husbands out of the labor force increases from about 2% at benchmark to more than 20% for a 500% benefit increase.

Table 7.2: Counterfactual experiments varying the maximum SNAP benefit amount

	Maximum SNAP Benefit							
	Decrease			Benchmark	Increase			
Change	75%	50%	25%		25%	100%	200%	500%
SNAP								
Share on SNAP	0.025	0.050	0.072	0.100	0.119	0.156	0.227	0.355
Share eligible for SNAP	0.058	0.085	0.121	0.148	0.149	0.164	0.230	0.356
Take-up rate	0.432	0.587	0.601	0.679	0.794	0.950	0.987	1.000
Average benefit	147.78	269.08	370.59	454.95	593.65	1095.59	1869.41	3795.00
Entry rate	0.002	0.003	0.004	0.005	0.005	0.007	0.000	0.000
Replacement rate	0.093	0.064	0.049	0.043	0.039	0.041	0.021	0.019
Exit rate	0.093	0.068	0.055	0.053	0.045	0.044	0.022	0.017
Reentry rate	0.088	0.120	0.147	0.158	0.177	0.181	0.175	0.236
Turnover rate	2.110	1.725	1.605	1.479	1.421	1.363	1.224	1.165
Labor Market								
Husbands								
Labor Market State:								
Employed	0.954	0.954	0.954	0.955	0.955	0.931	0.847	0.727
Unemployed	0.024	0.024	0.025	0.024	0.025	0.028	0.021	0.036
Out of labor force	0.022	0.022	0.021	0.021	0.020	0.041	0.132	0.237
Mean Wages:								
Off SNAP	24.79	24.94	25.13	25.40	25.58	25.55	24.98	23.75
On SNAP	12.83	14.70	15.51	16.17	16.77	17.21	17.47	13.65
After SNAP	14.74	15.82	16.54	17.22	17.49	17.65	16.73	16.62
Wives								
Labor Market State:								
Employed	0.622	0.625	0.626	0.631	0.634	0.656	0.665	0.693
Unemployed	0.039	0.039	0.037	0.038	0.037	0.044	0.037	0.047
Out of labor force	0.339	0.336	0.337	0.331	0.330	0.300	0.298	0.260
Mean Wages:								
Off SNAP	18.53	18.56	18.53	18.69	18.68	18.47	18.60	18.43
On SNAP	10.38	10.84	12.04	12.54	12.42	12.32	11.91	10.88
After SNAP	11.26	12.11	12.27	12.79	13.04	12.96	13.52	13.91
Lifetime Utility								
Mean (% change)	-0.594	-0.432	-0.210	0.000	0.202	-0.152	-2.149	0.645
CV (% change)	5.419	3.578	1.524	0.000	-1.198	11.606	43.217	-2.771

NOTE: The benchmark is the model simulated at estimated values. Share on SNAP = n. of households (hhs) receiving SNAP benefits/total n. of hhs; take-up rate = n. of hhs receiving SNAP benefits/total n. of eligible hhs. Entry rate, replacement rate and exit rate are at 3 months. Reentry rate is over 1 year after SNAP spell. Turnover rate is over 1 year. Wages on SNAP and off SNAP are received while in the program or not. Wages after SNAP are received the year after exiting SNAP. CV denotes the coefficient of variation.

These results suggest that the current level of benefits is too low to generate significant labor supply effects: any relatively small change around the current level has essentially no impact on the distribution over labor market states. But a much higher level of benefits can actually generate an important disincentive against supplying labor in the market.

This dynamic is reflected in the welfare values reported in the bottom panel of Table 7.2. Reducing benefits from current levels has a monotone negative impact on welfare. The monotonicity is respected for mild increases from current levels: a 25% increase in benefit generates an increase in lifetime utility which is comparable to the decrease generated by a 25% reduction in benefits. But for higher levels of benefit increases, an interesting non-monotonicity occurs. Large increases of 100% and 200% reduce average lifetime utility but a much larger increase of 500% actually increases it. The reason is the labor market dynamics discussed above. A large benefit increase induces husbands to leave the labor market and quit searching so as to avoid the risk of losing the benefit by finding a job generating income above the eligibility threshold. This ex-ante advantage, however, has ex-post costs because without search they give up the possibility of finding a relatively high-paying job that may more than compensate for the lost benefit. On average, these two effects may or may not balance each other out, generating the non-monotonicity we observe.

Benefit Reduction Rate

The SNAP reduction rate measures the amount by which the SNAP benefit is reduced with each additional dollar of net income. The benefit reduction rate of 0.3 has not changed since the 1977 Food Stamp Act. A higher benefit reduction rate lowers program costs by reducing benefits more quickly as earnings rise, which also limits eligibility. As a result, more of the available resources are concentrated among households with the lowest incomes. This implicit tax is unlike other rules that are designed to provide labor supply incentives to low-to-moderate-income workers, such as the Earned Income Tax Credit (EITC), because benefits are reduced at a relatively high rate for each additional dollar of earned income.

Table 7.3 presents the effects of changing the benefit reduction rate from its benchmark value.[55] The higher the benefit reduction rate, the lower the SNAP participation rate. However, with a smaller penalty for additional income (a benefit reduction rate of 0.1) , the take-up rate would increase from 67.9% at benchmark to

[55]The benchmark value is a 30% reduction for dollar earned, as shown by the 0.3 coefficient in front of income in equation (3.1).

81.6% and the average benefit increases from \$455 to \$564. With a larger penalty of 0.5, the take-up rate would also increase, to 73.3%, and the average benefit would increase to \$510. This non-monotone impact is due to the interaction of two channels. Decreasing the benefit reduction rate from the current benchmark value results in only a marginal increase in the population eligible for benefits (from 14.8% to 15.3%), but increases the value of the benefits received by those who are employed. The result is a higher take-up rate and an increase in the proportion of program participants who are employed. When increasing the benefit reduction rate, the population eligible for the benefits decreases much more substantially (from 14.8% to 9.7%). The population that remains eligible is selected in favor of households with the most benefits, increasing the take-up rate and decreasing the proportion of program participants who are employed. This asymmetry in the elasticity of the share of eligible households is due to the way eligibility and benefits are determined. The benefit reduction rate determines the amount of SNAP assistance a household receives rather than its eligibility for the program. As household income increases, benefits decline until the calculated allotment reaches zero, rendering the household effectively ineligible even though the underlying eligibility criteria remain unchanged.

The middle panel of Table 7.3 reports the impact on labor market states and wages for husbands and wives. The impact on husbands' employment level is negligible, are lower both off SNAP and on SNAP. The impact on wives' employment level is present but it is very small, with the proportion of employed moving from 63.2% with no penalty to 62.8% with one-to-one penalty, and the reductions in wages are smaller than those experienced by husbands.

The lack of impact on employment levels is the results of two channels working against each other. Increasing the benefit reduction rate has two effects. First, it dis-incentivizes employment and lower wages because with a higher benefit reduction rate the worker is punished more the more they earn. But the other channel increases the incentive to work and earn more because it provides higher SNAP benefits which help to subsidize job search and accept higher wage offers, everything else equal. At our estimated parameters and in our population, the two channels almost balance each other out in determining employment levels, with small but present adverse effects on wages.

The overall impact on households' welfare is shown in the bottom panel of Table 7.2. The impact of the benefit reduction rate is monotone: lifetime utility decreases as the benefit reduction rate is increased.

Table 7.3: Counterfactual experiments varying the SNAP benefit reduction rate

	SNAP benefit reduction rate						
	Decrease		Benchmark	Increase			
Value	0.0	0.1	0.3	0.5	0.7	0.9	1.0
SNAP							
Share on SNAP	0.132	0.125	0.100	0.071	0.060	0.054	0.051
Share eligible for SNAP	0.155	0.153	0.148	0.097	0.076	0.068	0.064
Take-up rate	0.847	0.816	0.679	0.733	0.791	0.795	0.800
Average benefit	642.21	564.43	454.95	509.56	524.93	546.12	564.53
Entry rate	0.007	0.005	0.005	0.004	0.004	0.004	0.004
Replacement rate	0.043	0.037	0.043	0.055	0.061	0.066	0.068
Exit rate	0.050	0.050	0.053	0.066	0.074	0.072	0.068
Reentry rate	0.188	0.184	0.158	0.153	0.149	0.145	0.135
Turnover rate	1.413	1.419	1.479	1.621	1.671	1.707	1.733
Labor Market							
Husbands							
Labor Market State:							
Employed	0.955	0.955	0.955	0.955	0.955	0.953	0.953
Unemployed	0.023	0.024	0.024	0.025	0.024	0.025	0.025
Out of labor force	0.022	0.021	0.021	0.021	0.021	0.021	0.021
Mean Wages:							
Off SNAP	25.53	25.52	25.40	25.19	25.12	25.04	25.03
On SNAP	16.72	16.90	16.17	15.56	15.15	15.07	15.00
After SNAP	17.62	17.44	17.22	16.57	16.07	15.92	15.86
Wives							
Labor Market State:							
Employed	0.632	0.633	0.631	0.629	0.629	0.629	0.628
Unemployed	0.038	0.037	0.038	0.038	0.036	0.037	0.037
Out of labor force	0.330	0.330	0.331	0.334	0.335	0.334	0.334
Mean Wages:							
Off SNAP	18.69	18.67	18.69	18.52	18.53	18.51	18.51
On SNAP	12.91	12.78	12.54	12.12	11.78	11.56	11.50
After SNAP	13.20	13.12	12.79	12.12	12.08	11.93	11.83
Lifetime Utility							
Mean (% change)	0.344	0.219	0.000	-0.123	-0.151	-0.175	-0.176
CV (% change)	-3.498	-2.289	0.000	1.043	1.451	1.692	1.726

NOTE: The benchmark is the model simulated at estimated values. Share on SNAP = n. of households (hhs) receiving SNAP benefits/total n. of hhs; take-up rate = n. of hhs receiving SNAP benefits/total n. of eligible hhs. Entry rate, replacement rate and exit rate are at 3 months. Reentry rate is over 1 year after SNAP spell. Turnover rate is over 1 year. Wages on SNAP and off SNAP are received while in the program or not. Wages after SNAP are received the year after exiting SNAP. CV denotes the coefficient of variation.

7.3 Reducing SNAP recipients' costs to participate

The presence of costs to receive benefits in public and nutrition assistance programs are consistently found to be one of the main factors that explain less than full take-up rates.[56] About 82% of households eligible to participate in SNAP participate nationally and more than 30 states have less than 95% take-up rates. As discussed in Section 2.2, the source of these costs include the "sludge" induced by the administrative burden to comply with requirements and the stigma and psychological costs associated with receiving social assistance. As specified in Section 3, our model captures these costs in a fairly general way as two types of utility costs: a one-time take-up cost (or certification cost) associated with applying to the program, which we denote with O; and a flow participation cost (or recertification cost) associated with remaining in the program, which we denote with ξ_i.

Table 7.4 examines the effects of eliminating these costs and quantifies how much they contribute to take-up. The first column contains statistics from the simulated benchmark model, the second column presents the results of eliminating only the one-time take-up cost, the third column presents eliminating only the flow participation cost, and the fourth of eliminating both types of costs. We present counterfactual experiments where we fully eliminate the costs to isolate their overall impact on SNAP and labor market outcomes. However, since current policies either directly or indirectly aim to reduce program access by increasing these costs, we conclude this section by interpreting the findings as measuring the effects of moving from the counterfactual state of no costs to the benchmark state of positive costs to evaluate the effect of increased costs.

Eliminating both costs increases SNAP participation by almost 50% and leads to essentially full take-up.[57] Between the two costs, by far the most important is the second one: eliminating the one-time fixed cost increases take-up by less than three percentage points, while eliminating the flow cost increases it by about thirty percentage points, leading to an almost full take-up. In terms of SNAP dynamics, we observe the expected results: reducing costs increases the entry rate while reducing the exit rate.

As shown in the middle panel of Table 7.4, reducing costs of participation and reaching full take-up have negligible impacts on overall employment and labor force

[56]For SNAP, see for example Finkelstein and Notowidigdo (2019); Deshpande and Li (2019); Homonoff and Somerville (2021); Giannella et al. (2024). For a review, see Ko and Moffitt (2020); Currie (2006).

[57]The actual value is not exactly 100% because some households may be entitled to benefits so small that do not rank above the minimum threshold set by the program.

Table 7.4: Counterfactual experiments eliminating the costs to receive SNAP benefits

Value	Benchmark	Eliminating: Take-up cost $O = 0$	Participation cost $\xi_i = 0$	Both costs $O = 0$, $\xi_i = 0$
SNAP				
Share on SNAP	0.100	0.104	0.144	0.148
Share eligible for SNAP	0.148	0.147	0.148	0.149
Take-up rate	0.679	0.705	0.969	0.999
Average benefit	454.95	449.39	405.70	397.12
Entry rate	0.005	0.005	0.005	0.001
Replacement rate	0.043	0.048	0.032	0.034
Exit rate	0.053	0.054	0.050	0.049
Reentry rate	0.158	0.195	0.181	0.195
Turnover rate	1.479	1.508	1.376	1.389
Labor Market				
Husbands				
Labor Market State:				
Employed	0.955	0.956	0.956	0.957
Unemployed	0.024	0.024	0.024	0.024
Out of labor force	0.021	0.021	0.020	0.020
Mean Wages:				
Off SNAP	25.40	25.40	25.69	25.73
On SNAP	16.17	16.38	17.43	17.53
After SNAP	17.22	17.22	17.69	17.85
Wives				
Labor Market State:				
Employed	0.631	0.631	0.629	0.628
Unemployed	0.038	0.038	0.037	0.037
Out of labor force	0.331	0.331	0.334	0.334
Mean Wages:				
Off SNAP	18.69	18.68	18.75	18.74
On SNAP	12.54	12.57	12.69	12.79
After SNAP	12.79	12.89	13.38	13.44
Lifetime Utility				
Mean (% change)	0.000	0.002	0.109	0.114
CV (% change)	0.000	0.031	-1.054	-1.043

NOTE: The benchmark is the model simulated at estimated values. Share on SNAP = n. of households (hhs) receiving SNAP benefits/total n. of hhs; take-up rate = n. of hhs receiving SNAP benefits/total n. of eligible hhs. Entry rate, replacement rate and exit rate are at 3 months. Reentry rate is over 1 year after SNAP spell. Turnover rate is over 1 year. Wages on SNAP and off SNAP are received while in the program or not. Wages after SNAP are received the year after exiting SNAP. CV denotes the coefficient of variation.

participation. However, eliminating both take-up and participation costs lead to higher average wages for both males and females both on and off SNAP. The average wage for male SNAP participants increases by almost $1.50, from $16.17 per hour to $17.53 per hour. The increase for female SNAP participants is smaller (about $0.25 per hour). This reflects that the households choosing not to participate in SNAP in the benchmark are those with the smallest benefits. Eliminating program costs entices these households to participate in SNAP, reducing the average SNAP benefit and, because SNAP serves as a job search subsidy, increasing the average wage accepted both on and off the program.

As expected, eliminating participation costs increase households welfare (see the bottom panel of Table 7.2): eliminating both costs would increase overall household welfare by about a tenth of percentage point.

Interpreting these findings in the opposite direction, from the perspective of increasing program costs from zero to their benchmark value, we conclude that positive program costs reduce SNAP participation and take-up, increase the amount of average SNAP benefits, and increase SNAP turnover. Increasing program costs have little effect on employment, but reduce wages for workers both on and off SNAP and reduce lifetime welfare.

7.4 Contextualizing findings from counterfactual experiments

The counterfactual experiments presented in this section consistently show that policies designed to limit access to SNAP and promote self-sufficiency can lead to reductions in SNAP participation, acceptance of lower-wage job offers, and overall lower lifetime utility, while simultaneously increasing administrative costs to taxpayers through higher cycling on and off SNAP. Each of the experiments is closely relevant to the current or recent SNAP policy debate.

Work requirements. As of November 1, 2025, H.R. 1 (the One Big Beautiful Bill Act) has mandated stricter federal SNAP work requirements for all states, precluding states from using broad waivers that exempt ABAWDs from work requirements, expanding the age of participants subject to work requirements, and narrowing the criteria for receiving specific types of exemptions. Our experiments showed that work requirements decrease SNAP participation and benefits, more than double unemployment for male workers, and decrease wages for workers on SNAP and, for males, after SNAP. Notably, wages for female workers off SNAP marginally increase by $0.08 per hour. These findings are consistent with studies using recent data to examine stricter SNAP work requirements. Multiple studies have found large reductions in

SNAP participation among groups subject to work rules, such as ABAWDs (Cook and East 2024; Gray et al. 2023). Additionally, studies linking SNAP administrative data with unemployment insurance earnings records have found either small or no effects on employment (Cook and East 2024), suggesting that reductions in SNAP participation associated with the implementation of work requirements are not due to employment gains, but to instances of noncompliance or administrative burden.

Our estimated impacts of SNAP work requirements on employment and wages are larger and generally opposite in sign than those found in the literature where the evidence, while mixed, leans towards no large average improvement in labor market outcomes for SNAP participants and low-wage workers. Gray et al. (2023) find no average effect on employment in their main model specifications and suggestive evidence of increases in earnings for a narrow subset of participants with earnings between the 69th and 81st percentile of the distribution. Harris (2021) found small positive effects on the likelihood of being employed and hours worked for several subgroups of ABAWDs, including those living in urban areas with generally greater job availability; however, the effects were modest and not robust across specifications.

Benefit allotments and the reduction rate. The National Academies of Sciences reviewed SNAP benefit adequacy including assessments of the maximum benefit allotment and the benefit reduction rate (2013). Several studies have estimated effects of exogenous changes in the maximum SNAP benefit amount. The 2009 SNAP benefit increase that was part of the American Reinvestment and Recovery Act (ARRA) national stimulus package was associated with an improvement in food security (Nord and Prell 2011). Wheaton and Kwon (2022) also exploited an exogenous increase in the maximum benefit amount created through reevaluating the Thrifty Food Plan and found that a 21% exogenous increase in SNAP benefits increased the average SNAP benefit by $37 (a 19.1% change) and reduced the number of people in poverty by 4.7%. The Urban Institute's TRIM model simulated percentage increases in the maximum SNAP allotment and its effect on SNAP participation, poverty, and earnings and showed that a 20% increase in SNAP benefits leads to a 13% reduction in child poverty and lower earnings and hours worked (National Academies of Sciences, Engineering, and Medicine 2019). However, the reduction in poverty in Wheaton and Kwon (2022) reflects including SNAP benefits among other income and transfers, rather than an endogenous effect on employment or wages and the analysis by the National Academies that shows lower earnings and hours worked associated with SNAP benefit increase guarantee this result through assumptions based on Hoynes and Schanzenbach's (2012) SNAP-related employment effects from the 1960s and

1970s. As such, their results are not directly comparable with those from our analysis which jointly models SNAP participation and employment decisions.

Other studies have exploited the Emergency Allotment benefits provided in many, but not all, states during the COVID-19 pandemic to analyze the effect of increases in SNAP benefits on outcomes. Steffen and Kim (2024) found a $183 higher average monthly SNAP benefit and 0.35% higher percentage of households participating in SNAP in states with the emergency allotment benefits than those without them. Additionally, Bitler and Schanzenbach (2025) estimated that increases in SNAP benefits from Emergency Allotments reduced food insufficiency by 9%. These studies help to understand how changes in the maximum SNAP benefit amount translate into changes in monthly benefits, SNAP participation, and food hardships, but are solely descriptive and abstract from examining connections between SNAP participation and employment decision.

The studies above estimated effects of exogenous changes in the maximum SNAP benefit amount, but in absence of changes to or variation in the benefit reduction rate of 0.30, studies have solely simulated the effects of changes in the benefit reduction rate. National Academies of Sciences, Engineering, and Medicine (2013) discussed the design tradeoffs associated with changing the benefit reduction rate but did not simulate the effects of those changes. More recent policy discussion has discussed lowering the rate as a means of addressing the benefit cliff and reducing total program costs (Rachidi and Randolph 2025; Ilin and Sanchez 2023), but without simulating the effects of benefit reduction rate changes on SNAP participation and employment or earnings. Our paper remains the only study that has explicitly modeled and simulated the effects of changing the benefit reduction rate on these outcomes.

Participant costs to participate. Our findings show that positive program entry and flow costs reduce SNAP participation and take-up, increase benefit amounts, and reduce wages and lifetime welfare. This is consistent other studies examining the effects of changes in SNAP application and participation costs on outcomes. Finkelstein and Notowidigdo (2019) find that reducing transaction and information costs increases take-up by 5 to 12 percentage points (83 to 200% increase in the take-up rate) through sharing eligibility information with participants and helping them complete applications, which is larger than our 4.8 percentage point increase (representing a 48% increase in the take-up rate). Giannella et al. (2024) find that alternative intake processes designed to increase interview flexibility increases approval rates by 6 percentage points and SNAP participation 1 to 5 months after application by 2 to 3 percentage points. GSA's OES (2024) recently tested text outreach campaigns that linked applicants to a redesigned document uploader. Although denials were reduced, there were no meaningful impacts on overall SNAP enrollment. Finally, several studies used text message or other behavioral interventions to reduce application or participation costs; some studies found significant improvements in SNAP participation, participation in SNAP services, and other outcomes (Muth et al. 2025; Rowe et al. 2024), while others found no meaningful changes (Rogers 2024). All of these studies focus on SNAP procedural outcomes related to application approval and participation; none examine related effects on employment and lifetime welfare.

8 Conclusion

As policymakers debate work requirements and administrative reforms in means-tested programs, understanding how households respond to program design is critical. This paper develops and estimates a dynamic structural model of household labor supply and SNAP participation that incorporates detailed program rules, administrative costs, and intra-household decision-making. The model rationalizes two salient empirical puzzles of low take-up rates and limited labor supply responses to work requirements even when households have full information and attachment to the labor market.

Four main findings emerge from our analysis. First, the well-known incomplete take-up of the SNAP program can be fully explained by the participation costs faced by households. Among these costs, the flow cost of remaining enrolled is quantitatively most significant: eliminating it would increase the take-up from 67.9% to 96.9%.

Second, counterfactual policy experiments show that adding more stringent work requirements to receive SNAP benefits sharply reduces participation without significantly increasing employment levels. The only noticeable employment effects are composition effects in jobs accepted, some of which pay lower wages. Under the most stringent work requirement policy we consider, the overall proportion of SNAP participants drops from 10% to 2.3%. Our household search model shows that the main mechanism generating these results is the interaction of labor supply decisions of multiple adults within the same household unit. Most eligible households in our sample already have at least one member employed full-time, limiting any labor supply adjustments to, typically, women who are mothers. For these potential workers, increasing labor supply is sufficiently costly that the loss of SNAP benefits at current levels does not induce large participation changes.

Third, our counterfactual policy experiments produce a counterintuitive result:

over a plausible range, increasing SNAP benefits leads to better labor market outcomes both in terms of larger participation and higher wages. In the model, this result arises from labor market frictions that make job search costly. SNAP benefits help to finance job search, leading–in our population and at at our estimated values–to better labor market outcomes. For example, an increase of 50% in the maximum SNAP benefits leads to a 1.3% increase in after-SNAP wages for women.

Fourth, our counterfactual policy experiments imply that a lower benefit reduction rate would be one of the most effective policies to increase SNAP take-up. The reduction rate is the amount by which the SNAP benefit is reduced as a function of earned income. Reducing the penalty from the current 30% to zero would increase the overall share of households in our population on SNAP to 13.2% (from 10% at benchmark) and the take-up rate to 84.7% (from 67.9% at benchmark). Interestingly, the impact on men's employment level is negligible but the impact on wages is positive. These outcomes reflect two opposing forces: a lower benefit reduction rate incentivizes employment by reducing the earnings penalty, but also raises benefits and dis-incentivizes employment through an income effect. In our estimates, the net effect is higher participation and higher wages.

These findings challenge two prominent claims in the policy debate about the link between SNAP participation and employment. First, weak connections between SNAP participation and employment are often attributed primarily to disability or low labor force attachment independent of any work requirements. In contrast, our model generates similar patterns for healthy, working-age households with high rates of labor force participation at the household level. Second, SNAP benefit rules are frequently argued to create large work disincentives. Even under sizable counterfactual changes to benefit parameters, we find modest labor supply disincentives for a representative sample of married couples.

The results have important implications for welfare program design. Administrative burden or "sludge" costs create significant barriers to access without advancing policy objectives to promote employment. In fact, our analysis suggests that these administrative barriers lead to an outcome where many households who would benefit substantially from SNAP do not participate, yet removing these barriers would not induce meaningful work disincentives. More effective reforms may therefore prioritize streamlining program access and reducing the implicit tax on low-earners created by the benefit reduction rate. Our welfare analysis indicates that such changes can improve household well-being while minimizing labor supply distortions.

More broadly, the results demonstrate the value of taking into account dynamic considerations when analyzing means-tested programs. By explicitly modeling household optimization under institutional constraints, we distinguish behavioral responses from compositional effects, evaluate multiple counterfactual policy reforms, and quantify welfare implications that are difficult to infer from reduced-form evidence alone. Incorporating realistic household decision-making into program design can both improve targeting and enhance household welfare.

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A Additional Institutional Background

To simplify eligibility determination and reduce administrative burden, households receiving benefits from other means-tested assistance programs including Supplemental Security Income (SSI), General Assistance (GA), or Temporary Assistance for Needy Families (TANF) are automatically eligible for SNAP and are not subject to income or resource limits. We capture these household-specific costs in a reduced-form way through the heterogeneous participation cost ξ.

For certain participants, particularly able-bodied adults without dependents (ABAWDs), work requirements further condition eligibility on employment or participation in employment or training activities. Although our model does not explicitly incorporate these requirements, our counterfactual experiments in Section 7 examine how such constraints affect both participation and labor supply decisions, building on the empirical literature that has documented significant participation effects but limited employment responses (Cook and East 2024, 2023; Harris 2021; Gray et al. 2023). Also, since we are looking at couples, most of individuals in our sample do in fact have dependents (see Table 4.1).

Program participants must periodically recertify their eligibility, generally every 12 months. But some states set shorter or longer windows based on household characteristics and circumstances such as income volatility, employment status, and household composition and state income-reporting requirements. Some states have attempted to reduce these barriers by allowing online applications and recertifications. Since 2017, 44 states have allowed online applications, and 34 permit online recertification. Given data limitations, we cannot fully capture state-level differences. However, we allow for household-specific heterogeneity in the flow cost that needs to be paid to remain in the program (participation cost or recertification cost, denoted by ξ). This heterogeneity capture in a reduced-form way the across states differences.

Household assets are part of the eligibility criteria but we completely abstract from them in our analysis. One reason is tractability: introducing savings and assets in our household search model is challenging and identification with the data at our disposal even more so.[58] The second reason is empirical: in our sample, assets are very low and therefore should not play an important role in household decisions. The median of total household liquid wealth (cash, stocks, bonds, and any other assets held at financial institutions) is \$2,500; the 25th percentile is \$400. Among SNAP

[58]To the best of our knowledge, García-Pérez and Rendon (2020) is the only published example of an estimated household search model with assets and savings.

households, the 25th percentile has \$22.50 in assets; the median \$433; and the 75th percentile about \$1,850. Moreover, 18% of households have zero assets.

The SNAP Employment and Training (E&T) program serves as a key mechanism for states to support employability among work registrants and to help ABAWDs fulfill their work requirements. SNAP E&T provides services, such as job search assistance, job skills training, education, work experience, or workfare, and supports, such as assistance with transportation and child care costs. The program expanded with the passage of the 2018 Farm Bill, which introduced mandatory case management and emphasized the need for supervised, rather than self-directed, job search activities. SNAP E&T also provides up to 90 days of job retention services to individuals who have exited SNAP due to increased earnings. States maintain flexibility in program design, which results in significant variation in services offered, geographic coverage, and partnerships with workforce or community-based providers. States may operate SNAP E&T programs as either voluntary or mandatory. In voluntary programs, participation is offered but not required, whereas mandatory programs compel participation from designated groups such as ABAWDs or certain work registrants as a condition of continued benefit receipt. Programs may differ by region within a single state, with some areas implementing mandatory E&T while others offer voluntary options due to availability of services. While work registrants form the primary eligible population for SNAP E&T, states retain discretion to target subgroups and to exempt individuals based on logistical or service-related constraints. As described above, these programs are relevant for the objective of this paper because they can affect labor market dynamics. However, the institutional context and actual implementation of the programs is very uneven and quite involved. We judged that the overall impact of these programs is relatively second order with respect to other institutional features we incorporate in the program and therefore left, once again, the heterogeneous parameter ξ capture any impact they may have.

B Data Appendix

Our raw sample is Wave 1 of the 2018 SIPP, which has calendar year 2017 as its retrospective reference period.[59] This full sample includes 26,215 households. We first restrict this to households in the lower 48 contiguous US states and the District of Columbia,[60] leaving 25,879 households. To align with our theoretical focus on couples,

[59]The data and documentation are available for download at https://www.census.gov/programs-surveys/sipp/data/datasets/2018-data/2018.html.

[60]Variable: *tehc_st*

we restrict this sample to households where the adults are married or cohabiting,[61] leaving 17,459 households. For each household, we count the number of children present as any member under age 18 or any member under 25 who is not in school and not working, recoding any values greater than 3 as 3.[62] We next keep households with only two (non-child) members between ages 18 to 59, and remove any with members over age 59, leaving 8,006 households. We next remove households where any adult member has any college education, is currently in school, active duty military, retired, or self-employed, or reports a work limiting disability,[63] leaving 2,071 households. Finally, we remove households with multiple distinct SNAP units or additional transfer income,[64] yielding 2,030 households.

To prepare the sample for estimation, if wages or hours are missing, we first attempt to impute them from the surrounding months, and drop any households for which we are unable to do so, leaving 1,965 households. For each individual, we use the variables in the SIPP recording up to 7 total jobs over the sample period to assign a job for each month.[65] If multiple jobs are reported within a month, for that month we take the job with the highest reported monthly income as the current job, assigning hours based on the corresponding average monthly hours reported for that job number.[66] We convert monthly earnings to an hourly wage using these reported hours and assuming 4.3 work weeks per month. To convert monthly SNAP amounts[67] to the same scale for estimation, we divide the benefit value by (365.25/12) and then by 16.

To reduce the influence of outliers in reported wages, which may reflect measurement error, we winsorize the data values at the 2.5th and 97.5th percentile. Jobs with reported hours greater than or equal to 35 are classified as full-time. Households that are on SNAP for any portion of a month are labeled as participating in SNAP for that month. Individuals who are not working for any portion of a month are set as unemployed or out of the labor force for that month, depending on the reason reported in the survey.[68]

---

[61] Variable: *erelrpe*

[62] Variables: *tage_ehc*, *tpearn*, *enj_nowrk7*

[63] Variables: *eeduc*, *enj_nowrk3*, *enj_nowrk7*, *edisabl*, *eedenroll*, *eeveret*, *eaf*

[64] Variables: *esnap_own*, *tptrninc*

[65] Variables: *tjb1_msumalt* − *tjb7_msumalt*

[66] Variables: *tjb1_mwkhrs* − *tjb7_mwkhrs*

[67] Variable: *tsnap_amt*

[68] Variables: *rmesr*, *rmwklkg*

C Value Functions: Additional Derivations

We derive here the value functions not explicitly discussed in the main text.

The value function of a household where the wife is employed and the husband is unemployed (denoted by T in Table 3.1), with a number of children k, and participating in the SNAP program ($a = 1, b > 0$) is:

$$
\begin{aligned}
(\rho + \pi_0 + \pi_1 + \lambda_e + \eta + \lambda_u) T[w, h, s', k, 1] &= (1 - 2\alpha_k) \ln(wh + t_u + b) \quad \text{(C.1)} \\
&+ \alpha_k \ln(1 - h) + \alpha_k \ln(1 - s') - \xi \\
+\pi_0 \max \left\{ \begin{array}{c} T[w, h, s', k-1, a], Q[w, h, k-1, a], \\ U[s, s', k-1, a], Z[k-1, a], R[s', k-1, a], R[s, k-1, a] \end{array} \right\}_{a \in \{0,1\}} \\
+\pi_1 \max \left\{ \begin{array}{c} T[w, h, s', k+1, a], Q[w, h, k+1, a], \\ U[s, s', k+1, a], Z[k+1, a], R[s', k+1, a], R[s, k+1, a] \end{array} \right\}_{a \in \{0,1\}} \\
+\lambda_e \int \max \left\{ T[w, h, s', k, 1], \left\{ T[\tilde{w}, \tilde{h}, s', k, a], Q[\tilde{w}, \tilde{h}, k, a] \right\}_{a \in \{0,1\}} \right\} dF(\tilde{w}, \tilde{h}) \\
+\eta \left\{ U[s, s', k, a], Z[k, a], R[s', k, a], R[s, k, a] \right\}_{a \in \{0,1\}} \\
+\lambda_u \int \max \left\{ \begin{array}{c} T[w, h, s', k, a], V[w, h, \tilde{w}, \tilde{h}, k, a], \\ T[\tilde{w}, \tilde{h}, s, k, a], Q[\tilde{w}, \tilde{h}, k, a] \end{array} \right\}_{a \in \{0,1\}} dF(\tilde{w}, \tilde{h})
\end{aligned}
$$

A symmetric value function can be derived when the wife is unemployed and the husband is employed. A similar value function can be derived when the starting state is *not* participating in SNAP. In that case, any transition into the SNAP program requires paying the take-up cost O.

The value function of a household where the wife is employed and the husband is out of the labor force (denoted by Q in Table 3.1), with a number of children k, and participating in the SNAP program ($a = 1, b > 0$) is:

$$
\begin{aligned}
(\rho + \pi_0 + \pi_1 + \lambda_e) Q[w,h,k,1] &= (1 - 2\alpha_k) \ln(wh + t_o + b) \\
&\quad + \alpha_k \ln(1-h) - \xi \\
+\pi_0 \max \left\{ \begin{array}{c} Q[w,h,k-1,a], T[w,h,s',k-1,a], \\ R[s,k-1,a], Z[k-1,a], U[s,s',k-1,a], R[s',k-1,a] \end{array} \right\}_{a\in\{0,1\}} \\
+\pi_1 \max \left\{ \begin{array}{c} Q[w,h,k+1,a], T[w,h,s',k+1,a], \\ R[s,k+1,a], Z[k+1,a], U[s,s',k+1,a], R[s',k+1,a] \end{array} \right\}_{a\in\{0,1\}} \\
+\lambda_e \int \max \left\{ Q[w,h,k,1], \left\{ Q[\tilde{w},\tilde{h},k,a], T[\tilde{w},\tilde{h},s',k,a] \right\}_{a\in\{0,1\}} \right\} dF(\tilde{w},\tilde{h}) \\
+\eta \left\{ U[s,s',k,a], Z[k,a], R[s',k,a], R[s,k,a] \right\}_{a\in\{0,1\}}
\end{aligned} \tag{C.2}
$$

A symmetric value function can be derived when the wife is out of the labor force and the husband is employed. A similar value function can be derived when the starting state is *not* participating in SNAP. In that case, any transition into the SNAP program requires paying the take-up cost O.

The value function of a household where the wife is unemployed and the husband is out of the labor force (denoted by R in Table 3.1), with a number of children k, and participating in the SNAP program ($a = 1, b > 0$) is:

$$
\begin{aligned}
(\rho + \pi_0 + \pi_1 + \lambda_u) R[s,k,1] &= (1 - 2\alpha_k) \ln(t_u + t_o + b) \\
&\quad + \alpha_k \ln(1-s) - \xi \\
&\quad +\pi_0 \max \left\{ \begin{array}{c} R[s,k-1,a], U[s,s',k-1,a], \\ Z[k-1,a], R[s',k-1,a] \end{array} \right\}_{a\in\{0,1\}} \\
&\quad +\pi_1 \max \left\{ \begin{array}{c} R[s,k+1,a], U[s,s',k+1,a], \\ Z[k+1,a], R[s',k+1,a] \end{array} \right\}_{a\in\{0,1\}} \\
+\lambda_u \int \max \left\{ R[s,k,a], Q[\tilde{w},\tilde{h},k,a], T[\tilde{w},\tilde{h},s',k,a] \right\}_{a\in\{0,1\}} & dF(\tilde{w},\tilde{h})
\end{aligned} \tag{C.3}
$$

A symmetric value function can be derived when the wife is out of the labor force and the husband is unemployed. A similar value function can be derived when the starting state is *not* participating in SNAP. In that case, any transition into the SNAP program requires paying the take-up cost O.

D Estimation Details and List of Moments

In reference to (6.1), the weighting matrix is a diagonal matrix where each entry is the inverse variance of the corresponding moment. We estimate the moment variances by bootstrapping the sample 200 times with replacement. Any moments that are calculated with data from fewer than 5 total households in the sample have their weights set to zero. To estimate the model, we apply a bounded global derivative-free optimization algorithm (particle swarm optimization)[69] to generate credible starting values for the 25 parameters listed in Table 6.1, and then we obtain point estimates by applying the simplex method of local derivative-free optimization, which is a modification of the Nelder Mead algorithm.

Tables D.1 through D.8 list the full set of moments, their sample values, and the values from our labor market simulation using the estimated parameter values. All distributions are discretized to a fixed number of grid points, which we use to find the fixed point of the value functions.[70] In the simulations, we interpolate any intermediate values. Integrals in expectation terms are numerically evaluated at these grid points using gaussian quadrature for the lognormal wage distributions. Each iteration simulates $N = 1965$ household work histories for 480 months, with each spouse starting out in as unemployed and off SNAP in month 0. Cross sectional moments are taken to be the household values in month 468 of the simulation and month 1 in the data. Dynamic moments are calculated based on all 3- or 6-month intervals in the data (e.g. month 1 to 4, month 2 to 5, etc.).

D.1 Details for welfare calculations

In summarizing the distributional effects of our counterfactual simulations, we calculate lifetime utility for a household as the present discounted value in month 0 of that household's flow utility over their 480 simulated career:

$$PV_{utility} = \int_{0}^{480} u(t)e^{-\rho t}dt \tag{D.1}$$

[69]Population size = 100, generations = 25, max velocity rate = 0.20, w = 0.7, c1 = 1.8, c2 = 1.5

[70]Wage distributions have 15 evenly spaced grid points between 0.01 and 75, and the ξ and ϵ distributions have 3 grid points set at the 25th, 50th, and 75th percentiles.

Because our simulations are recorded as a discrete time snapshot at each of the 480 months, we assume constant flow utility within a given month. That is,

$$u(m) = \int_{m}^{m+1} u_m e^{-\rho t} dt \tag{D.2}$$

$$= u_m \int_{m}^{m+1} e^{-\rho t} dt \tag{D.3}$$

$$= u_m \frac{e^{-\rho m} - e^{-\rho(m+1)}}{\rho}$$

such that the present value of lifetime utility for the household becomes

$$PV_{utility} = \sum_{m=0}^{479} u(m). \tag{D.4}$$

Table D.1: Moments for Husbands

#	Description	Condition	Sample	Simulation
1	Mean wage	husbands on SNAP	16.229	16.171
2	Std wage	husbands on SNAP	11.588	6.056
3	Skew wage	husbands on SNAP	3.068	0.474
4	FT share	husbands on SNAP	0.721	0.751
5	PT share	husbands on SNAP	0.058	0.067
6	UE share	husbands on SNAP	0.120	0.139
7	NP share	husbands on SNAP	0.101	0.043
8	Mean wage	husbands off SNAP	23.857	25.411
9	Std wage	husbands off SNAP	13.736	9.784
10	Skew wage	husbands off SNAP	1.541	1.120
11	FT share	husbands off SNAP	0.915	0.956
12	PT share	husbands off SNAP	0.036	0.014
13	UE share	husbands off SNAP	0.027	0.011
14	NP share	husbands off SNAP	0.023	0.019

Table D.2: Moments for Wives

#	Description	Condition	Sample	Simulation
15	Mean wage	wives on SNAP	14.706	12.553
16	Std wage	wives on SNAP	9.800	6.177
17	Skew wage	wives on SNAP	2.278	1.083
18	FT share	wives on SNAP	0.255	0.175
19	PT share	wives on SNAP	0.163	0.176
20	UE share	wives on SNAP	0.087	0.093
21	NP share	wives on SNAP	0.495	0.557
22	Mean wage	wives off SNAP	17.852	18.692
23	Std wage	wives off SNAP	9.869	8.214
24	Skew wage	wives off SNAP	1.644	1.143
25	FT share	wives off SNAP	0.546	0.543
26	PT share	wives off SNAP	0.137	0.120
27	UE share	wives off SNAP	0.035	0.032
28	NP share	wives off SNAP	0.283	0.305

Table D.3: Moments for Households labor force status

#	Description	Condition	Sample	Simulation
29	NP NP share	households on SNAP	0.048	0.002
30	NP UE share	households on SNAP	0.005	0.000
31	NP PT share	households on SNAP	0.014	0.040
32	NP FT share	households on SNAP	0.034	0.001
33	UE NP share	households on SNAP	0.043	0.064
34	UE UE share	households on SNAP	0.014	0.017
35	UE PT share	households on SNAP	0.024	0.020
36	UE FT share	households on SNAP	0.038	0.038
37	PT NP share	households on SNAP	0.034	0.056
38	FT NP share	households on SNAP	0.370	0.436
39	PT UE share	households on SNAP	0.000	0.003
40	FT UE share	households on SNAP	0.067	0.073
41	PT PT share	households on SNAP	0.005	0.003
42	PT FT share	households on SNAP	0.019	0.005
43	FT PT share	households on SNAP	0.120	0.112
44	FT FT share	households on SNAP	0.163	0.130
45	NP NP share	households off SNAP	0.003	0.000
46	NP UE share	households off SNAP	0.003	0.000
47	NP PT share	households off SNAP	0.002	0.004
48	NP FT share	households off SNAP	0.015	0.014
49	UE NP share	households off SNAP	0.007	0.000
50	UE UE share	households off SNAP	0.001	0.000
51	UE PT share	households off SNAP	0.005	0.000
52	UE FT share	households off SNAP	0.015	0.010
53	PT NP share	households off SNAP	0.006	0.005
54	FT NP share	households off SNAP	0.266	0.301
55	PT UE share	households off SNAP	0.001	0.001
56	FT UE share	households off SNAP	0.031	0.031
57	PT PT share	households off SNAP	0.008	0.003
58	PT FT share	households off SNAP	0.021	0.007
59	FT PT share	households off SNAP	0.122	0.112
60	FT FT share	households off SNAP	0.495	0.512

Table D.4: Moments for households by household size

#	Description	Condition	Sample	Simulation
61	LF LF share	households on SNAP, 0-1 kids	0.149	0.248
62	LF LF share	households on SNAP, 2-3 kids	0.303	0.153
63	LF OLF share	households on SNAP, 0-1 kids	0.077	0.066
64	LF OLF share	households on SNAP, 2-3 kids	0.370	0.489
65	OLF LF share	households on SNAP, 0-1 kids	0.019	0.002
66	OLF LF share	households on SNAP, 2-3 kids	0.034	0.039
67	OLF OLF share	households on SNAP, 0-1 kids	0.019	0.000
68	OLF OLF share	households on SNAP, 2-3 kids	0.029	0.002
69	LF LF share	households off SNAP, 0-1 kids	0.454	0.547
70	LF LF share	households off SNAP, 2-3 kids	0.244	0.129
71	LF OLF share	households off SNAP, 0-1 kids	0.130	0.106
72	LF OLF share	households off SNAP, 2-3 kids	0.149	0.200
73	OLF LF share	households off SNAP, 0-1 kids	0.014	0.006
74	OLF LF share	households off SNAP, 2-3 kids	0.006	0.012
75	OLF OLF share	households off SNAP, 0-1 kids	0.003	0.000
76	OLF OLF share	households off SNAP, 2-3 kids	0.001	0.000

Table D.5: Moments for SNAP participation and household size

#	Description	Condition	Sample	Simulation
77	% with 0 kids	all households	0.303	0.354
78	% with 1 kid	all households	0.262	0.271
79	% with 2 kids	all households	0.256	0.220
80	% with 3 kids	all households	0.179	0.156
81	% on SNAP	all households	0.106	0.101
82	% on SNAP	households with 0-1 kids	0.050	0.051
83	% on SNAP	households with 2-3 kids	0.179	0.184
84	Mean SNAP benefit	households with 0-1 kids	0.530	0.591
85	Mean SNAP benefit	households with 2-3 kids	0.717	1.084
86	Std SNAP benefit	households with 0-1 kids	0.260	0.305
87	Std SNAP benefit	households with 2-3 kids	0.338	0.441
88	% on SNAP	households LF LF	0.071	0.062
89	% on SNAP	households LF OLF	0.159	0.169
90	% on SNAP	households OLF LF	0.244	0.200
91	% on SNAP	households OLF OLF	0.625	1.000
92	Mean SNAP benefit	households LF LF	0.606	0.691
93	Mean SNAP benefit	households LF OLF	0.728	1.088
94	Mean SNAP benefit	households OLF LF	0.734	1.052
95	Mean SNAP benefit	households OLF OLF	0.618	1.583
96	Std SNAP benefit	households LF LF	0.321	0.368
97	Std SNAP benefit	households LF OLF	0.327	0.455
98	Std SNAP benefit	households OLF LF	0.379	0.430
99	Std SNAP benefit	households OLF OLF	0.248	0.000

Table D.6: Individual dynamic labor force moments

#	Description	Condition	Sample	Simulation
100	E to U transitions over 3 months	husbands off snap	0.010	0.015
101	E to U transitions over 3 months	wives off snap	0.012	0.015
102	E to U transitions over 3 months	husbands on snap	0.019	0.025
103	E to U transitions over 3 months	wives on snap	0.018	0.014
104	U to E transitions over 3 months	husbands off snap	0.444	0.503
105	U to E transitions over 3 months	wives off snap	0.386	0.346
106	U to E transitions over 3 months	husbands on snap	0.333	0.554
107	U to E transitions over 3 months	wives on snap	0.461	0.489

Table D.7: Household dynamic labor force moments

#	Description	Condition	Sample	Simulation
108	E E to E U over 3 months	E E households off snap	0.011	0.014
109	E E to U E over 3 months	E E households off snap	0.009	0.012
110	E E to E E over 3 months	E E households off snap	0.970	0.959
111	E E to U U over 3 months	E E households off snap	0.001	0.000
112	E E to E U over 3 months	E E households on snap	0.020	0.012
113	E E to U E over 3 months	E E households on snap	0.013	0.020
114	E E to E E over 3 months	E E households on snap	0.950	0.944
115	E E to U U over 3 months	E E households on snap	0.000	0.000
116	E U to E U over 3 months	E U households off snap	0.632	0.620
117	E U to U E over 3 months	E U households off snap	0.002	0.004
118	E U to E E over 3 months	E U households off snap	0.272	0.353
119	E U to U U over 3 months	E U households off snap	0.010	0.007
120	E U to E U over 3 months	E U households on snap	0.547	0.419
121	E U to U E over 3 months	E U households on snap	0.047	0.016
122	E U to E E over 3 months	E U households on snap	0.326	0.527
123	E U to U U over 3 months	E U households on snap	0.000	0.002
124	U E to E U over 3 months	U E households off snap	0.016	0.010
125	U E to U E over 3 months	U E households off snap	0.555	0.472
126	U E to E E over 3 months	U E households off snap	0.382	0.507
127	U E to U U over 3 months	U E households off snap	0.008	0.006
128	U E to E U over 3 months	U E households on snap	0.000	0.010
129	U E to U E over 3 months	U E households on snap	0.630	0.459
130	U E to E E over 3 months	U E households on snap	0.348	0.500
131	U E to U U over 3 months	U E households on snap	0.000	0.011
132	U U to E U over 3 months	U U households off snap	0.269	0.385
133	U U to U E over 3 months	U U households off snap	0.077	0.077
134	U U to E E over 3 months	U U households off snap	0.231	0.231
135	U U to U U over 3 months	U U households off snap	0.423	0.308
136	U U to E U over 3 months	U U households on snap	0.063	0.285
137	U U to U E over 3 months	U U households on snap	0.375	0.291
138	U U to E E over 3 months	U U households on snap	0.063	0.253
139	U U to U U over 3 months	U U households on snap	0.438	0.146

Table D.8: Household dynamic transitions

#	Description	Condition	Sample	Simulation
140	0 kids to 1 kids over 6 months	households with 0 kids	0.039	0.129
141	3 kids to 2 kids over 6 months	households with 3 kids	0.035	0.160
142	% joining SNAP over 6 months	households off snap	0.012	0.024
143	% leaving SNAP over 6 months	households on snap	0.081	0.196
144	SNAP take-up rate	households eligible for snap	0.618	0.649

E Additional Policy Experiments Results

Table E.1: Results from Work Requirement Counterfactual Experiments

	SNAP Work Requirement Regime			
Statistic	Either in LF	Either EM	Both in LF	Both EM
Share on SNAP	0.100	0.095	0.044	0.023
0 kids	0.034	0.034	0.033	0.011
1 kid	0.072	0.072	0.055	0.037
2 kids	0.128	0.111	0.073	0.041
3+ kids	0.260	0.249	0.009	0.001
Share eligible for SNAP	0.147	0.141	0.057	0.033
SNAP take-up rate	0.679	0.674	0.775	0.700
Average SNAP benefit	454.58	451.90	370.13	350.61
0 kids	247.62	234.17	251.31	235.20
1 kid	316.49	313.36	329.78	305.17
2 kids	443.06	446.71	463.27	443.54
3+ kids	591.07	586.19	708.34	611.08
Entry rate (3 months)	0.005	0.005	0.005	0.001
Entry rate (6 months)	0.010	0.009	0.008	0.003
Exit rate (3 months)	0.051	0.055	0.097	0.066
Exit rate (6 months)	0.107	0.105	0.188	0.153
Replacement rate (3 months)	0.043	0.048	0.111	0.044
Reentry rate (1 year)	0.158	0.224	0.137	0.194
Turnover rate (1 year)	1.477	1.477	2.000	1.721
Mean time on SNAP (per 48 months)	18.05	18.30	10.37	12.39
Employment rate on SNAP	0.584	0.631	0.753	1.000
Employment rate off SNAP	0.817	0.811	0.799	0.785
Mean wages after SNAP (H)	17.26	16.51	15.57	16.07
Mean wages after SNAP (W)	12.81	12.91	13.03	13.07
Husbands on SNAP				
Unemployed	0.140	0.064	0.246	0.000
Not in labor force	0.042	0.051	0.000	0.000
Employed	0.818	0.885	0.754	1.000
Mean wage	16.16	15.39	12.58	11.79
Husbands off SNAP				
Unemployed	0.011	0.017	0.014	0.023
Not in labor force	0.018	0.018	0.024	0.023
Employed	0.971	0.965	0.962	0.954
Mean wage	25.39	25.35	25.03	24.86
Wives on SNAP				
Unemployed	0.091	0.067	0.248	0.000
Not in labor force	0.560	0.555	0.000	0.000
Employed	0.350	0.378	0.752	1.000
Mean wage	12.54	12.55	11.02	10.62
Wives off SNAP				
Unemployed	0.032	0.035	0.028	0.040
Not in labor force	0.305	0.309	0.337	0.344
Employed	0.663	0.657	0.635	0.616
Mean wage	18.69	18.75	18.77	18.77

Table E.2: Results from Maximum SNAP Benefit Counterfactual Experiments

	Maximum SNAP Benefit								
	Decrease				Benchmark	Increase			
Statistic	100%	75%	50%	25%		25%	50%	75%	100%
Share on SNAP	0.000	0.025	0.050	0.072	0.100	0.119	0.133	0.143	0.156
0 kids	0.000	0.012	0.017	0.025	0.035	0.040	0.043	0.049	0.053
1 kid	0.000	0.020	0.039	0.051	0.072	0.081	0.092	0.090	0.090
2 kids	0.000	0.016	0.052	0.084	0.128	0.149	0.174	0.198	0.223
3+ kids	0.000	0.074	0.135	0.196	0.259	0.315	0.349	0.373	0.416
Share eligible for SNAP	0.000	0.058	0.085	0.121	0.148	0.149	0.153	0.156	0.164
SNAP take-up rate	0.000	0.432	0.587	0.601	0.679	0.794	0.869	0.919	0.950
Average SNAP benefit	0.00	147.78	269.08	370.59	454.95	593.65	766.52	929.45	1095.59
0 kids	0.00	85.06	161.43	211.63	246.14	298.92	383.66	486.28	562.88
1 kid	0.00	114.67	197.73	264.33	316.49	422.01	542.11	661.99	793.21
2 kids	0.00	143.59	255.74	354.53	443.79	588.98	763.06	930.50	1097.30
3+ kids	0.00	185.89	340.36	470.92	592.80	755.73	980.09	1177.62	1376.57
Entry rate (3 months)	0.000	0.002	0.003	0.004	0.005	0.005	0.006	0.007	0.007
Entry rate (6 months)	0.000	0.004	0.006	0.009	0.010	0.011	0.012	0.012	0.013
Exit rate (3 months)	0.000	0.093	0.068	0.055	0.053	0.045	0.040	0.043	0.044
Exit rate (6 months)	0.000	0.191	0.131	0.108	0.109	0.084	0.075	0.080	0.074
Replacement rate (3 months)	0.000	0.093	0.064	0.049	0.043	0.039	0.040	0.043	0.041
Reentry rate (1 year)	0.000	0.088	0.120	0.147	0.158	0.177	0.185	0.183	0.181
Turnover rate (1 year)	0.000	2.110	1.725	1.605	1.479	1.421	1.384	1.374	1.363
Mean time on SNAP (per 48 months)	0.00	8.90	13.05	15.58	18.08	19.61	20.71	21.31	21.79
Employment rate on SNAP	0.000	0.435	0.519	0.545	0.583	0.572	0.539	0.521	0.502
Employment rate off SNAP	0.788	0.797	0.804	0.809	0.817	0.824	0.835	0.841	0.847
Mean wages after SNAP (H)	0.00	14.74	15.82	16.54	17.22	17.49	17.32	17.44	17.65
Mean wages after SNAP (W)	0.00	11.26	12.11	12.27	12.79	13.04	12.96	12.95	12.96
Husbands on SNAP									
Unemployed	0.000	0.386	0.225	0.192	0.140	0.132	0.128	0.132	0.138
Not in labor force	0.000	0.020	0.033	0.037	0.044	0.049	0.125	0.179	0.189
Employed	0.000	0.593	0.742	0.771	0.816	0.819	0.747	0.689	0.673
Mean wage	0.00	12.83	14.70	15.51	16.17	16.77	17.22	17.16	17.21
Husbands off SNAP									
Unemployed	0.024	0.015	0.013	0.012	0.011	0.011	0.008	0.009	0.008
Not in labor force	0.022	0.022	0.022	0.020	0.019	0.016	0.015	0.014	0.013
Employed	0.953	0.963	0.965	0.968	0.971	0.973	0.976	0.977	0.979
Mean wage	24.58	24.79	24.94	25.13	25.40	25.58	25.49	25.58	25.55
Wives on SNAP									
Unemployed	0.000	0.154	0.123	0.103	0.093	0.093	0.098	0.101	0.096
Not in labor force	0.000	0.569	0.580	0.579	0.557	0.583	0.570	0.546	0.574
Employed	0.000	0.276	0.297	0.319	0.350	0.324	0.331	0.353	0.330
Mean wage	0.00	10.38	10.84	12.04	12.54	12.42	12.61	12.49	12.32
Wives off SNAP									
Unemployed	0.040	0.036	0.034	0.032	0.032	0.029	0.030	0.031	0.035
Not in labor force	0.337	0.333	0.323	0.318	0.306	0.295	0.277	0.265	0.249
Employed	0.623	0.631	0.642	0.650	0.663	0.675	0.693	0.704	0.716
Mean wage	18.38	18.53	18.56	18.53	18.69	18.68	18.60	18.55	18.47

Table E.3: Results from SNAP Benefit Reduction Rate Counterfactual Experiments

	SNAP Benefit Reduction Rate										
Statistic	0.0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
Share on SNAP	0.132	0.125	0.114	0.100	0.082	0.071	0.064	0.060	0.056	0.054	0.051
0 kids	0.044	0.040	0.039	0.035	0.026	0.022	0.019	0.018	0.017	0.017	0.016
1 kid	0.089	0.088	0.081	0.072	0.056	0.050	0.043	0.037	0.033	0.031	0.030
2 kids	0.161	0.155	0.146	0.128	0.103	0.087	0.076	0.072	0.067	0.064	0.060
3+ kids	0.357	0.336	0.297	0.259	0.226	0.193	0.184	0.179	0.171	0.162	0.153
Share eligible for SNAP	0.155	0.153	0.151	0.148	0.118	0.097	0.083	0.076	0.071	0.068	0.064
SNAP take-up rate	0.847	0.816	0.760	0.679	0.698	0.733	0.768	0.791	0.800	0.795	0.800
Average SNAP benefit	642.21	564.43	494.43	454.95	481.90	509.56	522.29	524.93	530.94	546.12	564.53
0 kids	357.00	309.82	261.72	246.14	273.46	293.36	306.83	309.13	305.21	295.14	309.43
1 kid	511.00	433.74	364.82	316.49	326.52	327.28	353.41	371.12	390.05	410.10	414.76
2 kids	649.00	567.17	494.21	443.79	462.06	480.34	492.93	494.86	509.52	529.02	556.05
3+ kids	771.00	689.74	625.09	592.80	615.38	663.13	656.29	645.70	639.36	658.84	679.45
Entry rate (3 months)	0.007	0.005	0.005	0.005	0.004	0.004	0.004	0.004	0.004	0.004	0.004
Entry rate (6 months)	0.013	0.012	0.011	0.010	0.009	0.009	0.008	0.008	0.008	0.007	0.007
Exit rate (3 months)	0.050	0.050	0.052	0.053	0.058	0.066	0.065	0.074	0.072	0.072	0.068
Exit rate (6 months)	0.092	0.090	0.098	0.109	0.119	0.124	0.121	0.133	0.132	0.133	0.132
Replacement rate (3 months)	0.043	0.037	0.041	0.043	0.044	0.055	0.057	0.061	0.067	0.066	0.068
Reentry rate (1 year)	0.188	0.184	0.168	0.158	0.162	0.153	0.148	0.149	0.148	0.145	0.135
Turnover rate (1 year)	1.413	1.419	1.445	1.479	1.562	1.621	1.637	1.671	1.683	1.707	1.733
Mean time on SNAP (per 48 months)	19.93	19.63	18.93	18.08	16.43	15.26	14.82	14.34	14.01	13.58	13.20
Employment rate on SNAP	0.578	0.580	0.586	0.583	0.548	0.534	0.530	0.525	0.512	0.495	0.485
Employment rate off SNAP	0.826	0.825	0.821	0.817	0.814	0.811	0.810	0.809	0.808	0.808	0.807
Mean wages after SNAP (H)	17.62	17.44	17.39	17.22	16.68	16.57	16.32	16.07	15.97	15.92	15.86
Mean wages after SNAP (W)	13.20	13.12	13.01	12.79	12.36	12.12	12.12	12.08	11.95	11.93	11.83
Husbands on SNAP											
Unemployed	0.121	0.125	0.127	0.140	0.181	0.204	0.201	0.211	0.222	0.250	0.262
Not in labor force	0.049	0.047	0.042	0.044	0.040	0.037	0.045	0.039	0.038	0.036	0.036
Employed	0.831	0.828	0.831	0.816	0.779	0.759	0.755	0.750	0.741	0.714	0.702
Mean wage	16.72	16.90	16.63	16.17	15.87	15.56	15.31	15.15	15.23	15.07	15.00
Husbands off SNAP											
Unemployed	0.009	0.010	0.010	0.011	0.011	0.011	0.012	0.012	0.013	0.013	0.013
Not in labor force	0.018	0.017	0.019	0.019	0.019	0.019	0.020	0.020	0.020	0.020	0.020
Employed	0.974	0.973	0.971	0.971	0.970	0.970	0.969	0.968	0.967	0.967	0.967
Mean wage	25.53	25.52	25.44	25.40	25.27	25.19	25.14	25.12	25.08	25.04	25.03
Wives on SNAP											
Unemployed	0.095	0.092	0.093	0.093	0.096	0.096	0.088	0.088	0.092	0.095	0.104
Not in labor force	0.578	0.576	0.566	0.557	0.586	0.595	0.607	0.612	0.625	0.629	0.628
Employed	0.326	0.332	0.342	0.350	0.317	0.309	0.306	0.300	0.283	0.277	0.268
Mean wage	12.91	12.78	12.33	12.54	12.28	12.12	12.18	11.78	11.72	11.56	11.50
Wives off SNAP											
Unemployed	0.030	0.030	0.031	0.032	0.032	0.033	0.034	0.033	0.034	0.034	0.034
Not in labor force	0.292	0.295	0.298	0.306	0.311	0.314	0.315	0.317	0.318	0.318	0.318
Employed	0.678	0.676	0.671	0.663	0.657	0.653	0.650	0.650	0.648	0.649	0.648
Mean wage	18.69	18.67	18.70	18.69	18.56	18.52	18.53	18.53	18.50	18.51	18.51

Table E.4: Results from SNAP Participation Costs Counterfactual Experiments

Statistic	Benchmark	Eliminating Costs Take-up cost $O = 0$	Participation cost $\xi_i = 0$	Both costs $O = 0$, $\xi_i = 0$
Share on SNAP	0.100	0.104	0.144	0.148
0 kids	0.035	0.034	0.043	0.043
1 kid	0.072	0.073	0.086	0.085
2 kids	0.128	0.126	0.202	0.205
3+ kids	0.259	0.284	0.385	0.409
Share eligible for SNAP	0.148	0.147	0.148	0.149
SNAP take-up rate	0.679	0.705	0.969	0.999
Average SNAP benefit	454.95	449.39	405.70	397.12
0 kids	246.14	248.34	215.61	212.13
1 kid	316.49	309.01	290.59	287.27
2 kids	443.79	449.22	393.81	388.70
3+ kids	592.80	566.14	505.41	484.38
Entry rate (3 months)	0.005	0.006	0.005	0.006
Entry rate (6 months)	0.010	0.012	0.011	0.012
Exit rate (3 months)	0.053	0.054	0.050	0.049
Exit rate (6 months)	0.109	0.110	0.085	0.086
Replacement rate (3 months)	0.043	0.048	0.032	0.034
Reentry rate (1 year)	0.158	0.195	0.181	0.195
Turnover rate (1 year)	1.479	1.508	1.376	1.389
Mean time on SNAP (per 48 months)	18.08	17.71	21.38	21.20
Employment rate on SNAP	0.583	0.574	0.587	0.586
Employment rate off SNAP	0.817	0.819	0.827	0.828
Mean wages after SNAP (H)	17.22	17.22	17.69	17.85
Mean wages after SNAP (W)	12.79	12.89	13.38	13.44
Husbands on SNAP				
Unemployed	0.140	0.138	0.106	0.103
Not in labor force	0.044	0.044	0.040	0.040
Employed	0.816	0.818	0.855	0.857
Mean wage	16.17	16.38	17.43	17.53
Husbands off SNAP				
Unemployed	0.011	0.010	0.010	0.010
Not in labor force	0.019	0.018	0.017	0.016
Employed	0.971	0.972	0.973	0.974
Mean wage	25.40	25.40	25.69	25.73
Wives on SNAP				
Unemployed	0.093	0.094	0.082	0.080
Not in labor force	0.557	0.575	0.598	0.605
Employed	0.350	0.331	0.320	0.315
Mean wage	12.54	12.57	12.69	12.79
Wives off SNAP				
Unemployed	0.032	0.031	0.030	0.030
Not in labor force	0.306	0.303	0.290	0.287
Employed	0.663	0.666	0.680	0.682
Mean wage	18.69	18.68	18.75	18.74