

Abstract

A median U.S. service worker earns \$2,500.08 a month. Of that, \$2,385.69 is allocated to essential spending, leaving \$114.39 of free cash flow. The standard financial advice is to build an emergency fund of three months of expenses before doing anything else. It would take the median service worker 62.07 months to reach this target. This paper asks where that \$114.39 should go. It formulates the choice among liquid savings, debt repayment, and risky investment as a two-stage stochastic mixed-integer program with a Conditional Value-at-Risk penalty on the worst five percent of outcomes over a 24-month horizon. Monthly income is determined through a five-state Markov chain fitted to Current Population Survey microdata. Each state's level is drawn non-parametrically. Balance sheets and credit access are taken from the Survey of Consumer Finances. Based on the data three archetypes are calibrated: a salaried professional, a gig worker, and a service worker.

Precautionary cash saving is optimal in a single-period version of the model, activating at risk-aversion weights of 3.25 to 6.50, and never optimal over 24 months at any weight tested up to 30. When given an extended time horizon, the household draws its credit line once and invests the proceeds in the higher-returning account. Regardless of the risk level, the gig worker and service worker archetypes draw that line to 100% of capacity. Emergency-fund-first requires an income above the median of both groups before it clears their debt within the horizon.

Introduction

A typical U.S. service worker earns about \$2,500 a month. When considering minimum expenditure like rent, food, and minimum bills that only leaves over \$114. This residual can be saved, used to pay down a credit card charging 21% interest, or invested for a higher but riskier return. Even so, allocating a dollar somewhere involves forgoing the opportunity to allocate it elsewhere.

The financial literacy industry suggests fixed heuristic rules, such as building an emergency fund first, or attacking the highest-interest debt first (Debt Avalanche). These rules assume steady income and that access to borrowing is constantly available. For service and gig workers, neither of the two holds. In turn, what is the most effective allocation? What is the cost of resilience?

Methods

In ‘The Cost of Resilience’ this allocation decision is formulated as a two-stage stochastic mixed-integer program. The model searches many possible plans and picks the one with the lowest total cost over 24 months. Income uncertainty justifies the decision to run the model on hundreds of simulated income paths. Each path is built from real U.S. government data. To ensure that bad months cluster together, monthly income moves between five Markov chain states, from stable to job loss. Patterns measured in national surveys are used to calibrate the model. The Survey of Consumer Finances provides the starting debt, savings, and credit limits. Conditional-Value-at-Risk is embedded into the model to protect against the worst 5% of outcomes.

The Cost of Resilience

Under uncertain monthly income, what is the optimal policy for jointly allocating a household's limited resources across debt repayment, liquid emergency savings, and risk-bearing investment, and what is the measurable cost of prioritizing solvency resilience over wealth-maximizing alternatives?

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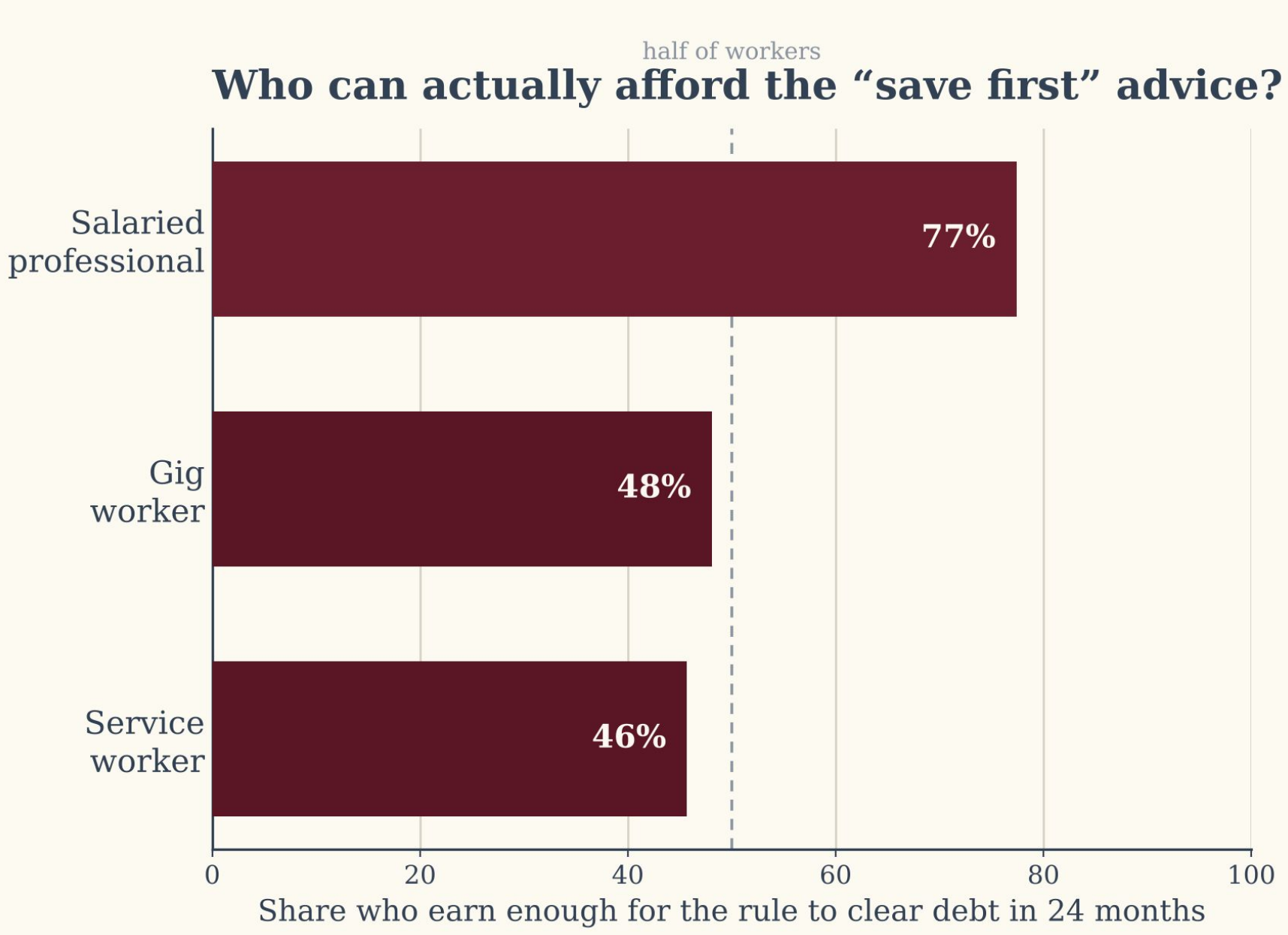
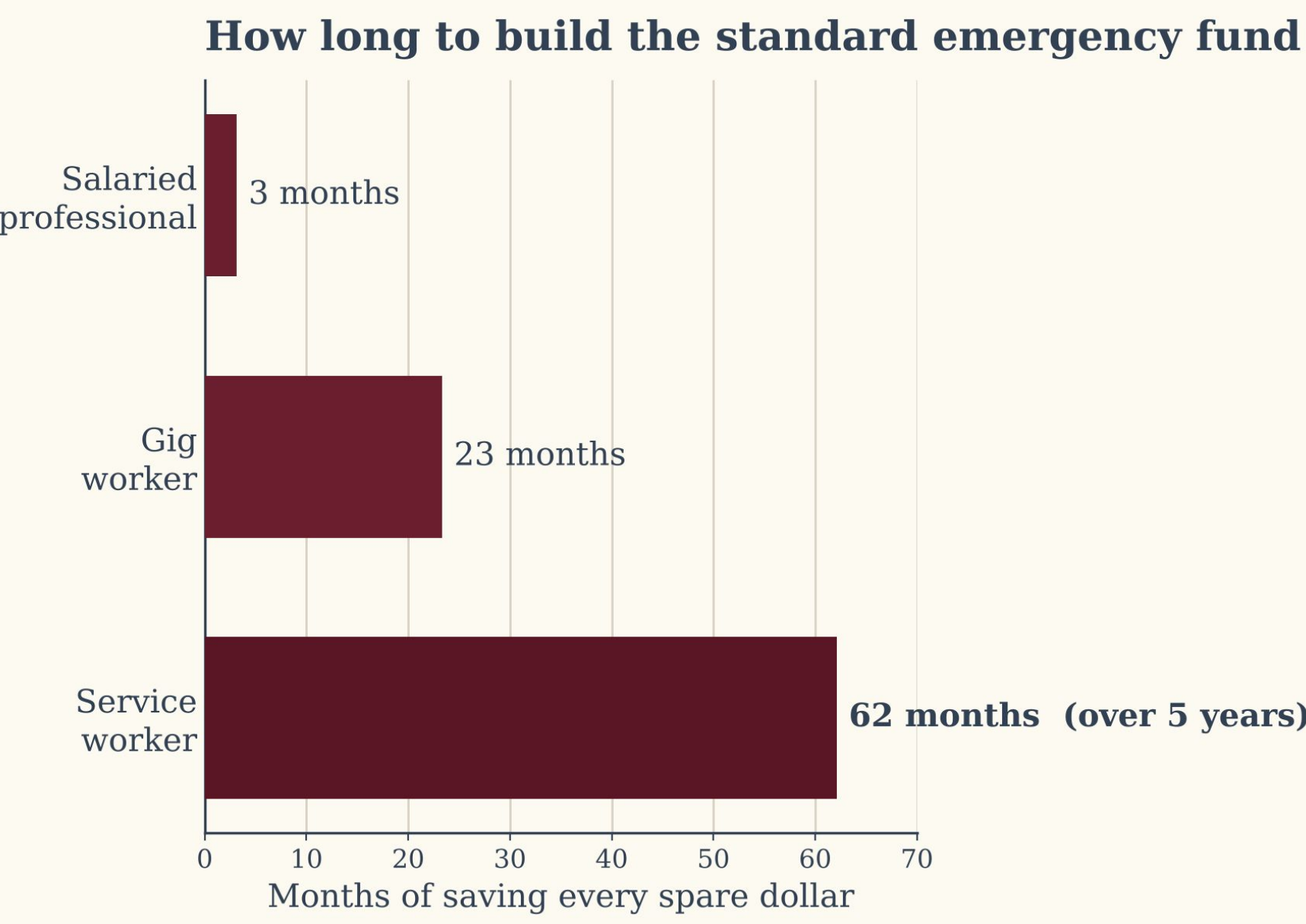
Results

To encapsulate the majority of society, this paper focuses on three archetypes: a salaried professional, a gig worker, and a service worker.

Over the two years savings was never the cheapest choice. The best plan instead keeps a buffer in an investment account that can be sold in a bad month, taking advantage of the higher average yields.

With the exception of the salaried professional's 1.71%, 100% of the credit line was borrowed by both the service and gig worker archetypes.

The popular save first rule only clears debt in time for workers who earn above the middle income. Lower-paid workers cannot save fast enough, as the charts show.



Discussion

The results show that for workers with low, uncertain income the real problem is credit access. In the case of a bad month, where credit becomes inaccessible, no heuristic rule can save a household. Thus, the selected heuristic rule is not the main issue.

This reframes financial literacy. A one-size-fits-all rule can mislead the very people it is meant to help. The safe choice carries a real price. In reality, that price is highest for those with the least ability to bear it.

Conclusion

Under uncertain income, the smartest plan depends on how much a household earns, not on a single heuristic rule. Over 24 months, holding savings was never optimal in this model, and the standard save first advice is out of reach for most lower-income workers. For many households guarding against risk is something they cannot buy more of. The strongest lever is credit access. Future work could add minimum debt payments and plans that adjust month to month.

References

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