LUDWIG INSTITUTE FOR SHARED ECONOMIC PROSPERITY

Technical Documentation: Informal Economy Analysis Methodology

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Purpose

The purpose of the Ludwig Institute for Shared Economic Prosperity's analysis on the informal economy is to determine the extent to which middle- and working-class households rely on supplementary income from informal work. LISEP uses the framework of its True Rate of Unemployment metric to evaluate how much informal work can make up for poverty wages and underemployment. Using publicly available data from the American Time Use Survey as well as the Current Population Survey, this analysis provides insight on the plight of informal workers who generally lack adequate opportunities in the formal market. This research further highlights the importance of considering job quality when measuring the health of the labor market.[1]

[1] LISEP would like to thank Dr. Nik Theodore for his invaluable insight and comments to the formulation of this methodology.

The Hidden Workforce: The Impact of the Informal Economy on Functional Employment

Introduction

The economic well-being of low- and middle-income (LMI) workers has worsened, or at the very least stagnated, over the last two decades. While low-wage occupations and poor-quality jobs became more prevalent, living costs relevant to LMI workers have outpaced earnings growth and resulted in real wage loss.[2] Ludwig Institute for Shared Economic Prosperity (LISEP) research has also documented how headline Bureau of Labor Statistics (BLS) metrics portray a misleadingly optimistic picture of reality: True Weekly Earnings (TWE) are 15% lower for the median earner, while a quarter of workers don't have a full-time and living-wage job.[3] So, how are LMI workers getting by?

One likely explanation is that the working-class is cutting back on basics and taking on higher levels of debt. Another possibility is that informal work has become more prevalent, which means more people are earning additional income without reporting it to tax authorities and government surveys. Some evidence points in this direction, such as a rise in nonstandard work arrangements and a well-documented income tax-gap. The self-employed represent one-tenth of employment and tend to report less than their actual earned income, with studies showing that when responding to surveys – such as the Consumer Expenditure Survey – that on average, they underreport their income by 30%.[4] Flexible work arrangements have become more commonplace since the Great Recession, such as on-call and temporary work through the just-in-time workforce model, which contributed to the growing precarity of work and a perceived informalization of employment.[5] To measure the extent to which

[2] Ludwig Institute for Shared Economic Prosperity (2022). "Determining More Accurate Living Costs for Median- and Lower-Income American Families." March 9, 2022. Accessed on: https://assets-global.website-files.com/63ba0d84fe573c7513595d6e/63c1bb25f744964622779535_TLC%20White%20Paper.pdf

[3] Ludwig Institute for Shared Economic Prosperity. "True Rate of Unemployment." "True Weekly Earnings" Accessed on 04/27/2023 on https://www.lisep.org/tru and https://www.lisep.org/twe

[4] Hurst, E., Li, G., & Pugsley, B. (2014). Are household surveys like tax forms? Evidence from income underreporting of the self-employed. *Review of economics and statistics*, *96*(1), 19-33. https://www.federalreserve.gov/pubs/feds/2011/201106/201106pap.pdf

[5] Katz, L. F., & Krueger, A. B. (2019). The rise and nature of alternative work arrangements in the United States, 1995–2015. *ILR review*, *72*(2), 382-416. https://www.nber.org/papers/w22667

lower-income workers rely on informal income, LISEP sought to determine how accounting for informal activities would affect the rate of functional unemployment.[6]

Background

First, it is necessary to define informal work and to understand it within the context of the United States. Broadly, the International Labour Organization defines informal employment as "all remunerative work (i.e., both self-employment and wage employment) that is not registered, regulated or protected by existing legal or regulatory frameworks, as well as non-remunerative work undertaken in an income-producing enterprise."[7] The informal sector includes productive activities such as domestic work, construction and selling food or handcrafts that informal employers or the self-employed don't report to authorities to save costs by paying less in taxes and compensation and by evading workplace protections. LISEP focuses on income-generating productive activities overlooked in the Current Population Survey (CPS) used to calculate the True Rate of Unemployment (TRU)[8] and other employment statistics.

In the United States, most informal employment resembles non-standard work taking place in poorly paid occupations that often are part-time and temporary. They can range from gigs such as gardening and childcare to jobs in construction, agriculture, food preparation and other retail and hospitality services. Low-income women and immigrants, especially those unauthorized to work and whose population tripled since 1990,[9] tend to have higher rates of employment in these sectors. Likewise, Blacks and Hispanics are also overrepresented in informal and nonstandard work, which became more prominent as firms adopted a just-in-time business model. In industries like warehousing and retail, enterprises

[6] "Functional unemployment" refers to those earning a poverty wage and who are underemployed. For a detailed definition of LISEP's rate of "functional unemployment" see the *Definitions* section on page 5.
[7] International Labour Organization. "Distinguishing the concepts: the informal sector, informal employment and the informal economy." *Chapter 4.5 : Informal economy workers.* https://www.ilo.org/global/topics/wages/minimum-wages/beneficiaries/WCMS_436492
[8] The True Rate of Unemployment tracks the percentage of the U.S. labor force that does not have a full-time job (35+ hours a week) but wants one, has no job, or does not earn a living wage, conservatively pegged at $20,000 annually before taxes in 2020 dollars. For more information, see https://www.lisep.org/tru
[9] Lopez M., Passel J. and Cohn D. (2021). "Key facts about the changing U.S. unauthorized immigrant population." *Pew Research Center.* April 13, 2021. Accessed on 04/27/2023: https://www.pewresearch.org/fact-tank/2021/04/13/key-facts-about-the-changing-u-s-unauthorized-immigrant-population/

following this model maintain lean workforces to minimize costs and rely on cheaper, subcontracted temporary workers and day laborers to meet surges in demand.[10] [11] [12]

As worker protections through unions have plummeted and labor standards have been poorly enforced, cost-competitive industries have increasingly leaned on precarious employment.[13] [14] But more non-standard work arrangements might not necessarily translate to more informal labor, since more restrictions on temporary employment correlate positively with under-the-table work. In other words, since regulations on staffing agencies and temporary work are very permissive in the United States, firms can turn to low-cost, flexible employment without relying on the informal sector. This takes place even though more social protections and labor-market interventions to protect vulnerable groups are associated with less informality.[15] Finally, worse-paying jobs, in addition to more slack in the labor market during the Great Recession, likely pushed more workers to the informal market for additional income. This includes underreporting as a self-employed worker, turning to gig work, or moonlighting informally by working an additional job.

Overall, the underground sector represents less than 10% of GDP, which is relatively small compared even to other high-income countries. The International Monetary Fund calculated it as 8.34% of the US economy between 1991 and 2017 and the World Bank at 8.6% and 8.9% between 1990 and 2018.[16] [17] Particularly relevant, Anat Bracha and Mary Burke estimate that in 2015 the employment-to-population ratio and the labor force participation rate would have been 2.5% and 2% higher, respectively, after considering informality with the Survey of Informal Work Participation. They also find that informal workers who are part-time

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[10] Nightingale, D. S., Wander S.A. (2011). Informal and nonstandard employment in the United States: Implications for low-income working families. *Urban Institute*. August 2011. https://webarchive.urban.org/publications/412372.html

[11] Katz, L. F., & Krueger, A. B. Ibid., 1.

[12] Houseman, S. N., & Heinrich, C. (2015). Temporary help employment in recession and recovery. https://research.upjohn.org/cgi/viewcontent.cgi?article=1244&context=up_workingpapers

[13] Mishel, L., Rhinehart, L., & Windham, L. (2020). Explaining the erosion of private-sector unions. *Economic Policy Institute. https://www. epi. org/unequalpower/publications/private-sector-unions-corporate-legal-erosion*. https://www.epi.org/unequalpower/publications/private-sector-unions-corporate-legal-erosion/

[14] Theodore, N. (2016). L'informalité et la sélectivité stratégique de l'État : la montée de l'emploi précaire dans l'industrie de la construction aux États-Unis. Lien social et Politiques, (76), 114–136. https://doi.org/10.7202/1037068ar

[15] Williams, Colin C. "Explaining the Informal Economy: An Exploratory Evaluation of Competing Perspectives." *Relations Industrielles / Industrial Relations*, vol. 70, no. 4, 2015, pp. 741–65. *JSTOR*, http://www.jstor.org/stable/24641929. Accessed 11 Apr. 2023.

[16] https://www.imf.org/en/Publications/WP/Issues/2018/01/25/Shadow-Economies-Around-the-World-What-Did-We-Learn-Over-the-Last-20-Years-45583

[17] Elgin, C., M. A. Kose, F. Ohnsorge, and S. Yu. 2021. "Understanding Informality." CERP Discussion Paper 16497, Centre for Economic Policy Research, London. Accessed April 12, 2023 on: https://www.worldbank.org/en/research/brief/informal-economy-database

for economic reasons engage more frequently and for longer hours in informal labor.[18] Similarly, to assess the quality of household surveys at identifying employment correctly, Dorinda Allard and Anne Polivka estimated that uncounted paid work would have increased total employment between 0.6% and 3%, representing 657,000 to 4.6 million workers each week between 2012 and 2016.[19] Ultimately, LISEP can contribute to the literature by analyzing the incidence informal work might have on providing meaningful employment under the lens of the TRU.

[18] Bracha, A., & Burke, M. A. (2016). Who counts as employed?: informal work, employment status, and labor market slack. https://www.bostonfed.org/publications/research-department-working-paper/2016/who-counts-as-employed-informal-work-employment-status-and-labor-market-slack.aspx

[19] Dorinda Allard, M., & Polivka, A. E. (2018). Measuring labor market activity today: are the words work and job too limiting for surveys?. *Monthly Labor Review*, 1-19. https://www.bls.gov/opub/mlr/2018/article/measuring-labor-market-activity-today.htm

Methodology

Definitions

LISEP uses the same criteria as the BLS to determine if a respondent is a member of the labor force but differs in the criteria to assign employment status.[20] LISEP's definition of employment, functional employment, requires a worker to earn a living wage above $20,000 (in 2020 dollars) annually and to work either full-time hours (at least 35 hours weekly to align with the BLS definition of full-time) or to be part-time for non-economic reasons. If a member of the labor force does not meet both conditions, they are functionally unemployed (LISEP, 2020).[21] In contrast, the BLS classifies anyone who worked at least one hour in the previous week as employed. For clarity, this paper will use the term "functional employment" or "functional unemployment" when alluding to LISEP's definition of employment and the term "employed" or "unemployed" when referencing the BLS's definition.

Based on the existing definitions of informal work, as well as Allard and Polivka's study on the BLS Monthly Labor Review that inspired this methodology,[22] LISEP defines informal work as income-generating activities that are not classified as formal market work and require labor input to make a product or provide a service. These activities include hobbies, crafts, and food preparation that are done for pay, as well as performances and services that would count as formal employment if compensation was over-the-table. LISEP's definition of informal work excludes income-generating rental activities as well as other activities that generate income from selling used items that don't necessarily involve a return on labor. For example, LISEP would not qualify a college student selling second-hand textbooks or subletting their room under-the-table as informally employed, but a student earning off-the-books income from tutoring would count as informally employed. LISEP classifies respondents who engaged in informal work activities for pay as informal workers regardless of income and time spent. However, to qualify as functionally employed, an informal worker must meet LISEP's living wage and full-time status conditions after accounting for both formal and informal market work.

Finally, LISEP defines "formal" to refer to labor market metrics only considering employment and earnings data as reported in the Current Population Survey while "informal" metrics consider data imputed from informal work in addition to reported CPS data.

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20 U.S. Bureau of Labor Statistics. (2022). Labor Force Statistics from the Current Population Survey. Retrieved from https://www.bls.gov/cps/definitions.htm

21 Cornell P. (2020). "Ludwig Institute for Shared Economic Prosperity Technical Documentation." *LISEP. Chapter 1: Methodology for LISEP's True Rate of Unemployment (TRU). Pp. 2-24.* Accessed on: https://assets-global.website-files.com/63ba0d84fe573c7513595d6e/63c1b88e3742ca36ae193f70_TRU%20Methodology.pdf

22 Dorinda Allard, M., & Polivka, A. E. (2018). Ibid., 4.

Consequently, the "formal labor force" refers to anyone who reports being employed or actively seeking employment, while the larger "informal labor force" is comprised of all members of the formal labor force, including informal and non-informal workers, and of informal workers who are not members of the reported labor force. All informal labor metrics in this paper consider the larger informal labor force.

Data

Data sources for informal employment estimates

To estimate a range of how many people work informally in the United States, LISEP uses time use data from the American Time Use Survey (ATUS) between 2003 and 2022 (with 234,012 respondents 16 and older). The ATUS asks respondents about what they did on the preceding day as well as the time spent on each activity. The ATUS also asks respondents about their current employment status as well as their earnings and usual hours worked, which allows LISEP to assign formal functional employment status. Since the ATUS focuses on providing time-use estimates rather than labor market estimates, employment and earnings data is not complete. LISEP can impute missing employment and earnings data from the Basic Monthly CPS in which all ATUS respondents participated in prior months. Providing annual data from 2003 to 2022 for a nationally representative sample, the ATUS allows LISEP to determine whether informal work permits a person who is functionally unemployed when considering only formal employment to become functionally employed by working full-time hours and earning a living wage after considering additional informal employment. Consequently, the ATUS is the best available resource to evaluate to what extent informal work can compensate for part-time jobs and poverty wages.

The ATUS sample is split in half to ask about time use on weekdays and weekends equally, and it's further divided equally for each specific week and weekend day to ensure good time use data. So, 25% of respondents detail their Saturday activities, another 25% their Sunday, and 10% of respondents detail one of Monday through Friday respectively.[23] Accepting that the survey estimates the non-institutional, civilian population accurately (Appendix J), its design allows for estimates of the number of people who reported spending time in a specific activity (coded under the variable *trcodep*) on an average day, as well as how much time is spent in said activity (reported by the variable *tuactdur24*).[24] The ATUS also provides a direct estimate of how many hours respondents spend on income-generating hobbies, crafts and food (specific activity code 050301), performances (coded as 050302), and

[23] Bureau of Labor Statistics. (2022). "American Time Use Survey User's Guide: Understanding ATUS 2003 to 2021." *U.S. Department of Labor. Chapter 3: Survey Design, pp. 11-14.* Accessed February 15, 2023 on https://www.bls.gov/tus/atususersguide.pdf

[24] Bureau of Labor Statistics. (2022). "American Time Use Survey (ATUS) Data Dictionary: Variables collected in ATUS 2003-21." *U.S. Department of Labor*. Accessed February 15, 2023 on https://www.bls.gov/tus/dictionaries/atusintcodebk0321.pdf

services (coded as 050303) that are separate from a respondent's job. This makes it possible for LISEP to determine how many people report engaging in informal work activities for pay and for how long. Unfortunately, because the ATUS does not distinguish from selling used goods occasionally to selling produced or collected goods as a source of continuous income (specific activity code 050399), LISEP cannot determine whether a seller qualifies as an informal worker. Consequently, hourly earnings and time spent selling goods do not count as informal work in this paper, but the production of goods for sale such as food or handcrafts is included (Appendix K).[25]

Data sources for occupation estimates

LISEP also uses the ATUS and the CPS data to identify the occupation of each employed respondent based on the 2010 Standard Occupational Classification (SOC) system. To gain additional insight on the labor market situation of informal workers, LISEP complements this data with median wages of the major occupation categories from the latest Occupational Employment Wage Statistics (OEWS) survey release. The BLS publishes the OEWS twice a year and provides robust wage and employment measures using responses from 1.1 million establishments.[26]

Data sources for estimates of self-employed workers underreporting income

For the self-employed underreporting their income in household surveys, LISEP uses the Basic Monthly CPS and the Annual Social and Economic Supplement (ASEC) to estimate the effect of accounting for this in the TRU. The Basic Monthly CPS helps determine the share of self-employed workers in the labor force and the overall civilian population while the ASEC provides better full-time and income data to measure functional unemployment for the self-employed. The ASEC sample is different than the ATUS sample even though all respondents for the ASEC and the ATUS respectively were sampled from the Basic Monthly CPS. So, while an ASEC respondent also responds to the Basic Monthly CPS, they might not participate in the ATUS. Consequently, LISEP used data from the Basic Monthly CPS rather than the ASEC to impute earnings and hours worked data for the self-employed workers who reported working informally for pay in the ATUS. Finally, LISEP applied the findings of informal work and income on the TRU and other labor statistics to the Basic Monthly CPS used for headline labor metrics.

[25] Bureau of Labor Statistics. (2021). "American Time Use Survey Lexicon. U.S. Department of Labor". Accessed February 15, 2023 on https://www.bls.gov/tus/lexicons/lexiconwex2021.pdf

26 Bureau of Labor Statistics. (2023). "Occupational Employment and Wage Statistics: Technical Notes for May 2022 OEWS Estimates." Accessed July 14, 2023 on: https://www.bls.gov/oes/current/oes_tec.htm.

Key Assumptions and Choices to Determine Functional Employment

LISEP classifies respondents who engaged in informal work activities for pay as informal workers as long as they reported engaging in informal activities for pay. [27] Using this classification, LISEP estimates how many people worked informally on an average day, which corresponds to the lower-bound estimate of how many people engage in informal work on an average week (Scenario A). Additionally, LISEP produces an upper-bound estimate by multiplying the number of informal workers on an average day by seven (Scenario B). The lower estimate represents the unlikely scenario where the same group works informally each day of the week while the upper estimate assumes that seven equally sized, but separate, groups of workers engage in informal work for only one day of the week (Figure 1). Allard and Polivka make the same choice in their study to provide a range of how many people work for pay outside of their job on an average week since the BLS defines employment on a weekly basis. Most likely, the actual number of informal workers lies between both bounds but considering Scenario B with a high population of informal workers can test the robustness of the formal TRU.

[27] LISEP also produced estimates that counted alternative definitions of informal work such as someone who engages in informal work activities for pay for at least an hour on an average day or at a rate of one hour per week: One hour of work per week averages to one hour divided by seven days, which comes out to 8.57 minutes. So, working for at least nine minutes on an average day translates to being informally employed. This change has a minimal incidence on the informal employment estimates, and a smaller impact in the final informal TRU estimates.

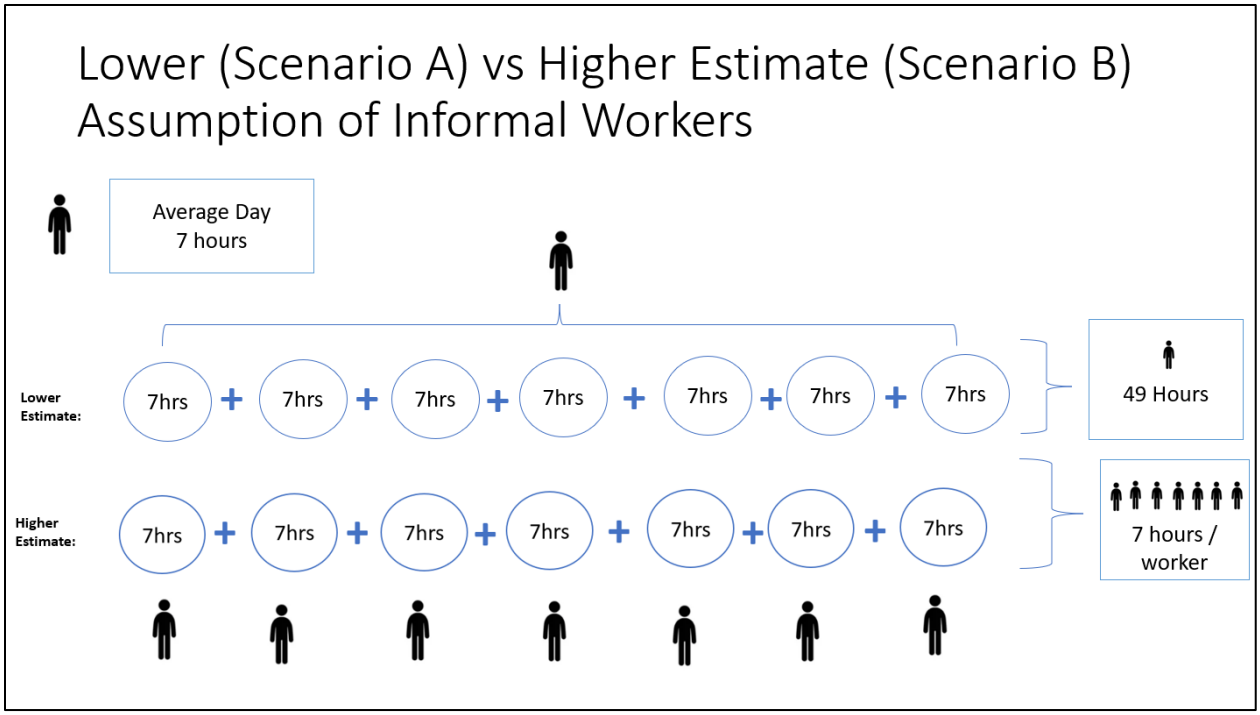


Figure 1: Lower-bound Scenario A Estimate vs. Upper-bound Scenario B Estimate

To measure the effect of informal work on functional unemployment, LISEP first determines whether an informal worker is functionally employed. This is determined by following a similar methodology as the TRU, and estimates the population of informal workers that work full-time or part-time for non-economic reasons, work part-time for economic reasons, are unemployed in the formal labor market, or are outside of the formal labor market.[28] For ATUS respondents missing important data, LISEP assumes earnings, employment status and usual hours worked remain at the same level as in their preceding Basic Monthly CPS interview. If weekly hours worked remain missing for one or all jobs, LISEP assumes full-time workers work 35 hours a week and part-time workers work average hours for part-time employees in that year's sample. Since the ATUS does not report a worker's reason for being part-time, LISEP assumes the reason for working part-time is the same as in the Basic Monthly CPS interview. If a part-time worker did not work part time at the time of the Basic Monthly CPS, the worker is classified as part-time for economic reasons. Given that earnings data for the self-employed in the ATUS is meager, LISEP imputes their annual income using their household income data from the Basic Monthly CPS. Similarly, LISEP also assigns hours worked for the self-employed from the CPS, and, if missing, assigns 35 hours for a full-time self-employed worker and average part-time hours for a part-time self-employed

[28] Bureau of Labor Statistics. (2022). "American Time Use Survey User's Guide: Understanding ATUS 2003 to 2021." *U.S. Department of Labor Chapter 7: Weights, linking, and estimation. pp. 35-43.* Accessed February 15, 2023 on https://www.bls.gov/tus/atususersguide.pdf. See Appendix B for calculation.

worker each year.[29] Finally, LISEP can assign functional employment status to ATUS respondents that satisfy the earnings and full-time requirements.

If informal work allows an involuntary part-time worker to surpass the 35 hours worked per week threshold, LISEP assigns them full-time status. LISEP also assumes an informal worker works informally each day of the week at the rate of an average day, so weekly informal work hours equal the duration of informal work on the reported day multiplied by seven.[30] Without this assumption, it would be impossible to assign full-time hours to informal workers who are not formally employed since a day only has 24 hours. Although it is inconsistent with Scenario B where seven different groups work informally on seven different days of the week, it follows the more important objective of, under the most generous estimations, assessing how problematic ignoring informal work might be.

To impute earnings, LISEP assumes informal work pays at least the same hourly rate as on the worker's formal job. If the informal worker is unemployed or outside of the labor force, LISEP imputes hourly earnings from the respondent's answer in the CPS, if available, and adjusts them for inflation since the CPS interview takes place a few months prior to the ATUS. After imputing hourly pay, LISEP calculates the increase in annualized weekly earnings from informal work by applying the hourly rate to a respondent's informal activity hours on an average day, and assumes they perform that paid activity each day of the week for 50 weeks each year. This is consistent with LISEP's method in the TRU calculation to annualize income from weekly earnings for workers with missing data for how many weeks they work during the year. If earnings data is unavailable, LISEP only considers the full-time hours threshold for part-time and not formally employed informal workers to determine functional employment status. Full-time workers without earnings data remain functionally unemployed since it is assumed they do not earn a living wage. Finally, LISEP accounts for the self-employed underreporting their income by 30% on the ASEC, consistent with the literature.[31] If a full-time, self-employed worker reports earning $14,000 or more in a year on the ASEC, then they will reach the TRU's living-wage threshold because their estimated annualized income after adding informal work is $20,000 or more.

[29] Because of this assumption, the informal work estimates for full time versus part time self-employed will be biased upwards.

[30] Implicitly, this means that a not-employed respondent who reports working on informal activities for at least 5 hours on an average day is assigned full-time status.

[31] Hurst, E., Li, G., & Pugsley, B. (2014). Are household surveys like tax forms? Evidence from income underreporting of the self-employed. *Review of economics and statistics*, *96*(1), 19-33. https://www.federalreserve.gov/pubs/feds/2011/201106/201106pap.pdf

Ultimately, LISEP classifies informal workers as newly functionally employed or unemployed if informal employment and income allows them to meet both full-time hours, or 35 hours of work per week, and a living wage defined as $20,000 a year (in 2020 dollars).

Calculation to Apply Informal Economy Estimates to the Headline TRU

After flagging the respondents who become functionally employed when considering informal work and income, LISEP calculates the new functionally employed, functionally unemployed, and labor force populations for the ATUS sample. Since many informal workers are not formally in the labor force, LISEP must assume they join the labor force, which makes the TRU rise or fall based on their functional employment status. Finally, to apply the ATUS estimates to the CPS sample, a ratio is applied to the formally employed, unemployed, and out of the labor force populations, as well as to that of informal workers in these populations. This is due to an overestimate by the ATUS of the employed and unemployed populations, and an underestimate of the population out of the labor force. Since the ATUS labor market populations move in parallel to the CPS population estimates, and as the ATUS tracks the civilian, non-institutional population very closely (Appendix J),[32] LISEP assumes the proportion of informal workers within a certain labor market group in the ATUS is equal to that proportion in the CPS sample.

More simply:

$$\frac{Informal\ Worker\ Population_{ATUS\ i}}{Labor\ Market\ Population_{ATUS\ i}} = \frac{Informal\ Worker\ Population_{CPS\ i}}{Labor\ Market\ Population_{CPS\ i}}$$

So:

$$Informal\ Worker\ Population_{CPS\ i} = \frac{Informal\ Worker\ Population_{ATUS\ i}}{Labor\ Market\ Population_{ATUS\ i}} * Labor\ Market\ Population_{CPS\ i}$$

Where *i* refers to the relevant formal labor market group (*employed, unemployed or outside of the labor force)*.

After imputing the labor market populations of functionally employed workers after considering informal work for the CPS, LISEP determines the lower and upper bound informal

[32] See Appendix J for reference. The only year where this is not the case in 2020 because of survey collection problems in April and May 2020 because of the pandemic. LISEP still included the 2020 estimates with the caveat that they are most likely skewed, and it also provides calculations without the 2020 estimates.

employment estimates. Finally, LISEP can estimate the range of the TRU considering informal work and compare how it differs over time as follows:

$$TRU_{\ Informal\ Labor} = \frac{LF_{\ New} - (FE_{Formal} + FE_{\ Informal})}{LF_{\ New}} \times 100$$

Where LF_{New} refers to the labor force population including informal employment and *FE* refers to the functionally employed populations. $FE_{\ Informal}$ refers to the population of informal workers who become functionally employed, and FE_{Formal} refers to the formal functionally employed population, which includes both traditional employees and self-employed workers. $TRU_{\ Informal\ Labor}$ is the True Rate of Unemployment after accounting for informal employment but before accounting for the self-employed underreporting their income.

For undeclared income, LISEP calculates the functional employment rate of self-employed workers with and without considering the 30% underreporting (SE_1 and SE_0) in the ASEC sample. Then, LISEP applies both rates to the population of self-employed workers (*SEPop*) measured in the Basic Monthly CPS to obtain functional employment estimates before and after accounting for unreported earnings.

To obtain the final estimate of the informal TRU ($TRU_{Informal}$), LISEP first calculates the population of functionally employed workers accounting for both informal employment ($FE_{Informal}$) unreported income ($SEPop\ x\ (SE1 - SE0)$). Second, LISEP computes the new labor force (LF_{New}) after adding the number of informal workers who are outside of the formal labor force to the formal labor force. Finally, LISEP can estimate the functionally unemployed population in the new labor force to determine the informal TRU:

$$\boldsymbol{TRU_{\ Informal} = \frac{LF_{New} - (FE_{Formal} + FE_{\ Informal} + SEPop \times (SE_1 - SE_0))}{LF_{\ New}} \times 100}$$

Calculation for Occupation Estimates

LISEP's method to produce population estimates based on occupation data is similar to the one for other labor market populations. First, LISEP calculates the population for each major occupation out of the whole ATUS sample as well as among informal workers. Because there are 22 occupations categories and the sample of respondents who work informally each year is limited, LISEP samples the whole period (2003 through 2022) rather than produce annual estimates to mitigate yearly volatility from small sample sizes. With the population estimates for the whole period, LISEP calculates the share of each occupation out of all employment, out of the labor force and out of all the population in the ATUS sample as well as out of informal and non-informal workers. The reason for producing estimates out of the

labor force and out of the population is because informal workers are more likely to be unemployed or to not participate in the labor market.

As with other labor force population estimates, LISEP uses the CPS to adjust the ATUS occupation estimates. LISEP computes the share of each occupation out of all employment, out of the labor force and out of the population using CPS data from 2003 and 2022 and applies this ratio to the ATUS estimates. So, the assumption that the proportion of informal workers within a certain labor market group in the ATUS is equal to that proportion in the CPS sample also applies:

$$Informal\ Worker\ Population_{CPS\ ij} = \frac{Informal\ Worker\ Population_{ATUS\ ij}}{Labor\ Market\ Population_{ATUS\ ij}} * Labor\ Market\ Population_{CPS\ ij}$$

Where *i* refers to the relevant formal labor market group (*employed, in the labor force* or *civilian non-institutional population)* and *j* refers the relevant occupation.

Findings

Informal Employment Estimates

A. Incidence on Functional Employment

Informal employment allows at least 0.24 million (M), and at most 1.70M, people to become functionally employed yearly, on average, between 2003 and 2022. In 2008 especially, informality helps between 0.56M and 3.91M people escape functional unemployment. However, it does not always do enough to fight functional unemployment in the labor force, as only 2008 witnessed net decreases in functional unemployment (Figure 2).[33] When considering the self-employed failing to report 30% of their income, functional unemployment also falls in the labor force in 2003, 2007, and 2019 (Figure 3). From this point on, the findings and discussion sections refer to estimates from the upper-bound Scenario B as detailed in the Key Assumptions section unless otherwise specified. For estimates on how the informal sector impact headline formal labor market statistics under Scenario A, reference Appendix (E).

[33] Functional Unemployment in the labor force can rise if a high rate of informal workers from outside the labor force join without jobs that provide functional employment.

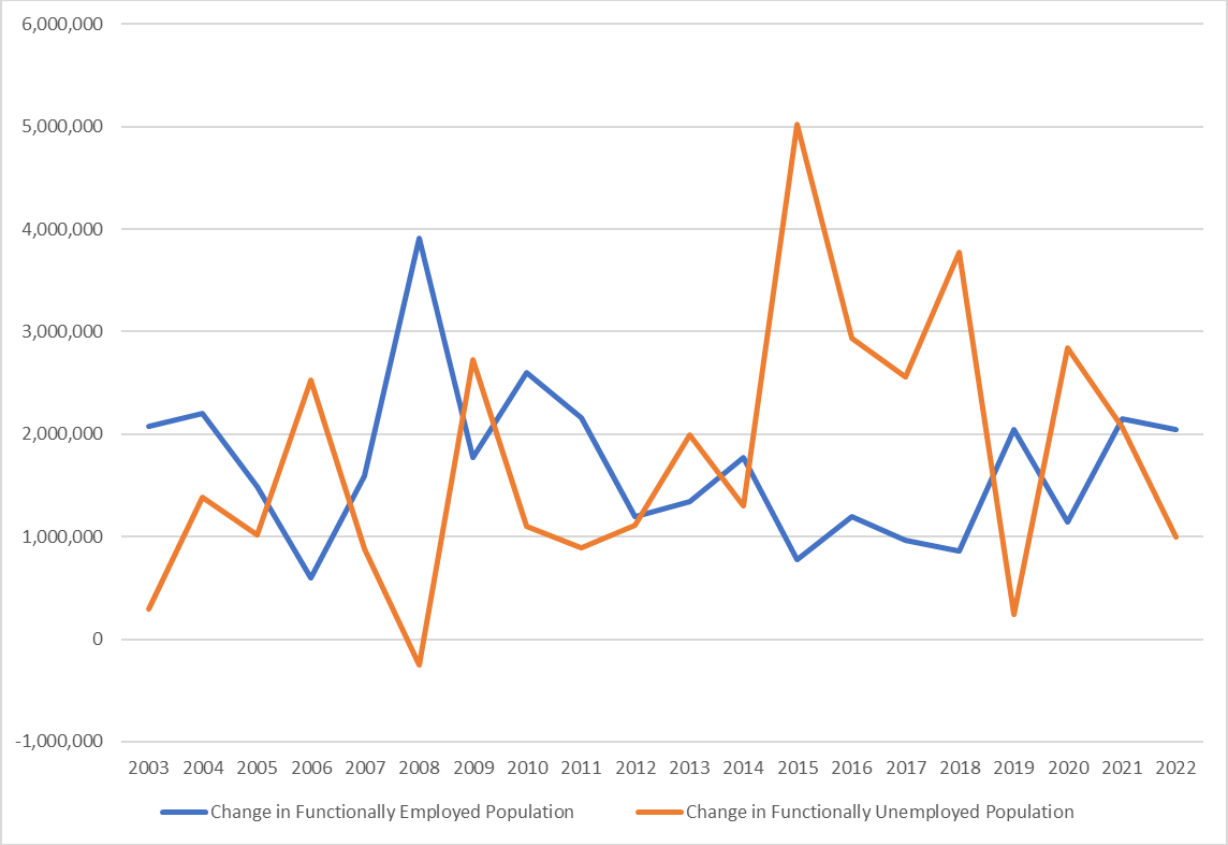


Figure 2: Functional unemployment in the labor force only fell in 2008 after accounting for informal work

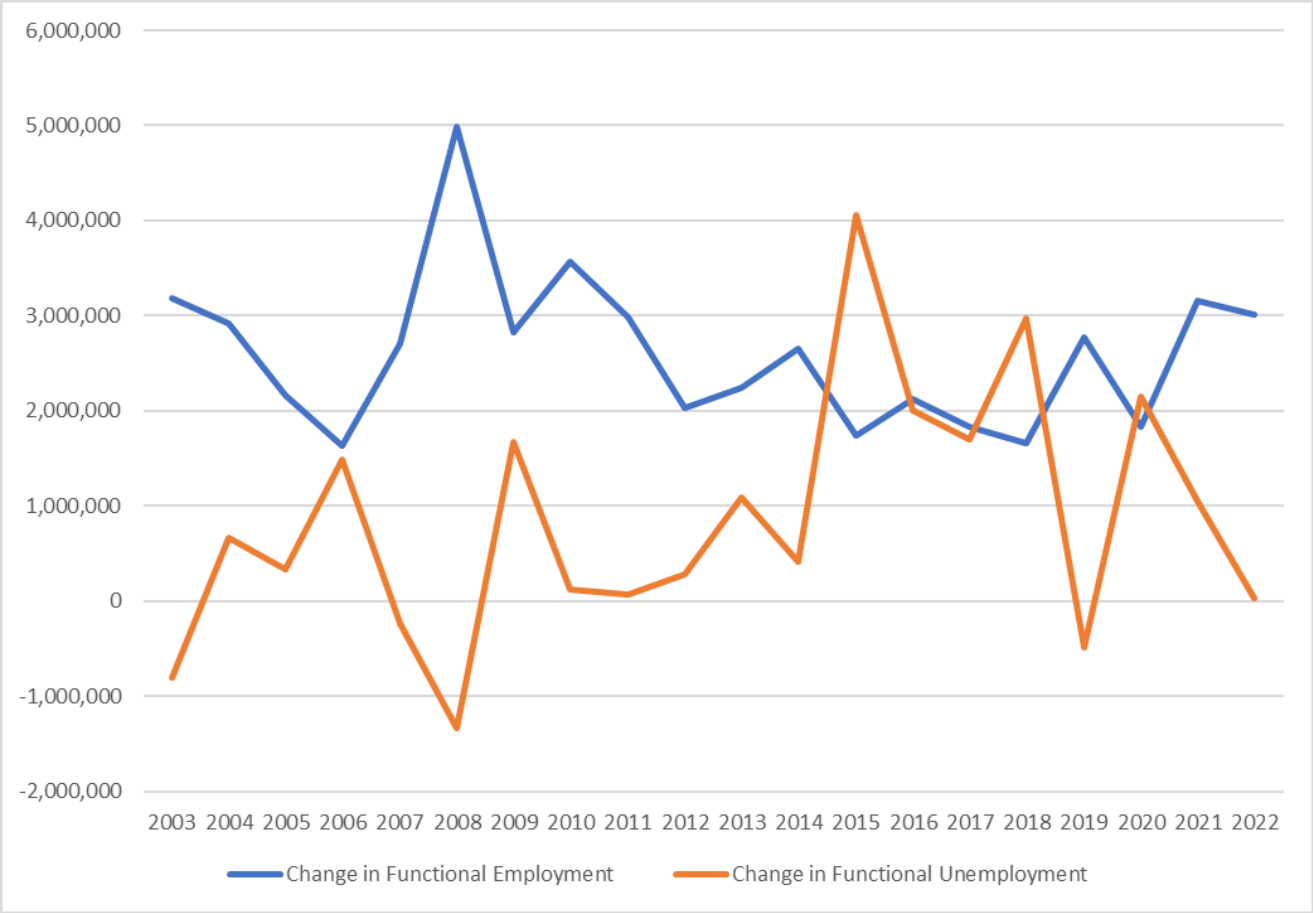


Figure 3: New functional employment outpaces new functional unemployment in the labor force when considering informal work and unreported income

The absolute difference between LISEP's headline TRU and the informal TRU before considering unreported income is only 0.63 percentage points (pp.) per year. Accounting for underreported income from the self-employed would lower the TRU by 0.56 pp. on average. Overall, the TRU falls on average by 0.08 pp. when considering informal employment and income. At most, the informal TRU is 1.5 pp. lower in 2008 and 1.5 pp. higher in 2015 than the headline metric respectively (Figure 4). The TRU Out of the Population (TRU OOP), which measures the percentage of people who are not functionally employed in the civilian population, only decreases on average by 0.70 pp. and by 1.10 pp. when also considering self-employed underreporting, with 2008 once again showing the most dramatic difference (Figure 5).

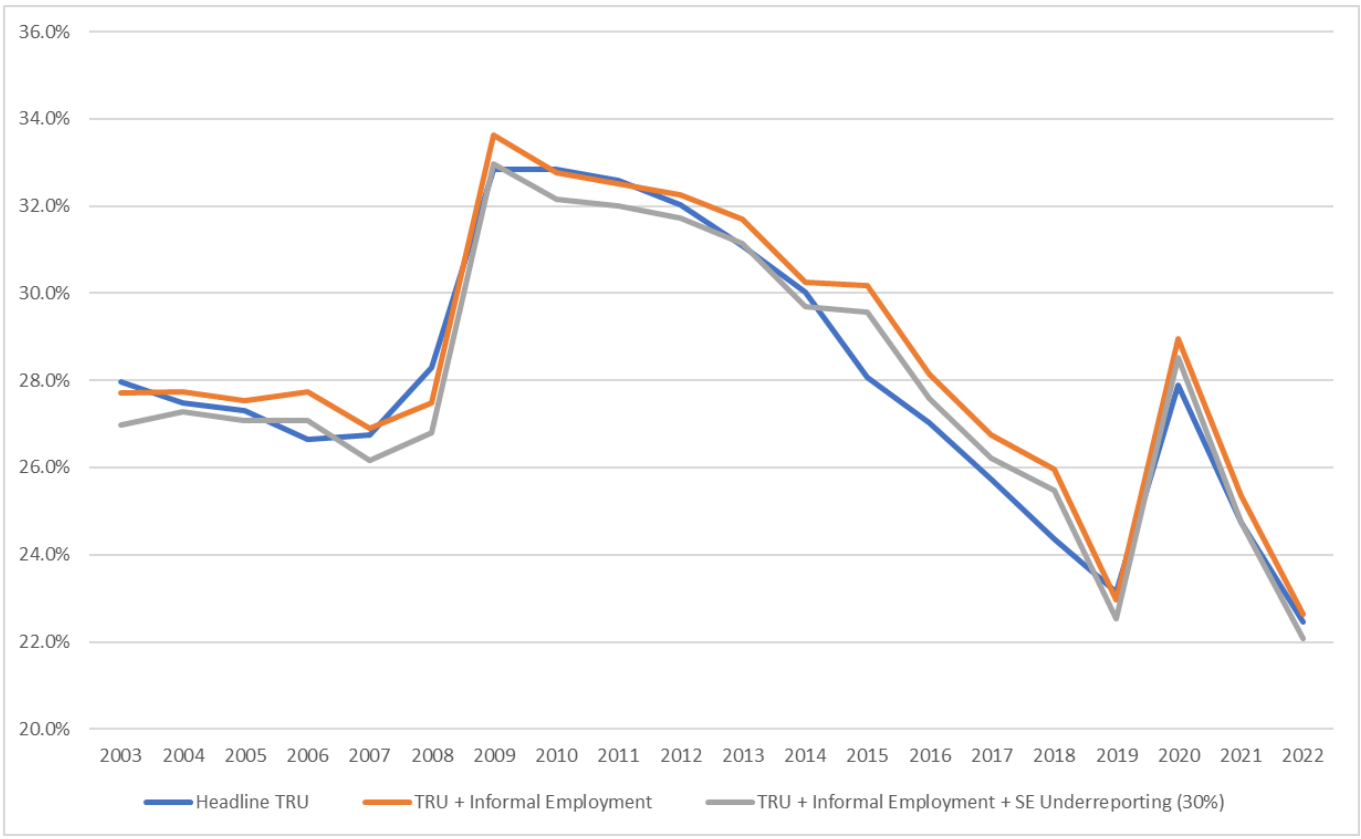


Figure 4: Self-Employed Underreporting Mitigates Bad Informal Jobs on Aggregate

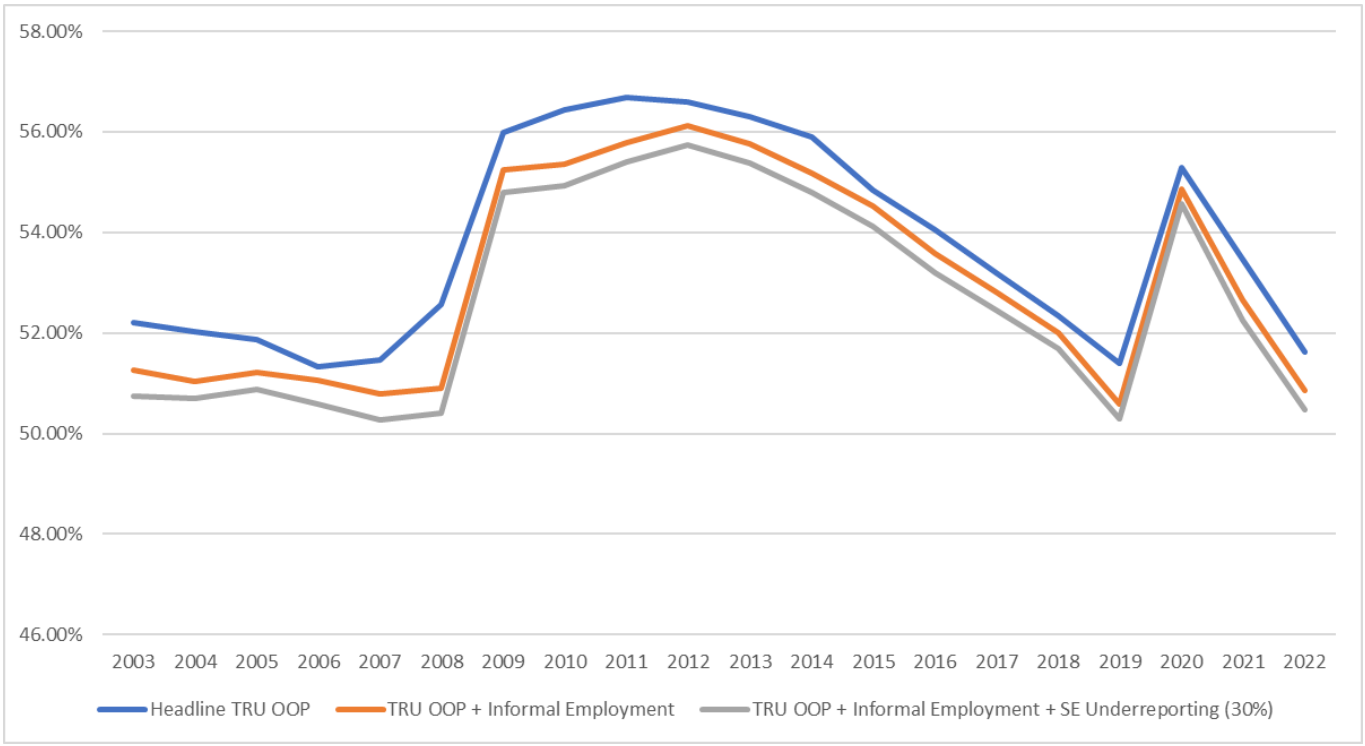


Figure 5: Functional Unemployment out of the population falls by 1.1 percentage points with informal work and income

As for other employment metrics, including informal work increases employment level and decreases U3 unemployment. Between 2003 and 2022, the employment-to-population ratio (EPR) rises by 1.80 pp. (Figure 6) and the U3 rate would fall by 0.70 pp. on average. In the recessionary and recovery period from 2008-2011, informal work had a strong impact on employment as the EPR increased by 2.3 pp. and the U3 rate fell by 1.21 pp. on average. In 2009, unemployment fell by 1.5 pp. and the EPR rose 2.7 pp., as more than 6.44 M people found jobs through informality. While informal labor contributed more to functional employment in this period, it had a less pronounced effect, as the TRU OOP fell by 1.11 pp. and the TRU by 0.04 pp. on average (Figure 7). Since many informal workers without formal jobs don't necessarily meet the threshold for functional employment, informal work has a greater impact on BLS employment statistics than on the TRU metrics. Interestingly, the TRU fell more than the U3 rate in 2008 (by 0.8 pp. and 0.6 pp., respectively) while the TRU actually rose 0.8 pp. in 2009 when headline unemployment fell strongly by 1.5 pp. Indeed, the TRU and the U3 rates often don't trend similarly since most people relying on informal jobs do not have full-time and living-wage jobs (Figure 8).[34]

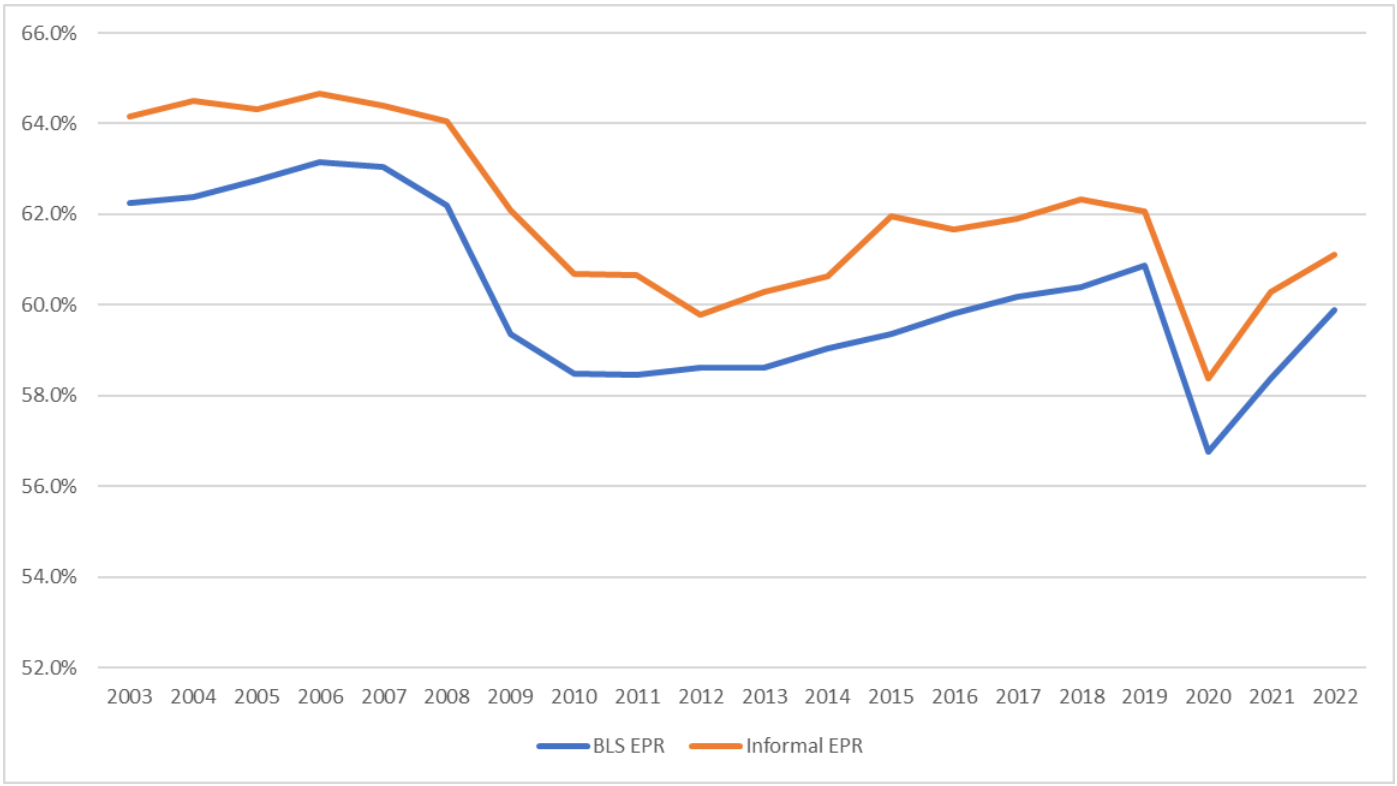


Figure 6: Impact of Informal Work on Employment-to-Population Ratio (Scenario B)

[34] The TRU and TRU OOP estimates in this paragraph do not include self-employed unreported income

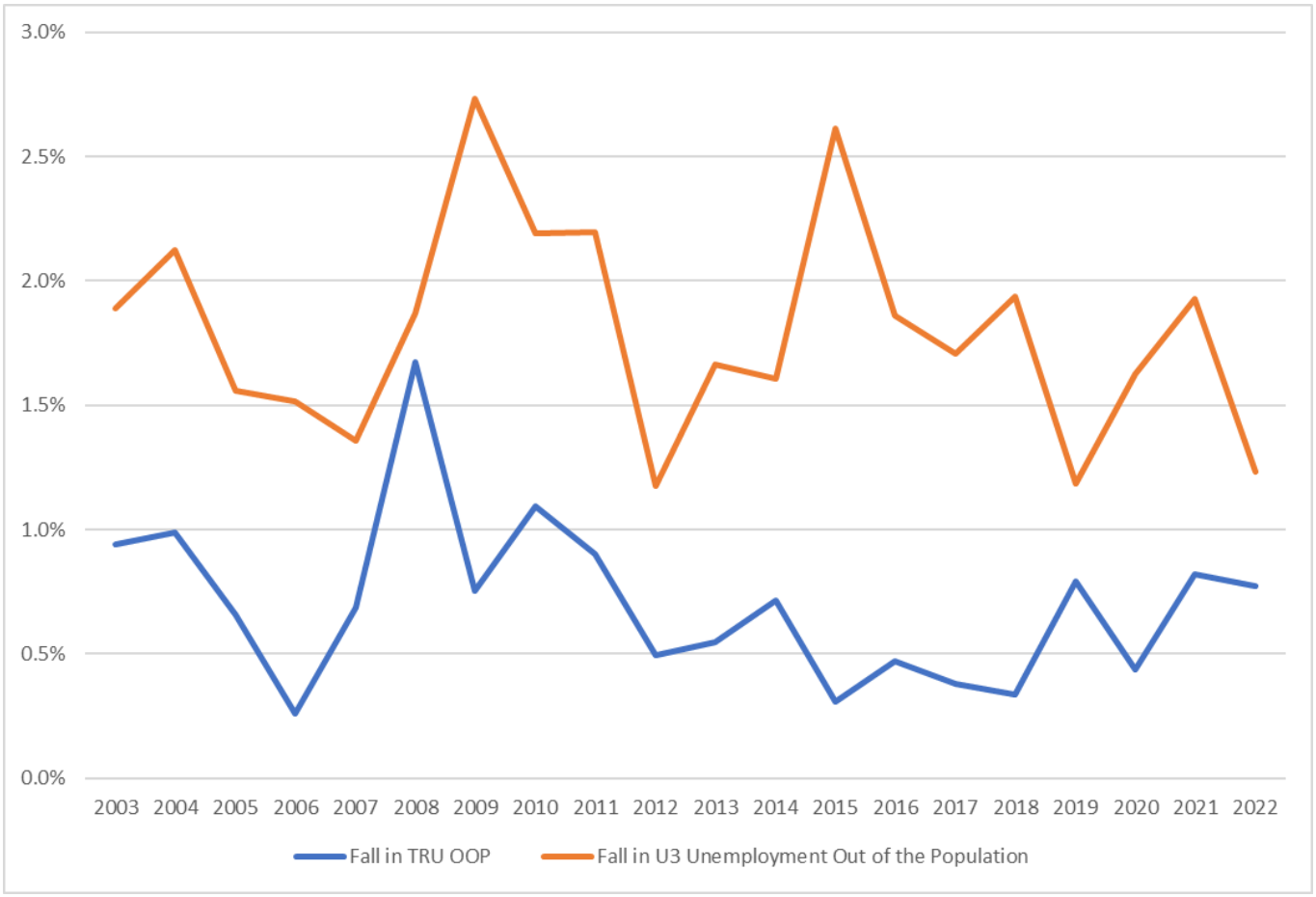


Figure 7: Decrease in TRU Out of the Population vs U3 Out of the Population (Scenario B)

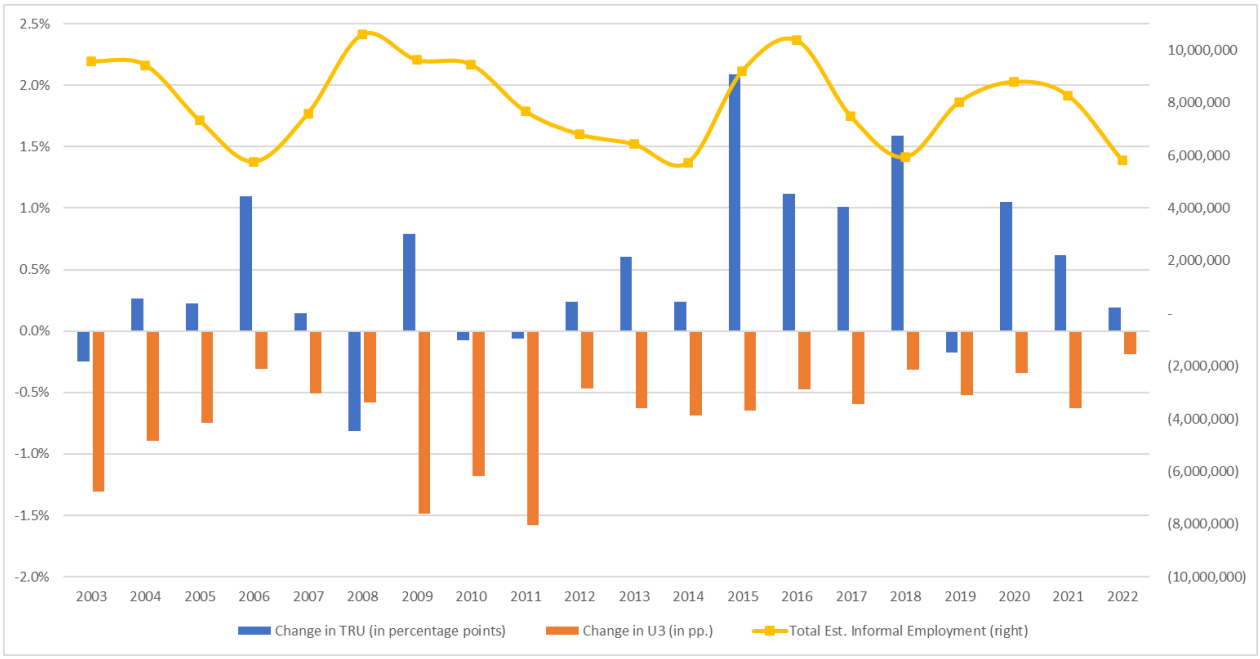


Figure 8: Change in the TRU vs the U3 Rate (Scenario B)

Finally, imputing the actual earnings of the self-employed has a significant impact on their functional employment, but given that they only represent around 10% of the workforce, the impact on the TRU is small. If all self-employed workers fail to report 30% of their income, their functional employment rate rises by 5.8pp., on average, from 66.3% to 72.1% from 2003 through 2022. Overall, this would mean that 0.95M more workers are functionally employed per year. However, the TRU OOP would only fall by 0.39 pp. on average, ranging from 0.28 pp. decrease in 2020 to 0.51pp. in 2003 and 2007 (Figure 9).

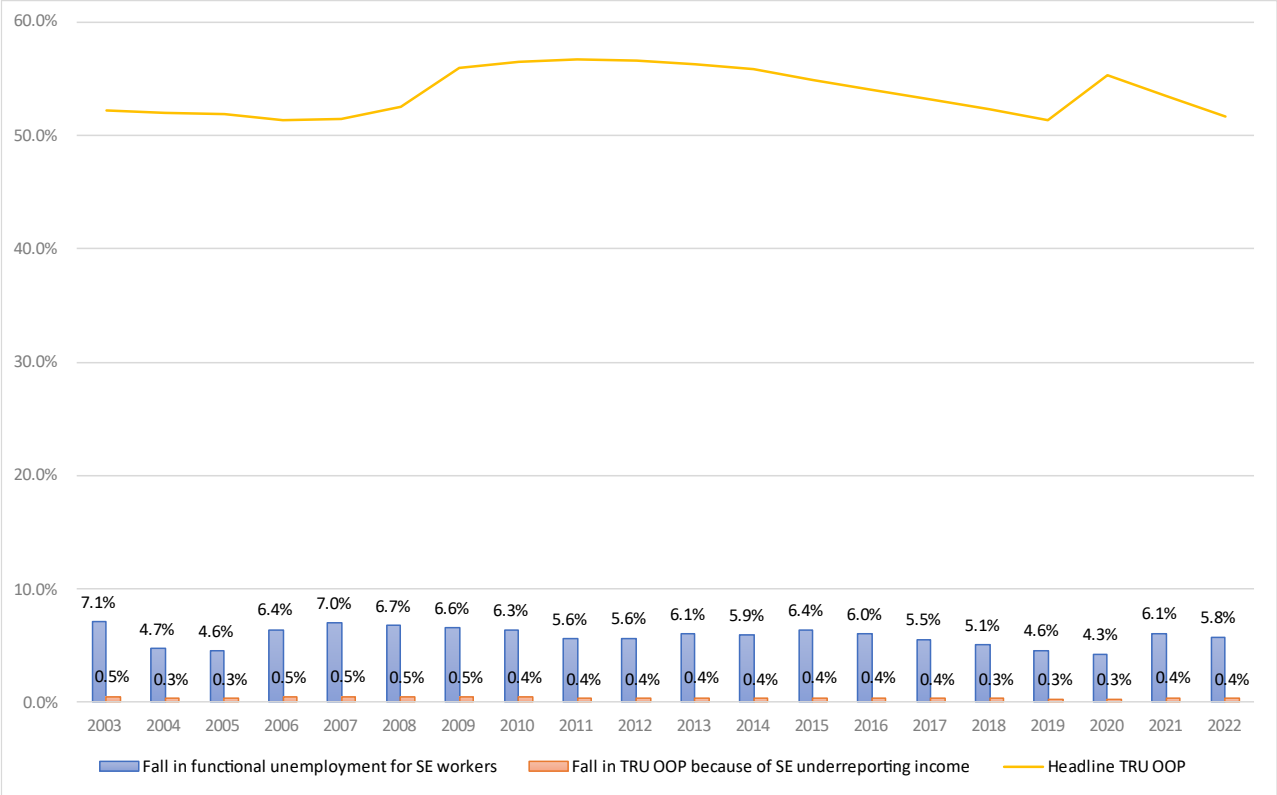


Figure 9: Imputing unreported income significantly lowers functional unemployment for the self-employed, but the overall effect remains small

B. Informal Employment Estimates

Between 2003 and 2022, annual informal employment consisted of 1.14M workers in the lower-bound estimate and of 7.99 M workers in the upper-bound estimate on average. The year 2006 witnessed the lowest level of informal employment at 5.76 M while 2008 had the highest level with 10.58M informal workers. Conversely, 2012 is the year with the least amount of new employment added with only 2.86M informal workers that do not have a formal job. In turn, in 2015 informal activities increased employment level the most adding 6.54M new workers. Figure 10 depicts LISEP's informal employment estimates for people who report being employed, unemployed or are outside of the labor force in the formal market. Informal workers include people who report working for pay in the ATUS outside of a job, so it

includes jobholders, unemployed jobseekers, and not employed people outside of the labor force as registered by the BLS.

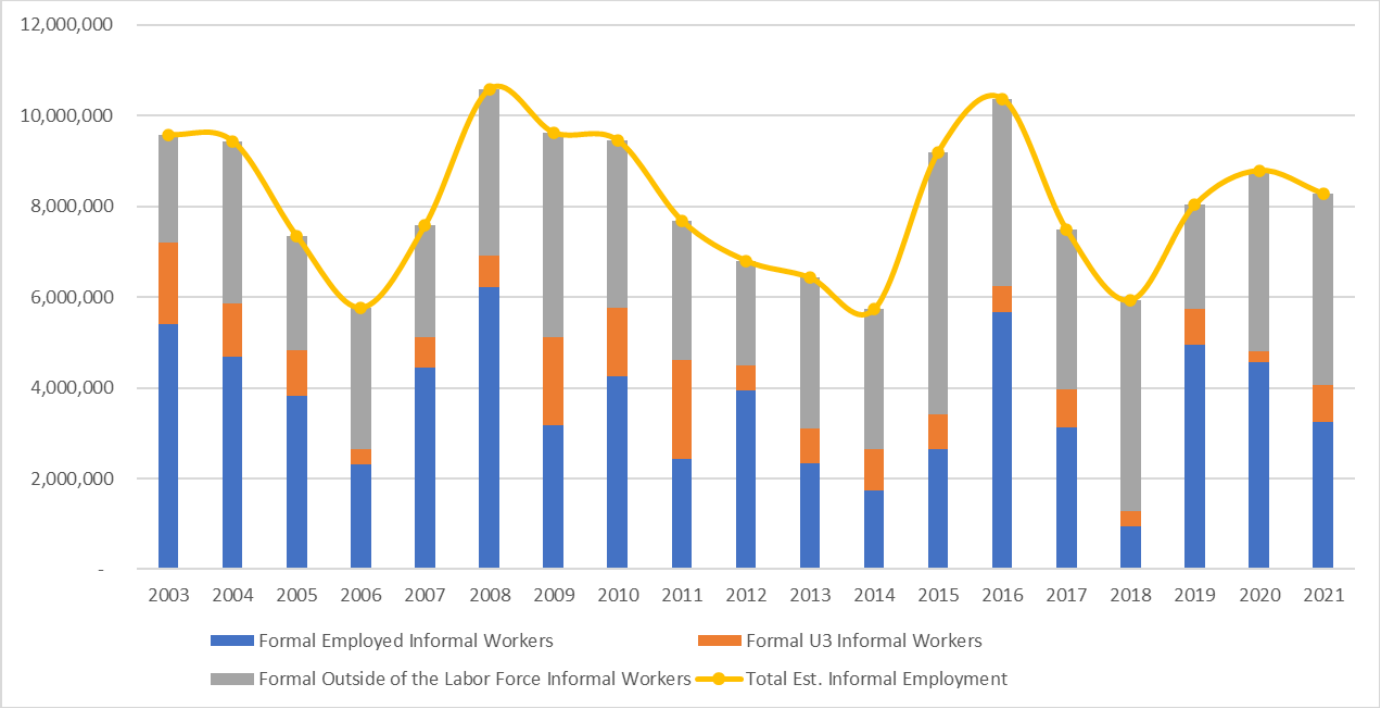


Figure 20: Informal Workers by Formal Employment Status (Scenario B Estimate)

C. Demographics

In terms of demographics, women make up a disproportionately higher share of informal workers, accounting for 58.0% of informal workers on average while only representing 51.6% of the ATUS sample population (Table 1). In turn, men only make up 42.0% of informal workers while totaling 48.4% of the sample. Likewise, people aged between 25 and 54 only account for 41.2% of informal workers even though they account for 51.3% of the total population. People older than 54 only represent 24.3% of informal workers, despite comprising 33.1% of the sample. Indeed, young people report a disproportionately high amount of informal activity, making up 34.5% of informal workers, more than double their population share at 15.6% of the sample. Those who work part-time for economic reasons also have a higher chance of working informally, representing 16.5% of informal workers while only comprising 9.9% of the sample population. Finally, the racial breakdown of informal employment does not significantly deviate from that of the sample population, with Black, Hispanic, and White non-Hispanic representing 15.3%, 16.2% and 66.6% of informal employment, respectively.

Table 1: Overrepresentation of Women in Informal Work (ATUS Sample)

Demographic	All	**Female**	**Male**
Share of Sample Population	100.0%	51.6%	48.4%
Share of Informal Workers	100.0%	58.0%	42.0%
% who are Functionally Employed	45.9%	37.5%	54.7%
% who work Informally (Low Estimate)	0.5%	0.5%	0.4%
% who work Informally (High Estimate)	3.3%	3.7%	2.9%
% of Informal Workers who are Functionally Employed in the formal sector	20.7%	19.1%	22.8%
% of Informal Workers who are Functionally Employed after accounting for Informality	41.7%	40.7%	43.1%

D. Occupations

Those with limited or no sources of formal employment income are also overrepresented in the informal sector. People outside of the formal workforce make up 43.3% of informal workers even though they represent only 36.1% of the population throughout the period. Similarly, unemployed workers who want to work but are unable to find formal employment account for 3.7% of the population but they make up 11.6% of all informal workers. So, the share of the unemployed exclusively in the informal sector is over three times as high as their share in the formal workforce. Finally, informal workers who have a low-paying formal job make up a disproportionately higher share of workers in the informal sector who are also employed in the formal sector. For example, personal care and service occupations (e.g., childcare workers and hairdressers) with a median hourly wage of only $15.07 (about $31,000 if annualized) represent over a tenth of informal workers with formal jobs, despite representing only 3.5% of all employment, while high paying occupations such as management are underrepresented in the informal economy. Table 2 summarizes the breakdown of formally employed informal workers sorted by the "representation factor" defined as the ratio of informal workers in a formal occupation out of all employed informal workers over the percent of all formal workers in that formal occupation out of all employed.[35] The median hourly wage for each occupation of the latest OEWS release is

[35] $Representation\ Factor = \frac{Informal\ Workers\ in\ formal\ occupation\ j \div Informal\ Workers\ with\ formal\ jobs}{All\ workers\ in\ formal\ occupation\ j \div All\ workers\ with\ formal\ jobs}$

Where *j* defines the specific occupation. A representation factor greater than 1 indicates that formal workers in a specific formal sector occupation are overrepresented among informal workers with formal jobs.

included for reference, but the employment estimates were derived with CPS data from 2003 to 2022.

Table 2: Occupation Breakdown of Informal Workers

Occupation Title	Median Hourly Wage (OEWS May 2022)	% occupation out of all employment	% occupation out of informal workers	% occupation out of non-informal workers	Representation factor
Farming, Fishing, and Forestry Occupations	$16.33	0.7%	2.2%	0.7%	3.14
Personal Care and Service Occupations	$15.07	3.5%	10.9%	3.4%	3.14
Building and Grounds Cleaning and Maintenance Occupations	$16.28	3.7%	6.7%	3.7%	1.79
Arts, Design, Entertainment, Sports, and Media Occupations	$27.90	2.0%	3.2%	2.0%	1.60
Community and Social Service Occupations	$23.74	1.7%	2.4%	1.7%	1.41
Educational Instruction and Library Occupations	$27.64	5.9%	8.3%	5.9%	1.40
Healthcare Support Occupations	$16.16	2.3%	3.2%	2.3%	1.39
Transportation and Material Moving Occupations	$18.24	6.2%	7.0%	6.2%	1.14
Food Preparation and Serving Related Occupations	$14.25	5.3%	5.7%	5.3%	1.07
Production Occupations	$19.19	5.9%	5.9%	5.9%	1.01
Construction and Extraction Occupations	$24.31	5.5%	5.4%	5.5%	0.99
Office and Administrative Support Occupations	$19.67	12.5%	11.9%	12.5%	0.95
Sales and Related Occupations	$16.96	10.7%	9.4%	10.7%	0.88
Life, Physical, and Social Science Occupations	$35.74	1.0%	0.8%	1.0%	0.87
Healthcare Practitioners and Technical Occupations	$37.38	5.6%	3.8%	5.6%	0.67

Management Occupations	$51.62	11.4%	6.7%	11.4%	0.59
Business and Financial Operations Occupations	$36.95	4.6%	2.6%	4.6%	0.56
Legal Occupations	$45.76	1.2%	0.6%	1.2%	0.54
Protective Service Occupations	$21.85	2.1%	1.0%	2.1%	0.47
Installation, Maintenance, and Repair Occupations	$24.08	3.4%	1.1%	3.4%	0.32
Architecture and Engineering Occupations	$40.24	2.0%	0.6%	2.0%	0.31
Computer and Mathematical Occupations	$48.29	2.9%	0.5%	2.9%	0.17

Discussion

Minimal Effect on Overall Functional Employment

LISEP's findings suggest incorporating informal employment would not significantly alter the picture of the True Rate of Unemployment in the labor force nor in the True Rate of Unemployment out of the population. Even with the addition of income and labor hours from informal employment, many low- and middle-income Americans still cannot attain living-wage jobs. From 2003 to 2022, informal employment only raised the average TRU 0.49 pp. Those who become functionally employed through informality do not offset the large population of informal workers who are functionally unemployed even when considering the informal sector. A large share of informal workers is not counted in the formal labor force and the vast majority does not meet the requirements for functional employment after accounting for informal work. Consequently, accounting for informality often causes the TRU to increase as this share of informal workers is added to the labor force. Indeed, this is consistent with the literature on the U.S. informal economy suggesting that informal work supplements low earnings from precarious, formal employment.[36] [37] Adjusting for inaccurate income reporting among self-employed workers does meaningfully lower their functional unemployment out of the population, by 5.8 pp. on average, but the impact on the overall functional unemployment rate is limited, diminishing functional unemployment out of the population by only 0.4 pp. Even when considering both effects together, the impact on functional employment remains small, indicating that LISEP's headline TRU remains representative of labor market trends for LMI workers.

[36] Nightingale, D. S., Wander S.A. Ibid,, 3.
[37] Abraham, K. G., & Houseman, S. N. (2019). Making ends meet: The role of informal work in supplementing Americans' income. RSF: The Russell Sage Foundation Journal of the Social Sciences, 5(5), 110-131.

Insights on Informal Workers

A deeper analysis of the informal worker demographics provides further evidence that informal workers experience a dire reality as functionally unemployed people are more likely to rely on informal income. Only 1 in 5 informal workers in the ATUS sample met the conditions for functional employment before considering informality. 81.3% of female and 78.1% of male informal workers in the ATUS sample did not have a full-time and living-wage job in the formal sector. LISEP's research found women make up a disproportionate larger share of informal workers, and they also have a disproportionately higher likelihood of working in low-wage and part-time occupations.[38] In the last three years, 0.50% of women reported working informally on an average day compared to 0.31% of men (Appendix H). Unsurprisingly, those in involuntary part-time employment also have a disproportionately higher participation rate in informal work. Among young people, the share of low-wage occupations has risen considerably faster than among other age groups,[39] which might partly explain why the proportion of young people in informal work is more than twice as high as in the overall population. Surprisingly, while Black and Hispanic workers make up a relatively larger share of informal workers based on the existing literature, their share of informal employment was only 2.7 and 1.2pp. higher than their sample population, respectively. Still, 0.51% of Black or Hispanic workers reported working informally in the last three years compared to 0.38% of non-Hispanic White people (Appendix H).

Informal workers who are in the formal workforce come disproportionately from low-paying or seasonal occupations rather than secure high-paying occupations. From 2003 to 2022 unemployment made up 5.9% of the overall workforce, but 20.5% of informal workers among those in the formal labor force were unemployed in the formal sector, over three times as much (Appendix I). So, a fifth of these informal workers were either in between jobs or unable to find one in the formal labor market. Among informal workers who are formally employed, informal workers with formal occupations paying low wages at the median were overrepresented. Examples of these jobs include personal care and service, cleaning and maintenance or healthcare support occupations while high paying ones like management, healthcare practitioners and engineers were underrepresented. Seasonal occupations like agriculture and education were also among the occupations with more informal

[38] Ludwig Institute for Shared Economic Prosperity. "True Rate of Unemployment." Accessed on 05/05/2023 on https://www.lisep.org/tru. The gender TRU gap has decreased since the turn of the century, but it remains at an astonishing 10 percentage points higher for women.

[39] Howell, D. R., & Kalleberg, A. L. (2019). Declining job quality in the United States: Explanations and evidence. *RSF: The Russell Sage Foundation Journal of the Social Sciences*, *5*(4), 1-53. https://www.rsfjournal.org/content/5/4/1.short

representation (Table 2). Most likely, workers in these occupations look for supplementary income during their periods off the job.

The informal economy provides a pathway for precarious workers to achieve a bare-minimum living wage. When only accounting for formal work, only one third of informal workers who are also in the formal labor force are functionally employed. After accounting for informal employment, just over half meet the threshold functional employment. More precisely, the functional unemployment rate for informal workers who are also in the labor force fell by 30% (from 67.9% to 47.6% over the entire period) after adding informal employment. Similar trends happen among more specific demographics: the rate of functional employment more than doubles among all female informal workers (from 18.7% to 40.2%) and increases sixfold for young informal workers (from 4.3% to 29.4%) after considering informal labor. But, since informal workers represent only between 0.5% and 3.3% of the population, the incidence of the informal sector on the overall TRU is small. For example, while 32.1% of informal workers who are part-time for economic reasons become functionally employed, less than 1% of people with involuntary part-time participate in informal work on an average day. And most informal workers still don't work full-time hours and earn a living wage, even though informal employment drastically improves their economic reality.[40]

Even though informal employment does not lift Americans out of functional unemployment in the long-term, it can be a cushion for low-income workers. Indeed, it softened the blow of the Great Recession for working-class people. As firms laid workers off and relied on temporary and part-time contracts for production, informal labor compensated for hours and income lost. Between 2008 and 2011, the TRU fell on average by 0.66pp. and by 1.54pp. out of the population after considering the informal sector compared to an increase of 0.07pp. and a fall of 0.98pp., respectively, in the other years. 2008 experienced the largest increase in functional employment from informality, and 2009 witnessed the largest rise in employment from informal jobs along with 2015. But, the informal sector in 2009 allowed twice as many people to achieve full-time and living-wage status than in 2015. Overall, more people who were formally functionally unemployed during the Great Recession leaned into their already-established informal job to maintain a full-time, living-wage employment status, or turned to the informal market for work. Similarly, slightly more self-employed workers become functionally employed when imputing unreported income during the Great Recession than in subsequent years. This likely reflects lower earnings rather than an

[40] See Appendix H for detailed demographic data on the ATUS informal estimates by demographics.

increased reliance on informality. Overall, earnings metrics are more likely to be off the mark during downturns because of increased reliance on informal income.

Understanding the Prevalence of the Informal Economy

Finally, it's important to consider the possible explanations for why informal employment is not as prevalent as thought or perceived, and the relevant implications. First, household surveys do not necessarily reflect the actual level of informality although they serve as useful guidance. Informal workers and employers are less likely to report informal labor and income, even if surveys don't have legal implications. In addition to the self-employed underreporting income, undocumented workers have a considerably higher probability of working informally and understandably would fear reporting it in government surveys and even answering them. Since LISEP's upper estimate of informal work raises the employment-to-population ratio (EPR) by 2.6 pp. in 2015, which is very close to the Boston Fed's 2.5 pp. estimate, actual informal employment is probably closer to the upper estimate of the range than to the lower one. This reflects that the CPS and the ATUS likely miss a substantial number of informal workers because they are not representative of undocumented immigrants. More relevant to the ATUS, informal opportunities are more sporadic than formal employment, so the survey might not capture all informal activities by only asking about the preceding day. Although LISEP determines a weekly range of informal workers to address this, more people might engage in informal gigs once every few weeks, months or even year, which explains the higher rate of informal employment in surveys asking about longer timeframes.[41] However, neither the BLS nor LISEP would classify engaging in informal work so sporadically as employment. LISEP's definition also excludes the sale of goods because the ATUS does not distinguish between selling used goods and selling produced or collected goods for pay as an informal business (Appendix K). While ignoring sellers might overlook an important part of the informal economy, the potential impact on functional employment remains minimal (Appendix K).

Second, the informal employment estimate might appear small since the formal sector has welcomed and promoted poorer job standards. As firms rely on flexible work arrangements and subcontracting to minimize costs and increase competitiveness, supply chains have become fissured. Industries such as residential construction, warehousing and retail increasingly rely on temporary help services through staffing agencies and day laborers.[42] With temporary and part-time labor regulations being less stringent in the United

[41] Bracha, A. & Burke, M. A. (2016). Ibid., 3.

[42] Weil, D. (2019). Understanding the Present and Future of Work in the Fissured Workplace Context. *RSF: The Russell Sage Foundation Journal of the Social Sciences, 5*(5), 147–165. https://doi.org/10.7758/rsf.2019.5.5.08

States and household surveys capturing most of these lower-wage formal sector jobs, informal employment might be lower than expected.[43] Likewise, digital solutions such as TaskRabbit and Etsy that facilitate traditional gigs and expanded marketplaces also promote more visibility through electronic payments and formal registration as an employee, seller or contractor. Since these alternative work arrangements often lack essential benefits such as health insurance and retirement savings plans found in traditional full-time employment, they resemble informal sector activities but are captured in the formal labor market.

Conclusion

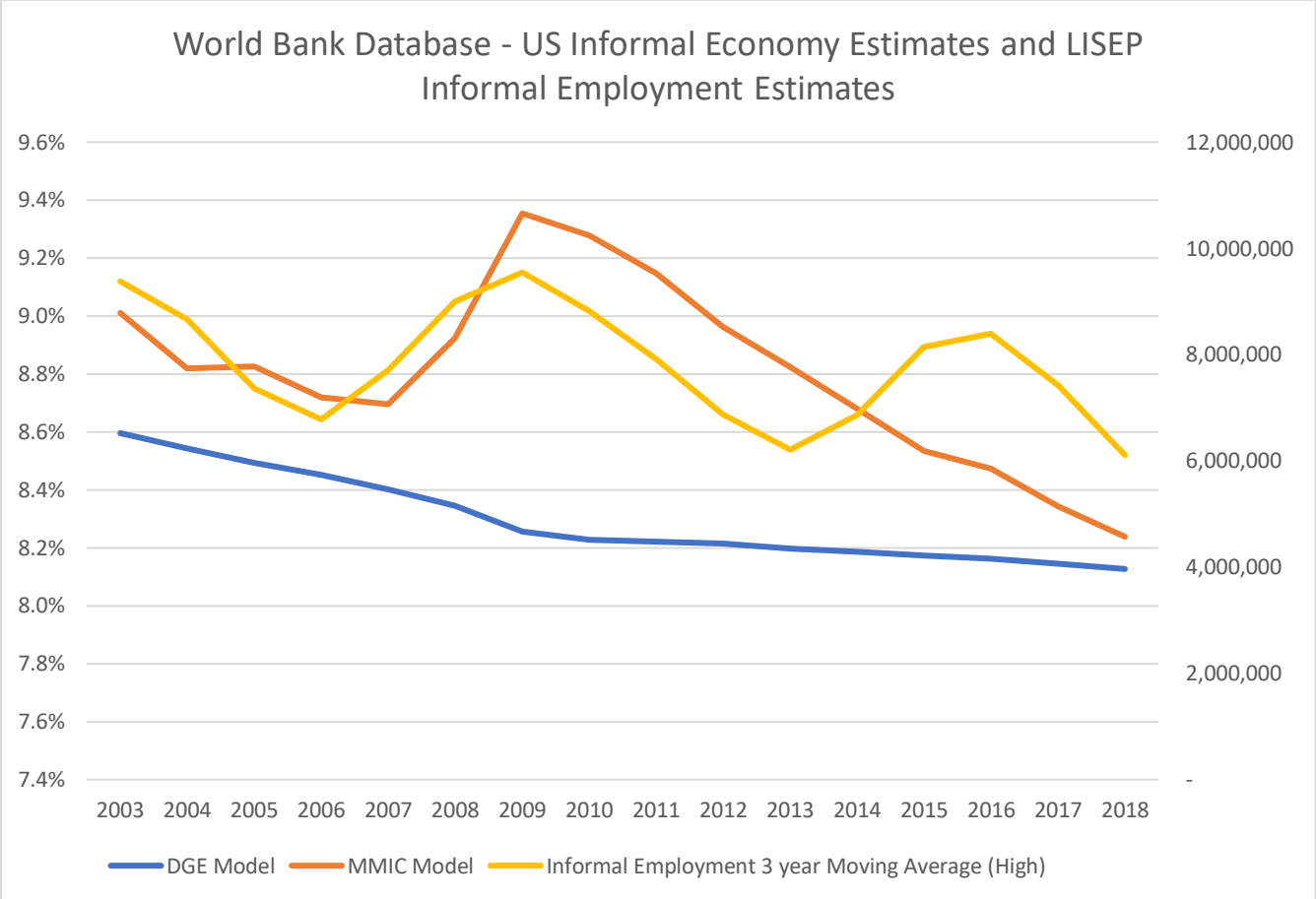
Studying informal work under the lens of the TRU suggests informal income and employment does not significantly improve the level of functional employment in the United States. Whether they have a job in the formal market or not, informal workers are more likely to experience economic distress due to poor prospects in the labor market. And even though informal work can provide necessary breathing space by helping informal workers earn above a poverty wage, most informal gigs have low compensation, are sporadic, and lack the indispensable safeguards and protections of formal employment.

The perception of growing informality in the U.S. labor market only conveys that low-wage and unstable jobs have become more commonplace, and employment surveys capture this trend. However, the prevalence of precarious work also highlights how problematic the BLS's definition of employment is. A quarter of workers and jobseekers have involuntary part-time work and annual earnings far below a basic standard of living, but the U3 definition of unemployment turns a blind eye to this reality. Even if more people than estimated relied on informal income, most would work informally to compensate for lamentable opportunities in the formal market, and LISEP statistics display the true level of underemployment. Government agencies and policymakers must incorporate job quality in labor market metrics to truly understand the economic health of low-income workers.

[43] Williams, C. (2015). Ibid., 3.

Appendix

Appendix A: World Bank Informal Economy Estimates as a % of U.S. GDP



Appendix B: Formula for estimating populations in the ATUS

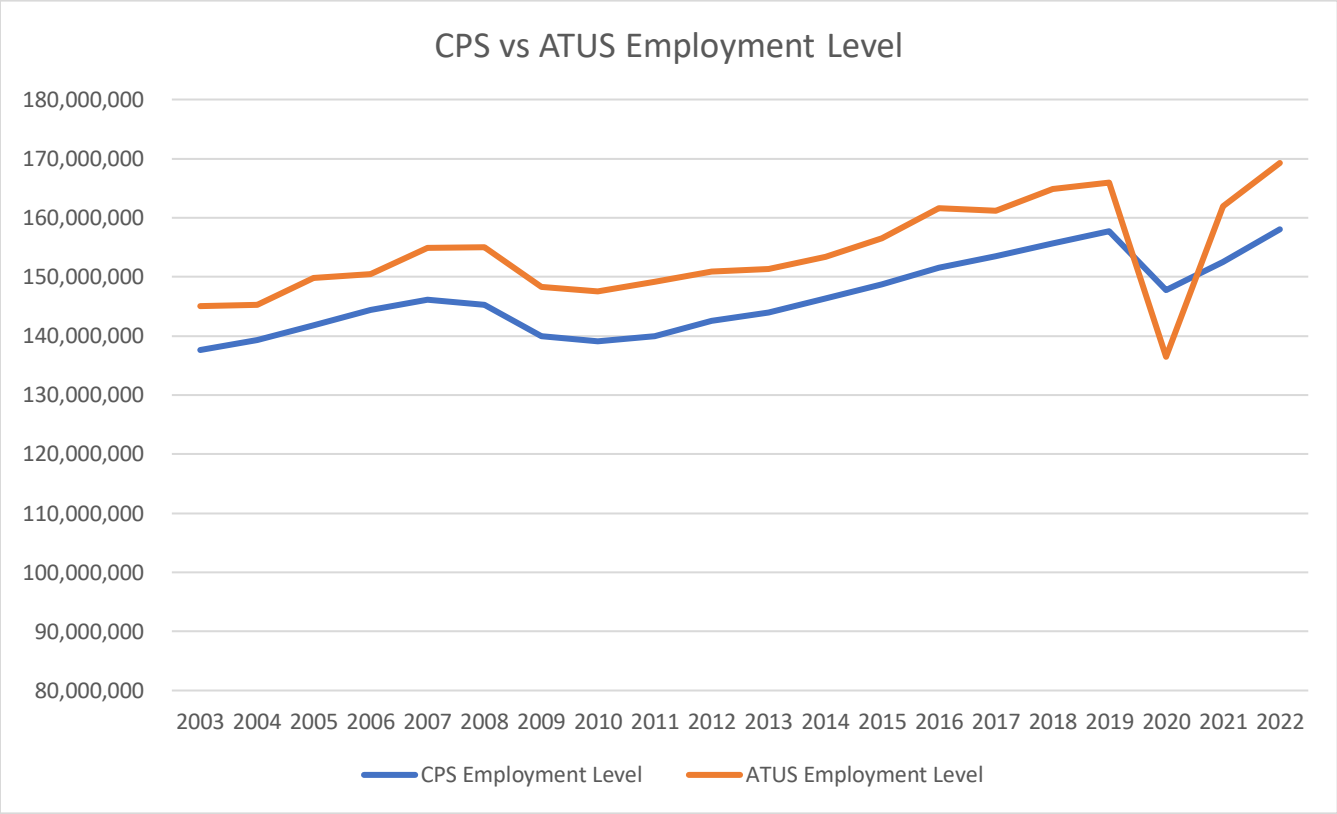
Number of participants. Num_j, the number of persons engaging in activity j during an average day, is given by

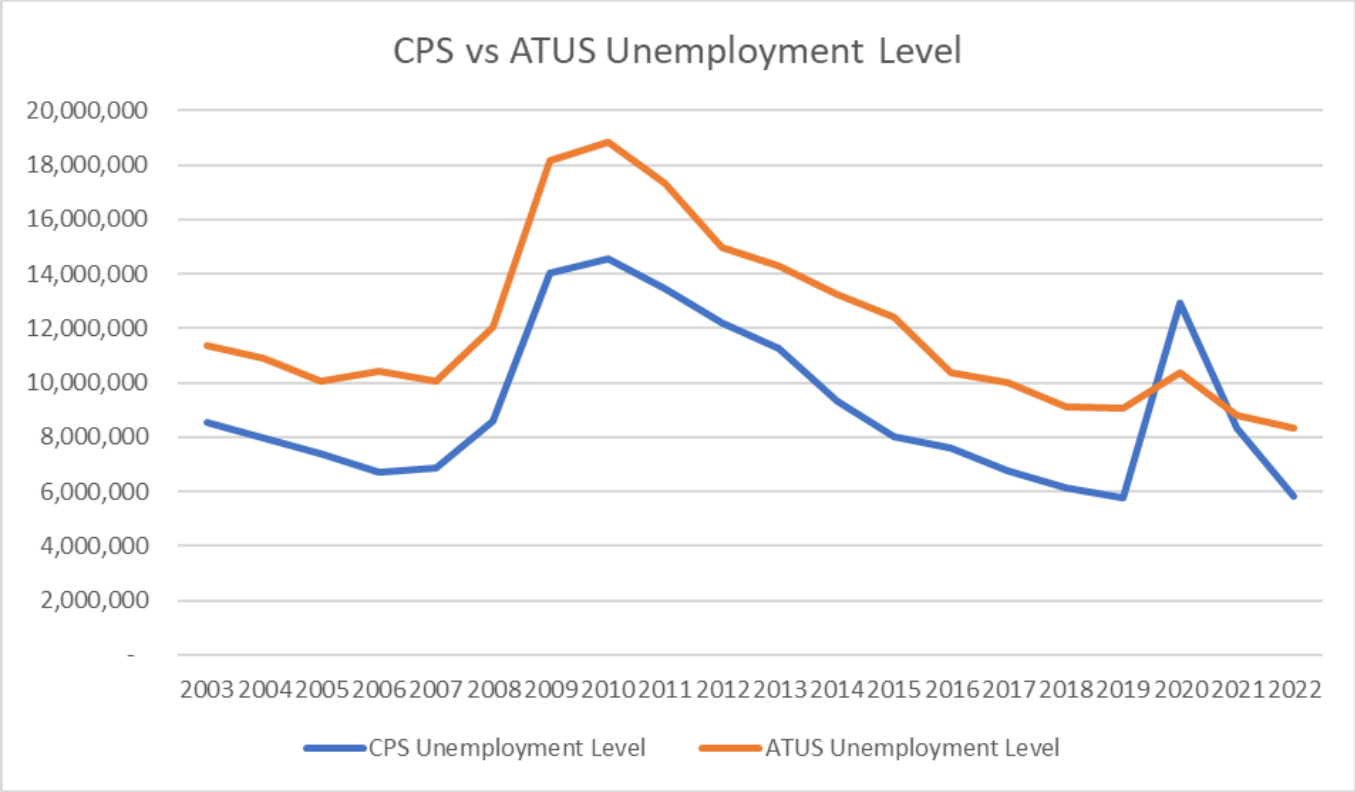
$$Num_j = \sum_i \frac{fwgt_i I_{ij}}{D}$$

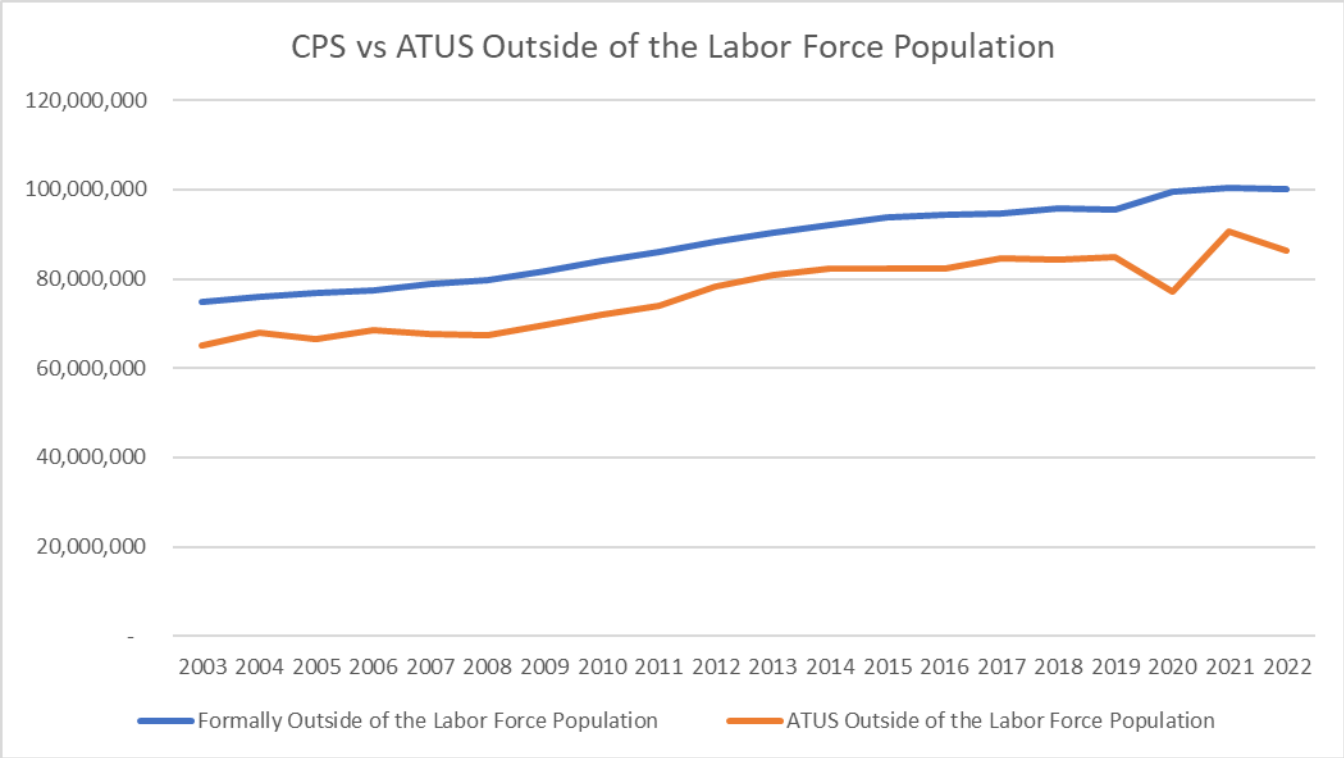
where $fwgt_i$ is the final weight for respondent i,

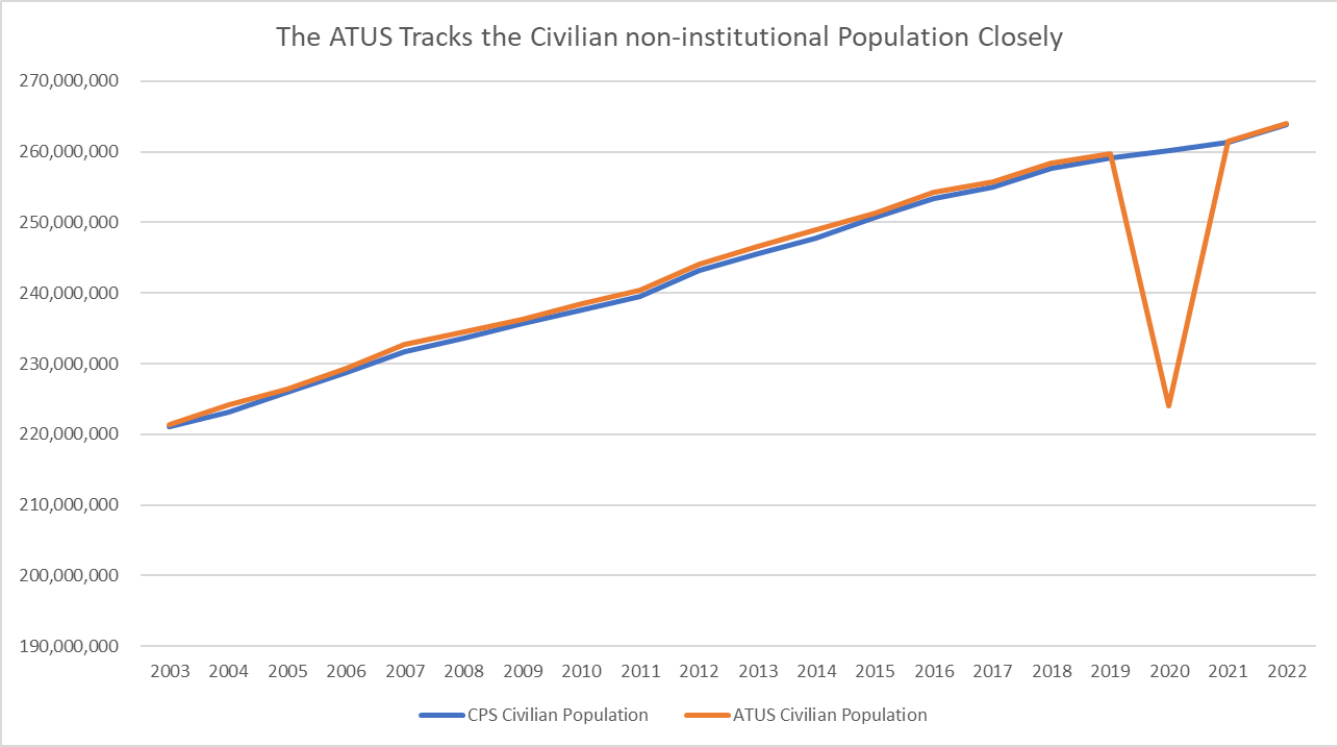
I_{ij} is an indicator that equals 1 if respondent i participated in activity j during the reference day and 0 otherwise, and
D is the number of days in the estimation period (for example, 365 for annual averages for years other than leap years).

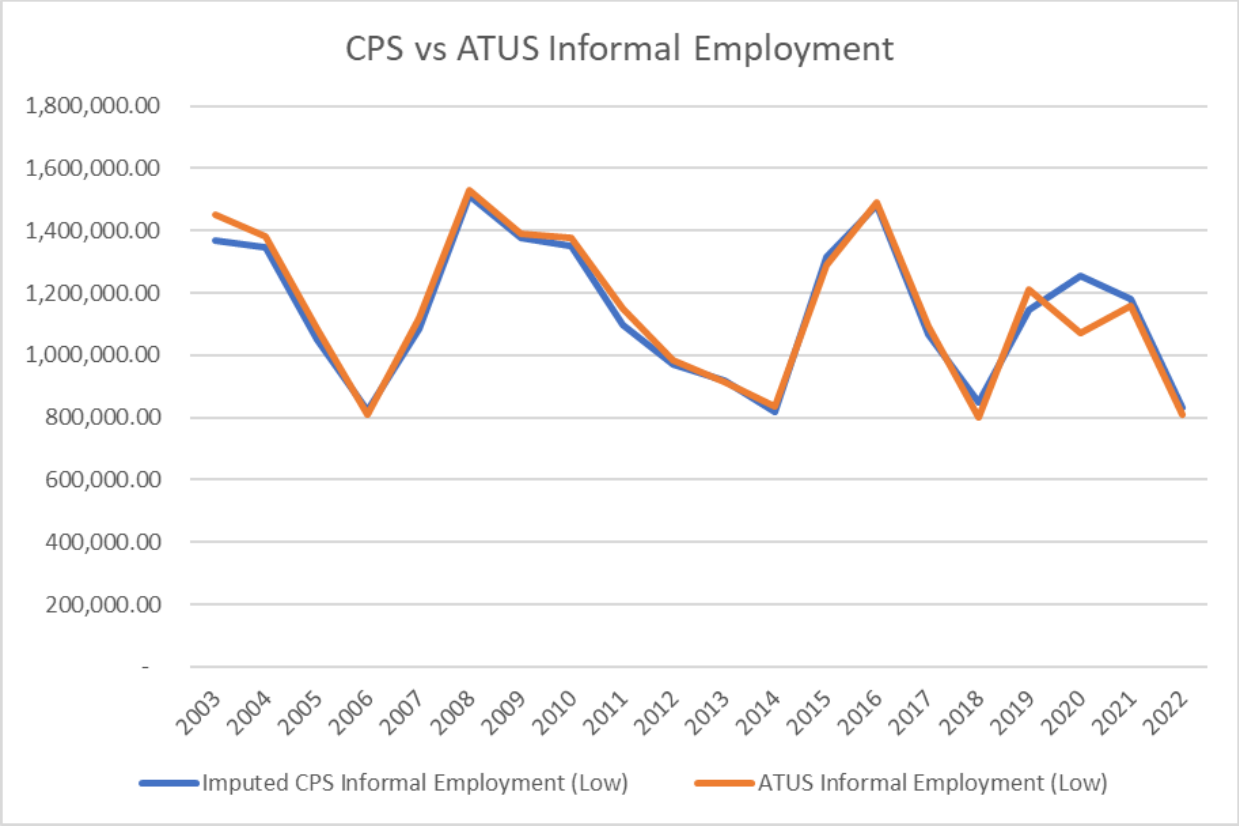
Appendix C: Population estimates CPS vs ATUS

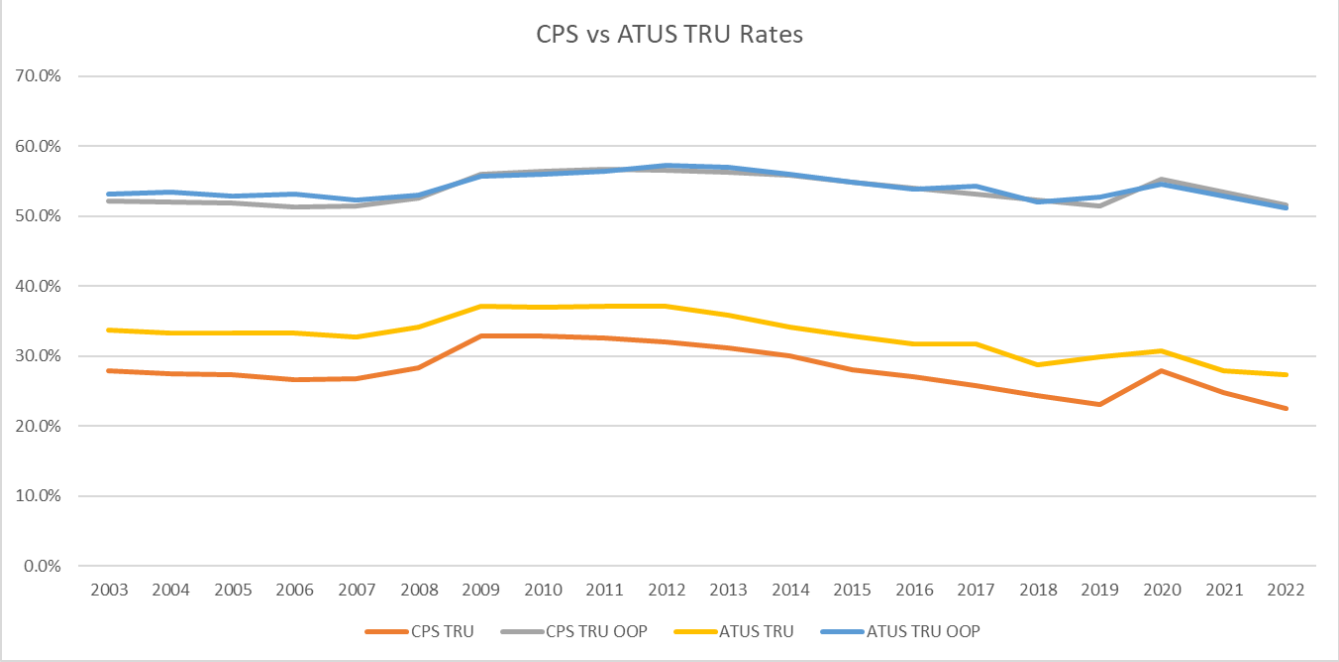





CPS vs ATUS Outside of the Labor Force Population
120,000,000
100,000,000
80,000,000
60,000,000
40,000,000
20,000,000
-
2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021 2022
Formally Outside of the Labor Force Population
ATUS Outside of the Labor Force Population


The ATUS Tracks the Civilian non-institutional Population Closely
270,000,000
260,000,000
250,000,000
240,000,000
230,000,000
220,000,000
210,000,000
200,000,000
190,000,000
2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021 2022
CPS Civilian Population
ATUS Civilian Population


CPS vs ATUS Informal Employment
1,800,000.00
1,600,000.00
1,400,000.00
1,200,000.00
1,000,000.00
800,000.00
600,000.00
400,000.00
200,000.00
-
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
Imputed CPS Informal Employment (Low)
ATUS Informal Employment (Low)


CPS vs ATUS TRU Rates
70.0%
60.0%
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
CPS TRU
CPS TRU OOP
ATUS TRU
ATUS TRU OOP

Appendix D: Effect of Informality and Underreporting on the TRU

Year	Headline TRU	Headline TRU OOP	TRU + Informal Employment (Scenario B)	TRU OOP with Informal Employment (Scenario B)	TRU + Informal Employment (Scenario B) + Self-employed Underreporting Income	TRU OOP + Informal Employment (Scenario B) + Self-employed Underreporting Income
2003	28.0%	52.2%	27.7%	51.3%	27.0%	50.7%
2004	27.5%	52.0%	27.7%	51.0%	27.3%	50.7%
2005	27.3%	51.9%	27.5%	51.2%	27.1%	50.9%
2006	26.6%	51.3%	27.7%	51.1%	27.1%	50.6%
2007	26.7%	51.5%	26.9%	50.8%	26.2%	50.3%
2008	28.3%	52.6%	27.5%	50.9%	26.8%	50.4%
2009	32.9%	56.0%	33.6%	55.2%	33.0%	54.8%
2010	32.8%	56.4%	32.8%	55.3%	32.1%	54.9%
2011	32.6%	56.7%	32.5%	55.8%	32.0%	55.4%
2012	32.0%	56.6%	32.3%	56.1%	31.7%	55.7%
2013	31.1%	56.3%	31.7%	55.8%	31.1%	55.4%
2014	30.0%	55.9%	30.3%	55.2%	29.7%	54.8%
2015	28.1%	54.8%	30.2%	54.5%	29.6%	54.1%
2016	27.0%	54.0%	28.1%	53.6%	27.6%	53.2%
2017	25.7%	53.2%	26.7%	52.8%	26.2%	52.5%
2018	24.4%	52.3%	26.0%	52.0%	25.5%	51.7%
2019	23.1%	51.4%	23.0%	50.6%	22.5%	50.3%
2020	27.9%	55.3%	28.9%	54.9%	28.5%	54.6%
2021	24.7%	53.5%	25.4%	52.6%	24.7%	52.2%
2022	22.5%	51.6%	22.6%	50.9%	22.1%	50.5%

Appendix E: Effect of Informal Employment on Labor Market Statistics in Scenarios A and B

Scenario A:

Year	Formally Employed Population	Total Est. Employed population after considering informality	Formally Unemployed Population	Total Est. Unemployed Population after considering informality	Labor Force Population	Total Est. Labor Force Population
2003	137,613,392	138,209,904	8,533,104	8,275,471	146,146,496	146,485,375
2004	139,253,024	139,930,592	7,956,578	7,791,335	147,209,616	147,721,927
2005	141,800,592	142,303,584	7,373,046	7,228,141	149,173,648	149,531,725
2006	144,410,256	144,905,040	6,699,899	6,651,290	151,110,160	151,556,330
2007	146,074,960	146,524,960	6,856,687	6,760,276	152,931,648	153,285,236
2008	145,292,800	145,916,592	8,605,583	8,504,614	153,898,384	154,421,206
2009	139,898,928	140,819,056	14,050,345	13,773,075	153,949,280	154,592,131
2010	139,036,592	139,780,720	14,564,907	14,349,076	153,601,504	154,129,796
2011	139,981,312	140,733,136	13,472,164	13,157,532	153,453,472	153,890,668
2012	142,502,192	142,910,848	12,208,025	12,129,610	154,710,224	155,040,458
2013	143,943,248	144,526,560	11,242,267	11,134,988	155,185,520	155,661,548
2014	146,299,632	146,868,144	9,323,648	9,193,837	155,623,280	156,061,981
2015	148,769,136	149,704,384	8,039,050	7,931,323	156,808,192	157,635,707
2016	151,558,384	152,231,456	7,589,185	7,506,293	159,147,568	159,737,749
2017	153,473,920	154,096,080	6,786,576	6,668,113	160,260,496	160,764,193

2018	155,624,592	156,337,472	6,129,547	6,079,643	161,754,128	162,417,115
2019	157,709,600	158,149,040	5,791,716	5,679,100	163,501,328	163,828,140
2020	147,719,888	148,324,400	12,958,948	12,924,169	160,678,832	161,248,569
2021	152,530,144	153,249,744	8,350,417	8,233,032	160,880,560	161,482,776
2022	158,033,248	158,498,320	5,825,852	5,795,730	163,859,104	164,294,050

Year	**U3**	**U3 with informality**	**BLS Employment-to-Population Ratio**	**BLS Employment-to-Population Ratio with informality**
2003	5.8%	5.6%	62.3%	62.5%
2004	5.4%	5.3%	62.4%	62.7%
2005	4.9%	4.8%	62.8%	63.0%
2006	4.4%	4.4%	63.1%	63.4%
2007	4.5%	4.4%	63.0%	63.2%
2008	5.6%	5.5%	62.2%	62.5%
2009	9.1%	8.9%	59.4%	59.7%
2010	9.5%	9.3%	58.5%	58.8%
2011	8.8%	8.5%	58.5%	58.8%
2012	7.9%	7.8%	58.6%	58.8%
2013	7.2%	7.2%	58.6%	58.9%
2014	6.0%	5.9%	59.0%	59.3%
2015	5.1%	5.0%	59.3%	59.7%
2016	4.8%	4.7%	59.8%	60.1%
2017	4.2%	4.1%	60.2%	60.4%
2018	3.8%	3.7%	60.4%	60.7%
2019	3.5%	3.5%	60.9%	61.0%
2020	8.1%	8.0%	56.8%	57.0%
2021	5.2%	5.1%	58.4%	58.6%
2022	3.6%	3.5%	59.9%	60.1%

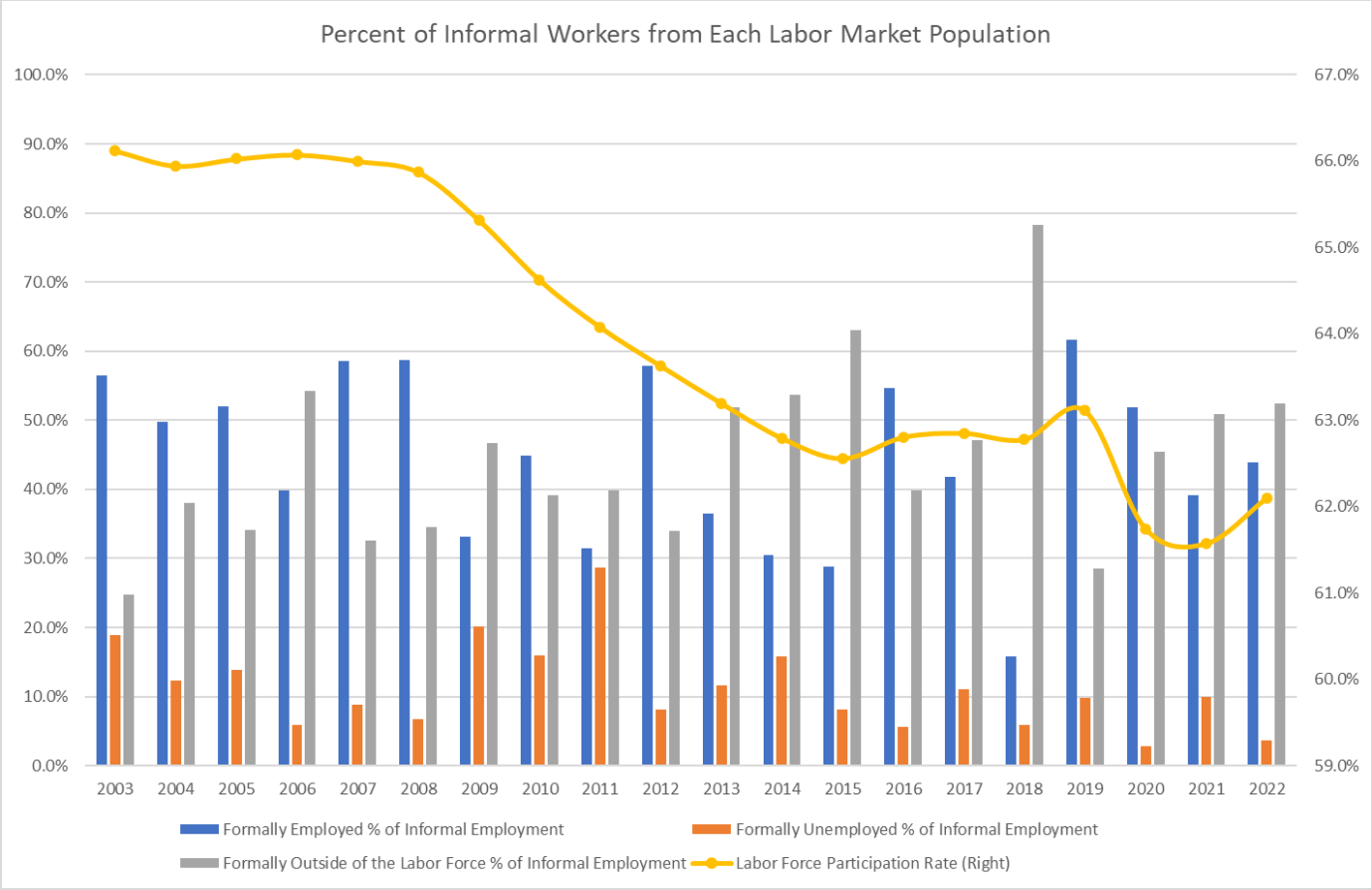
Scenario B:

Year	Formally Employed Population	Total Est. Employed population	Formally Unemployed Population	Total Est. Unemployed Population	Labor Force Population	Total Est. Labor Force Population
2003	137,613,392	141,789,008	8,533,104	6,729,674	146,146,496	148,518,682
2004	139,253,024	143,996,000	7,956,578	6,799,875	147,209,616	150,795,875
2005	141,800,592	145,321,504	7,373,046	6,358,710	149,173,648	151,680,214
2006	144,410,256	147,873,792	6,699,899	6,359,634	151,110,160	154,233,426
2007	146,074,960	149,224,944	6,856,687	6,181,811	152,931,648	155,406,755
2008	145,292,800	149,659,376	8,605,583	7,898,802	153,898,384	157,558,178
2009	139,898,928	146,339,856	14,050,345	12,109,456	153,949,280	158,449,312
2010	139,036,592	144,245,504	14,564,907	13,054,091	153,601,504	157,299,595
2011	139,981,312	145,244,112	13,472,164	11,269,737	153,453,472	156,513,849
2012	142,502,192	145,362,736	12,208,025	11,659,119	154,710,224	157,021,855
2013	143,943,248	148,026,432	11,242,267	10,491,314	155,185,520	158,517,746
2014	146,299,632	150,279,232	9,323,648	8,414,970	155,623,280	158,694,202
2015	148,769,136	155,315,824	8,039,050	7,284,963	156,808,192	162,600,787
2016	151,558,384	156,269,872	7,589,185	7,008,944	159,147,568	163,278,816
2017	153,473,920	157,829,008	6,786,576	5,957,336	160,260,496	163,786,344
2018	155,624,592	160,614,736	6,129,547	5,780,218	161,754,128	166,394,954
2019	157,709,600	160,785,712	5,791,716	5,003,403	163,501,328	165,789,115
2020	147,719,888	151,951,488	12,958,948	12,715,494	160,678,832	164,666,982
2021	152,530,144	157,567,328	8,350,417	7,528,722	160,880,560	165,096,050
2022	158,033,248	161,288,720	5,825,852	5,614,995	163,859,104	166,903,715

Year	U3	U3 with informality	BLS Employment-to-Population Ratio	BLS Employment-to-Population Ratio with informality
2003	5.8%	4.5%	62.3%	64.1%
2004	5.4%	4.5%	62.4%	64.5%
2005	4.9%	4.2%	62.8%	64.3%
2006	4.4%	4.1%	63.1%	64.7%
2007	4.5%	4.0%	63.0%	64.4%
2008	5.6%	5.0%	62.2%	64.1%
2009	9.1%	7.6%	59.4%	62.1%
2010	9.5%	8.3%	58.5%	60.7%
2011	8.8%	7.2%	58.5%	60.7%
2012	7.9%	7.4%	58.6%	59.8%
2013	7.2%	6.6%	58.6%	60.3%
2014	6.0%	5.3%	59.0%	60.6%
2015	5.1%	4.5%	59.3%	62.0%

2016	4.8%	4.3%	59.8%	61.7%
2017	4.2%	3.6%	60.2%	61.9%
2018	3.8%	3.5%	60.4%	62.3%
2019	3.5%	3.0%	60.9%	62.1%
2020	8.1%	7.7%	56.8%	58.4%
2021	5.2%	4.6%	58.4%	60.3%
2022	3.6%	3.4%	59.9%	61.1%

Appendix F: Contribution of each labor force population to informal labor



Appendix G: Summary of Informal Employment Demographics in ATUS Sample

Demographic	**All**	**In the Labor Force**	**Part-time for Economic Reasons**
Share of Sample	100.0%	68.4%	9.9%
Share of Informal Workers	100.0%	62.5%	16.5%
Percent who are functionally employed	45.9%	67.1%	0.0%

Percent who work informally (Low Estimate)	0.5%	0.4%	0.8%
Percent who work informally (High Estimate)	3.3%	3.0%	5.5%
Percent of informal workers who are functionally employed in formal labor market	20.7%	33.1%	0.0%
Percent of informal workers who are functionally employed including informality	41.7%	53.5%	32.1%

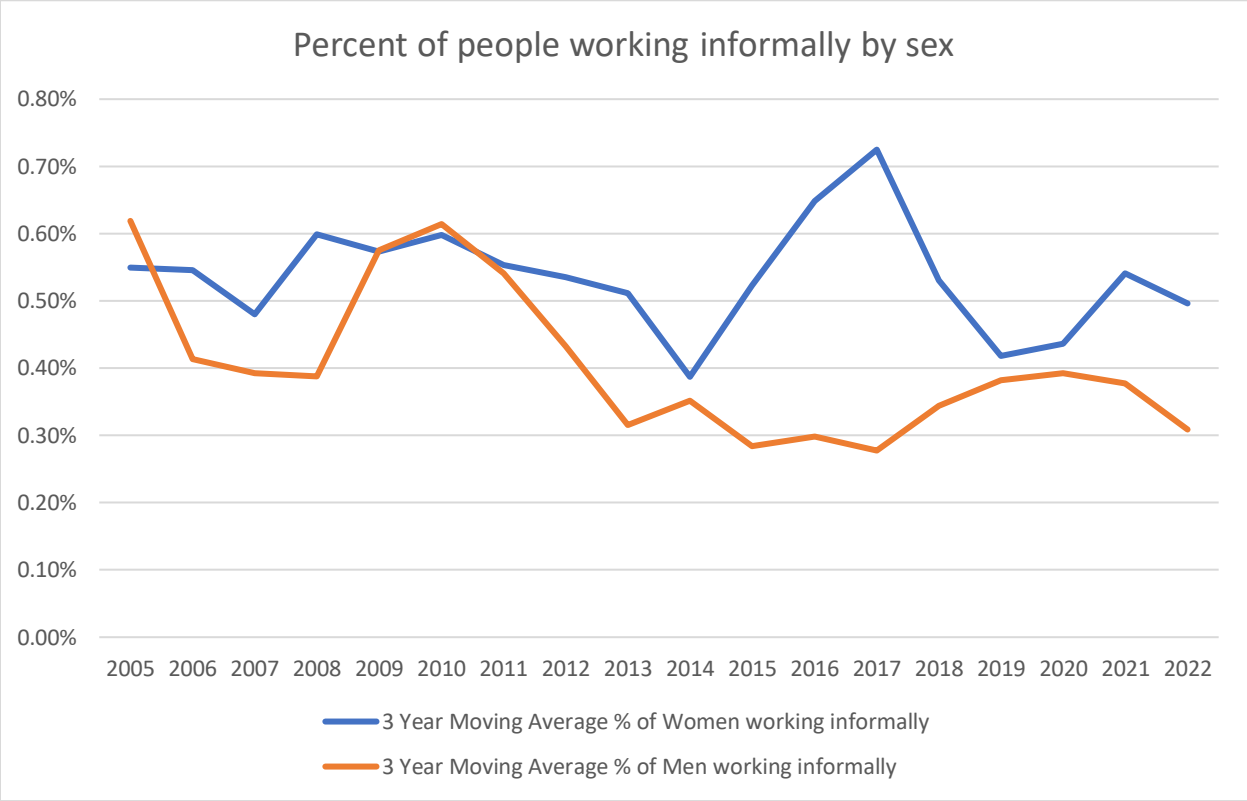
Demographic	All	**Female**	**Male**
Share of Sample Population	100.0%	51.6%	48.4%
Share of Informal Workers	100.0%	58.0%	42.0%
% who are Functionally Employed	45.9%	37.5%	54.7%
% who work Informally (Low Estimate)	0.5%	0.5%	0.4%
% who work Informally (High Estimate)	3.3%	3.7%	2.9%
% of Informal Workers who are Functionally Employed in the formal sector	20.7%	19.1%	22.8%
% of Informal Workers who are Functionally Employed after accounting for Informality	41.7%	40.7%	43.1%

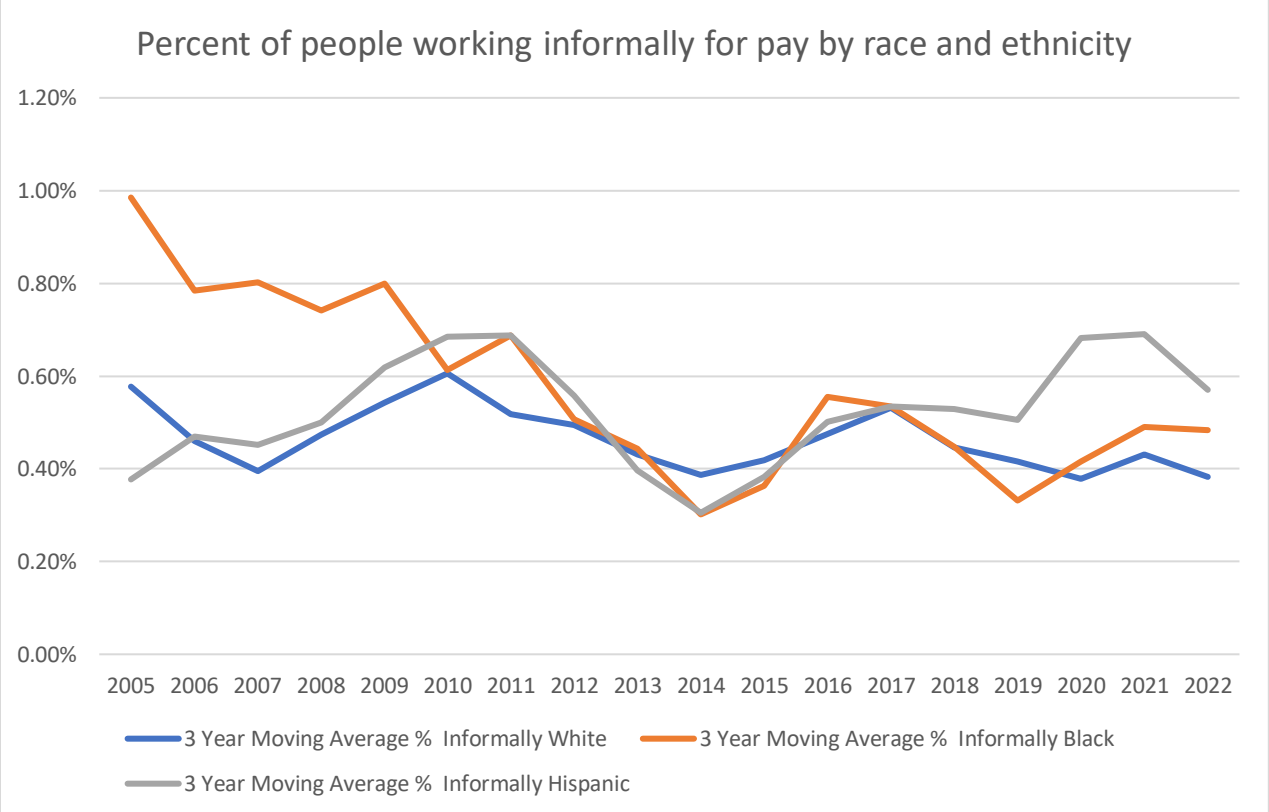
Demographic	All	**Black**	**Hispanic**	**White Non-Hispanic**	**Other**	**Black or Hispanic**
Share of Sample Population	100.0%	12.6%	15.0%	67.3%	5.6%	27.1%
Share of Informal Workers	100.0%	15.3%	16.2%	66.6%	2.5%	30.9%
% who are Functionally Employed	45.9%	40.1%	43.1%	47.2%	49.9%	41.8%
% who work Informally (Low Estimate)	0.5%	0.6%	0.5%	0.5%	0.2%	0.5%
% who work Informally (High Estimate)	3.3%	4.0%	3.6%	3.3%	1.5%	3.8%
% of Informal Workers who are Functionally Employed	20.7%	11.9%	22.9%	22.5%	7.8%	17.8%
% of Informal Workers who are Functionally Employed accounting for Informality	41.7%	37.9%	40.7%	43.2%	21.3%	40.1%

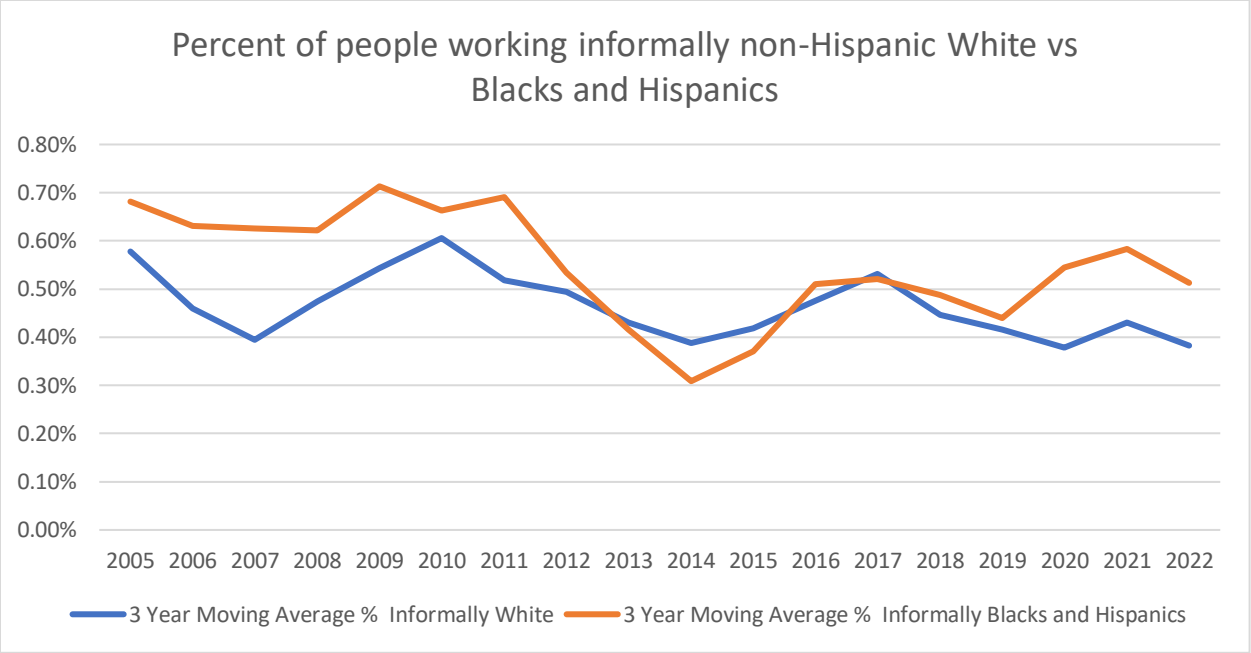
Demographic	All	**Young (16-24)**	**Prime (25-54)**	**Older (55+)**
Share of Sample Population	100.0%	15.6%	51.3%	33.1%
Share of Informal Workers	100.0%	34.5%	41.2%	24.3%
% who are Functionally Employed	45.9%	22.7%	65.4%	26.6%
% who work Informally (Low Estimate)	0.5%	1.0%	0.4%	0.3%
% who work Informally (High Estimate)	3.3%	7.3%	2.7%	2.4%
% of Informal Workers who are Functionally Employed	20.7%	4.3%	38.6%	13.6%
% of Informal Workers who are Functionally Employed accounting for Informality	41.7%	29.4%	53.0%	39.9%

Appendix H: Probability of Working Informally by Demographic

Given the high degree of volatility when examining demographic data for informal workers annually, LISEP decided to report most findings on demographic trends based on all years in the ATUS sample. However, this renders analyzing trends over time more difficult. So, LISEP produced three-year moving averages of the percent of each demographic group working informally on an average day to show trends over time while mitigating volatility. The graphs below detail the results. In general, women, Black and Hispanic people report working outside of their formal job for pay more often than men and non-Hispanic White workers, but less than 1% of respondents in each demographic report working informally. For most of the period, a higher share of women report working informally than men, with the trend reversing only during the Great Recession years. The overrepresentation of Hispanic and Black people among informal workers is less pronounced than that of women, but it's more marked before 2012 and since 2019. In general, Black and Hispanic workers tend to work informally at a higher rate than non-Hispanic Whites.


Percent of people working informally by sex
0.80%
0.70%
0.60%
0.50%
0.40%
0.30%
0.20%
0.10%
0.00%
2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021 2022
3 Year Moving Average % of Women working informally
3 Year Moving Average % of Men working informally


Percent of people working informally for pay by race and ethnicity
1.20%
1.00%
0.80%
0.60%
0.40%
0.20%
0.00%
2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021 2022
3 Year Moving Average % Informally White
3 Year Moving Average % Informally Black
3 Year Moving Average % Informally Hispanic



Year	Percent of people who report working informally on an average day (3 Year Moving Average)	Percent of women who report working informally on an average day (3 Year Moving Average)	Percent of men who report working informally on an average day (3 Year Moving Average)
2003	0.66%	0.55%	0.77%
2004	0.64%	0.60%	0.68%
2005	0.58%	0.55%	0.62%
2006	0.48%	0.55%	0.41%
2007	0.44%	0.48%	0.39%
2008	0.50%	0.60%	0.39%
2009	0.57%	0.57%	0.58%
2010	0.61%	0.60%	0.61%
2011	0.55%	0.55%	0.54%
2012	0.49%	0.53%	0.43%
2013	0.42%	0.51%	0.32%
2014	0.37%	0.39%	0.35%
2015	0.41%	0.52%	0.28%
2016	0.48%	0.65%	0.30%
2017	0.51%	0.72%	0.28%
2018	0.44%	0.53%	0.34%
2019	0.40%	0.42%	0.38%
2020	0.42%	0.44%	0.39%

2021	0.46%	0.54%	0.38%
2022	0.41%	0.50%	0.31%

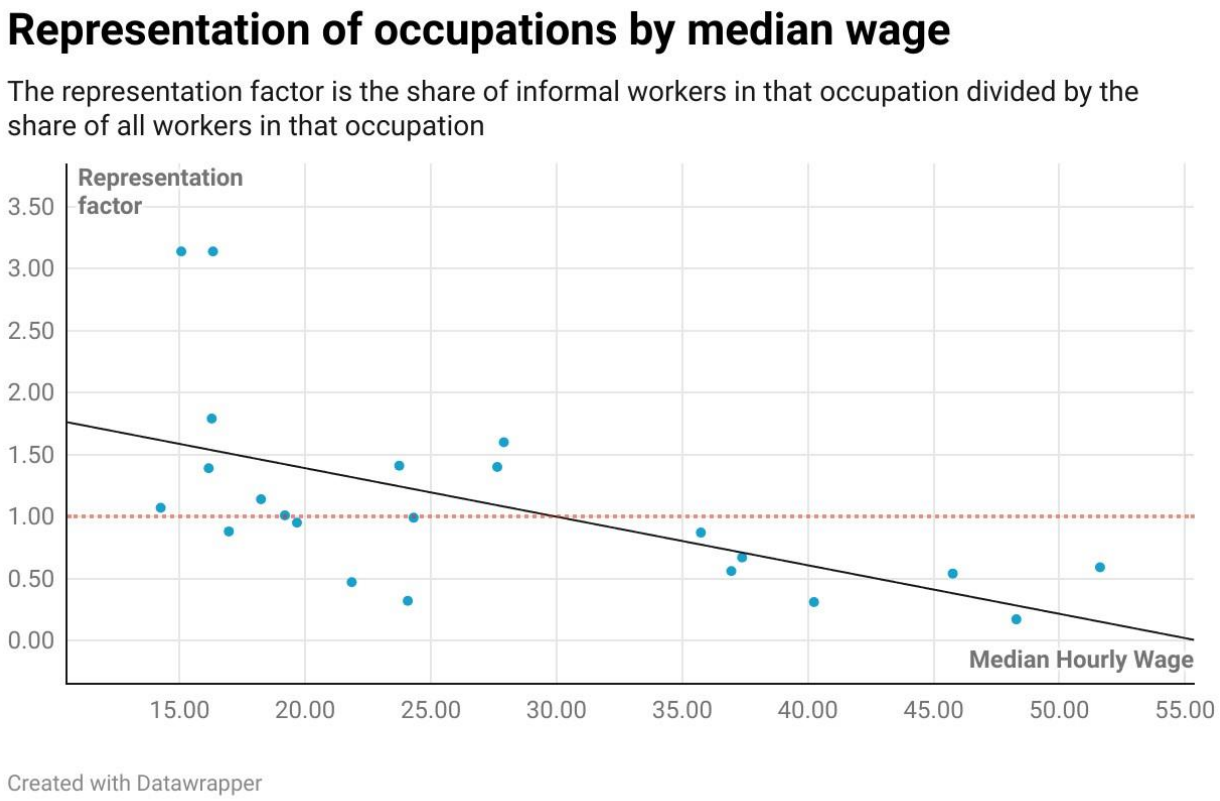
Year	Percent of non-Hispanic White people who report working informally on an average day (3 Year Moving Average)	Percent of Black people who report working informally on an average day (3 Year Moving Average)	Percent of Hispanic people who report working informally on an average day (3 Year Moving Average)	Percent of Black or Hispanic people who report working informally on an average day (3 Year Moving Average)
2003	0.65%	1.16%	0.33%	0.74%
2004	0.63%	1.06%	0.40%	0.74%
2005	0.58%	0.99%	0.38%	0.68%
2006	0.46%	0.78%	0.47%	0.63%
2007	0.39%	0.80%	0.45%	0.63%
2008	0.47%	0.74%	0.50%	0.62%
2009	0.54%	0.80%	0.62%	0.71%
2010	0.61%	0.61%	0.68%	0.66%
2011	0.52%	0.69%	0.69%	0.69%
2012	0.49%	0.51%	0.56%	0.53%
2013	0.43%	0.44%	0.40%	0.42%
2014	0.39%	0.30%	0.31%	0.31%
2015	0.42%	0.36%	0.38%	0.37%
2016	0.48%	0.55%	0.50%	0.51%
2017	0.53%	0.53%	0.53%	0.52%
2018	0.45%	0.45%	0.53%	0.49%
2019	0.42%	0.33%	0.51%	0.44%
2020	0.38%	0.42%	0.68%	0.54%
2021	0.43%	0.49%	0.69%	0.58%
2022	0.38%	0.48%	0.57%	0.51%

Appendix I: Occupations Estimates for Everyone in the Formal Labor Force

Occupation Title	Median Hourly Wage (OEWS May 2022)	% Occupation in the labor force	% Occupation of informal workers in the labor force	% Occupation of non-informal workers in the labor force	Representation factor
Unemployed	$0.00	5.9%	20.5%	5.8%	3.49

Farming, Fishing, and Forestry Occupations	$16.33	0.6%	1.7%	0.6%	2.66
Personal Care and Service Occupations	$15.07	3.3%	8.7%	3.2%	2.66
Building and Grounds Cleaning and Maintenance Occupations	$16.28	3.5%	5.3%	3.5%	1.52
Arts, Design, Entertainment, Sports, and Media Occupations	$27.90	1.9%	2.6%	1.9%	1.35
Community and Social Service Occupations	$23.74	1.6%	1.9%	1.6%	1.19
Educational Instruction and Library Occupations	$27.64	5.6%	6.6%	5.6%	1.18
Healthcare Support Occupations	$16.16	2.2%	2.5%	2.2%	1.18
Transportation and Material Moving Occupations	$18.24	5.8%	5.6%	5.8%	0.97
Food Preparation and Serving Related Occupations	$14.25	5.0%	4.6%	5.0%	0.91
Production Occupations	$19.19	5.5%	4.7%	5.5%	0.85
Construction and Extraction Occupations	$24.31	5.2%	4.3%	5.2%	0.83
Office and Administrative Support Occupations	$19.67	11.8%	9.5%	11.8%	0.81
Sales and Related Occupations	$16.96	10.0%	7.5%	10.1%	0.75
Life, Physical, and Social Science Occupations	$35.74	0.9%	0.7%	0.9%	0.73
Healthcare Practitioners and Technical Occupations	$37.38	5.3%	3.0%	5.3%	0.57
Management Occupations	$51.62	10.7%	5.4%	10.7%	0.50
Business and Financial Operations Occupations	$36.95	4.4%	2.1%	4.4%	0.47
Legal Occupations	$45.76	1.1%	0.5%	1.1%	0.46
Protective Service Occupations	$21.85	2.0%	0.8%	2.0%	0.40
Installation, Maintenance, and Repair Occupations	$24.08	3.2%	0.9%	3.2%	0.27
Architecture and Engineering Occupations	$40.24	1.9%	0.5%	1.9%	0.26

Computer and Mathematical Occupations	$48.29	2.7%	0.4%	2.7%	0.15



Appendix J: Robustness Checks

To check the validity of using population ratios to apply ATUS estimates to employment statistics gathered with the CPS, LISEP compared the ATUS population labor market estimates to those of the CPS. As Figure 10 shows, the ATUS civilian population estimate is very close to the CPS, except for the year 2020 where no ATUS interviews were conducted in April and May due to the pandemic. Figure 11 also depicts how the ATUS slightly overestimates the employed population, but still closely mirrors trends in the CPS employment level. The same is true for the unemployment level. Conversely, it underestimates the population outside of the labor force but follows parallel trends (Appendix C). Finally, the functionally employed and functionally unemployed levels in the ATUS also move in parallel to those in the CPS, but the ATUS overestimates functional unemployment in the labor force (Figure 12). As a result, the TRU calculated with the ATUS is higher than the CPS metric, but they do have similar trends over time with the exception of 2020, while the TRU OOP for the ATUS follows the CPS closely (Appendix C). Ultimately,

because the different labor market estimates with the ATUS trend similarly to those of the CPS, and especially since the overall civilian population measure is practically the same, LISEP used population ratios to impute the number of informal workers in the CPS population. Barring 2020, both estimates for total informal employment are extremely close (Appendix C).

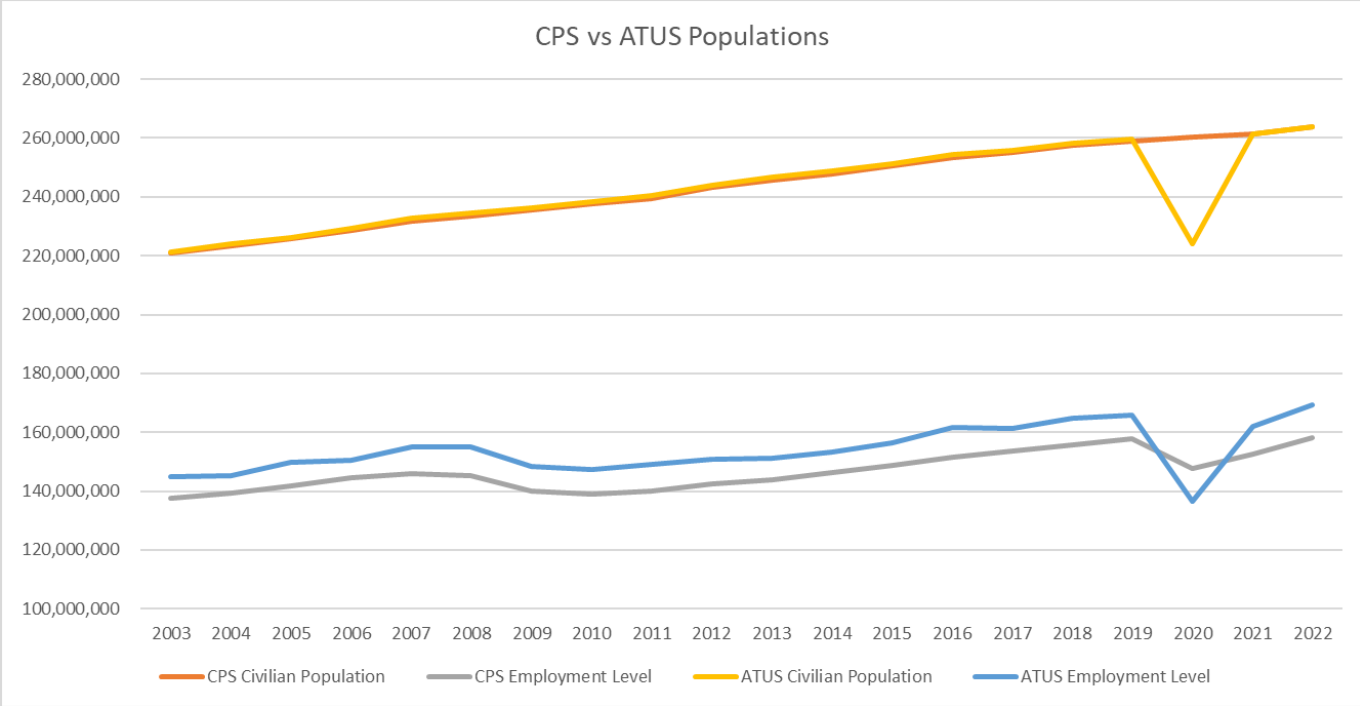


Figure 11: CPS vs ATUS Populations

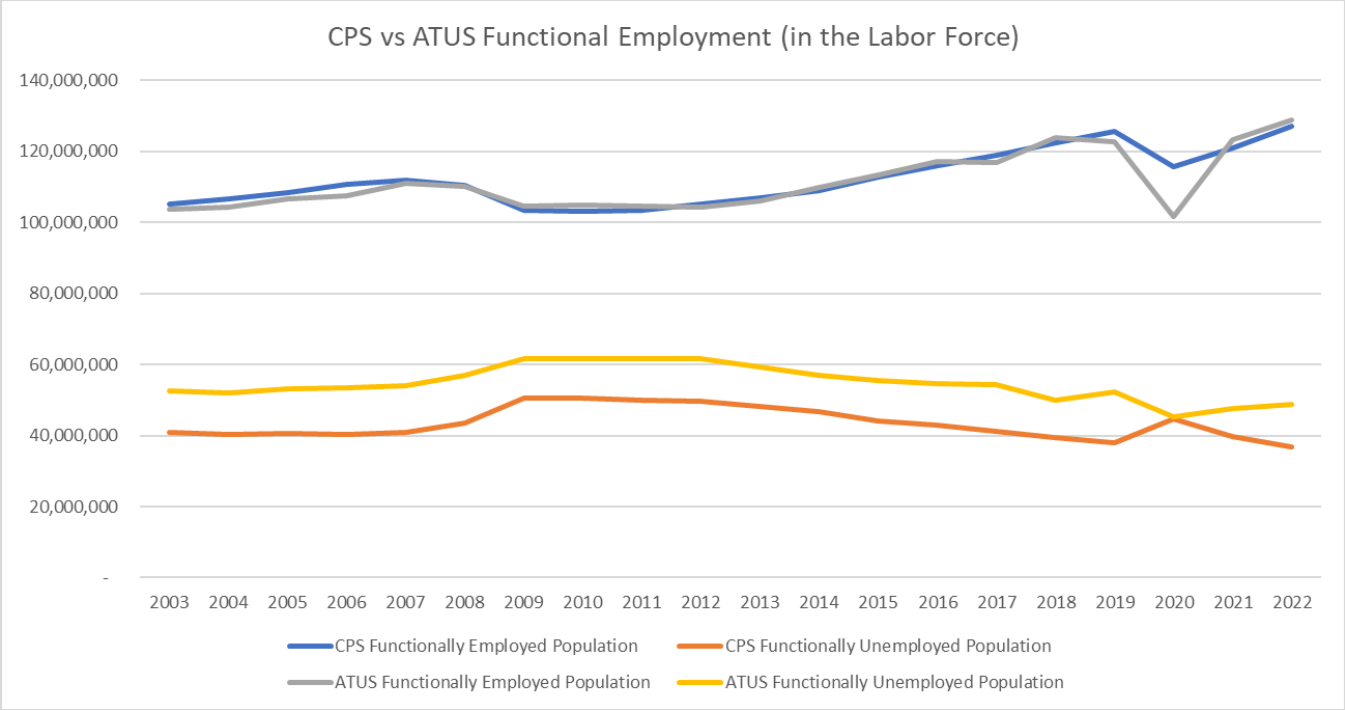


Figure 12: CPS vs ATUS Functional Employment (in the Labor Force)

Since 2020 appears as the only year that might problematically affect the informal employment estimates, LISEP also calculated the mean impact of informality on the TRU and other relevant statistics without the 2020 data under Scenario B, before accounting for self-employed workers underreporting their earnings. Ignoring 2020 has a very minimal effect on average and does not alter the picture.

Table 3: Estimates Without the Year 2020 under Scenario B:

	Estimates including 2020	Estimates without 2020
Average Change in TRU	0.49 pp.	0.46 pp.
Absolute Average Change in TRU	0.63 pp.	0.61 pp.
Average Change in TRU OOP	-0.70 pp.	-0.72 pp.
Average Change in EPR	1.80 pp.	1.81 pp.
Average Change in U3	-0.70 pp.	-0.72 pp.
Average Informal Employment per year	7,994,198	7,952,358

Since omitting time spent selling goods for pay from informal work might be problematic, LISEP also produced estimates of informal employment that includes the sale of goods. LISEP cannot determine with the ATUS whether someone who reports selling something does so in the form of an informal business, which would entail steady income through a year, or as a unique occurrence such as selling an old piece of furniture online. So, LISEP assumes that everyone who spends time selling an item is an informal worker and treats them equally: they earn at the same hourly rate as in the formal market and their time

spent selling items is added to their weekly hours worked. Despite significantly raising informal employment by 86.4% annually, or by 6.9M workers under Scenario B (Figure 13), the impact on the TRU and the TRU OOP remains limited. Between 2003 and 2022, the TRU would increase by 0.59 pp. on average when considering informal labor and time spent selling in Scenario B, instead of by 0.49 pp. when excluding it (Figure 14) The TRU OOP would fall by 1.32 pp. rather than by 0.70 pp. (Figure 15) if selling were included. Even in the upper estimate of Scenario B that assumes everyone who sells an item is an informal worker (which is certainly not true), the impact on overall functional employment remains small. At most, an additional 1.54 M workers would become functionally employed each year when including time spent selling goods (Figure 16), which represents only 1.3% of functional employment in Scenario B.[44]

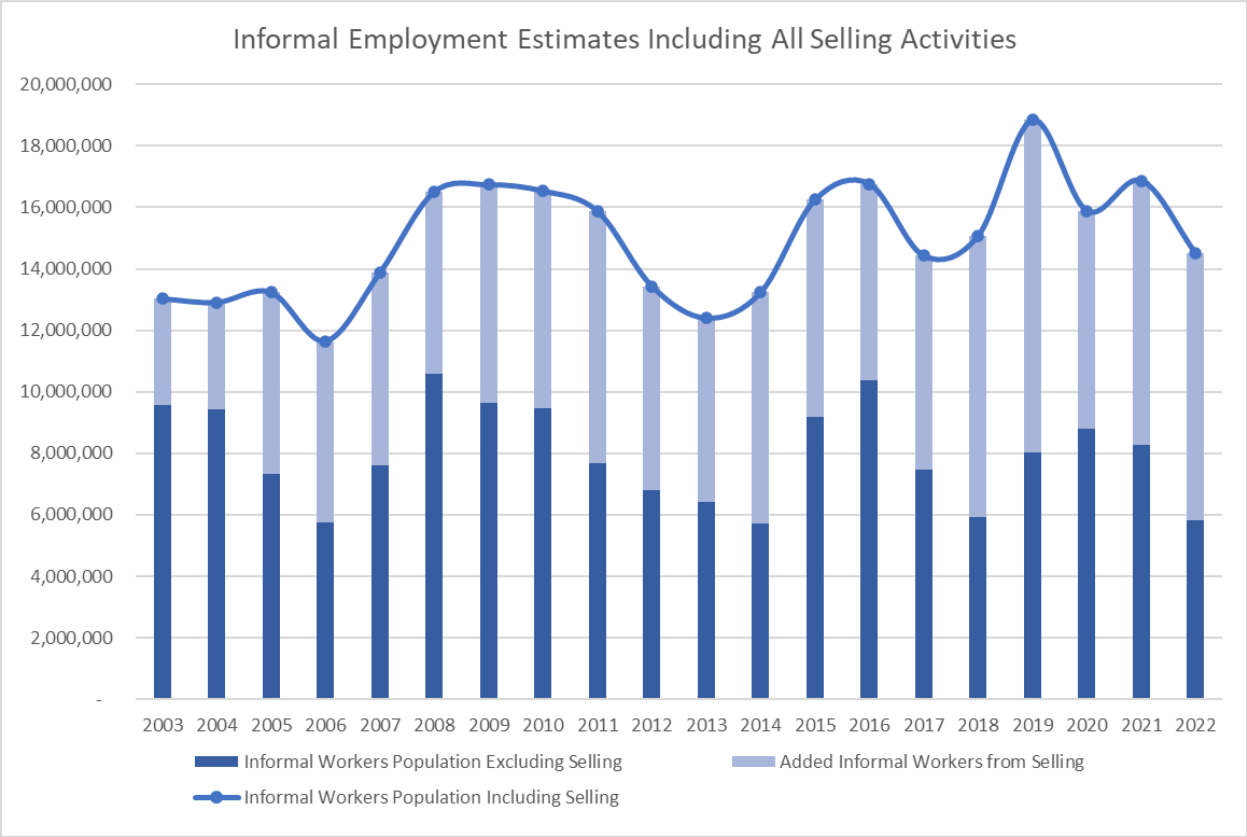


Figure 13: Classifying all selling activities as informal work increases informal employment by 84% (Scenario B)

[44] Because reporting time spent selling goods does not alter whether a self-employed person underreports their income in household surveys, these measures only consider the incidence of informal employment on the TRU and exclude the incidence of underreporting income.

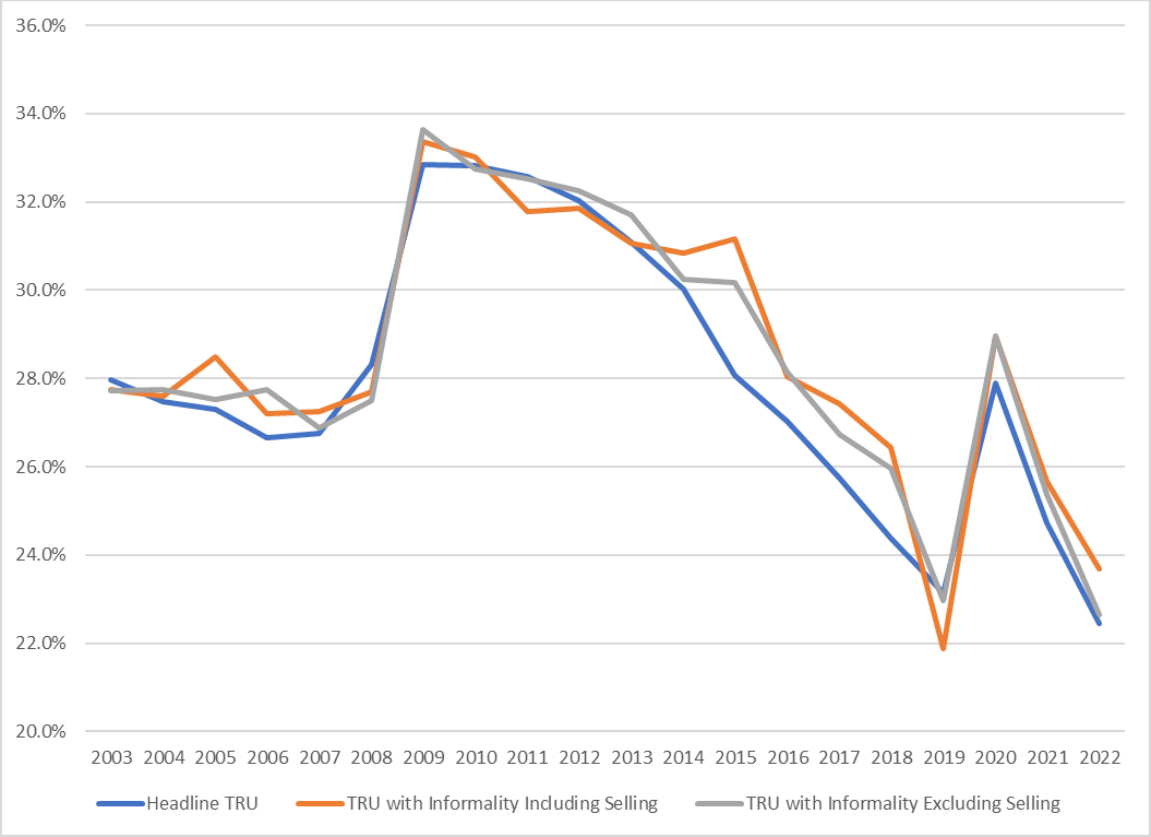


Figure 14: Classifying all selling activities does not meaningfully change functional unemployment in the labor force (Scenario B)

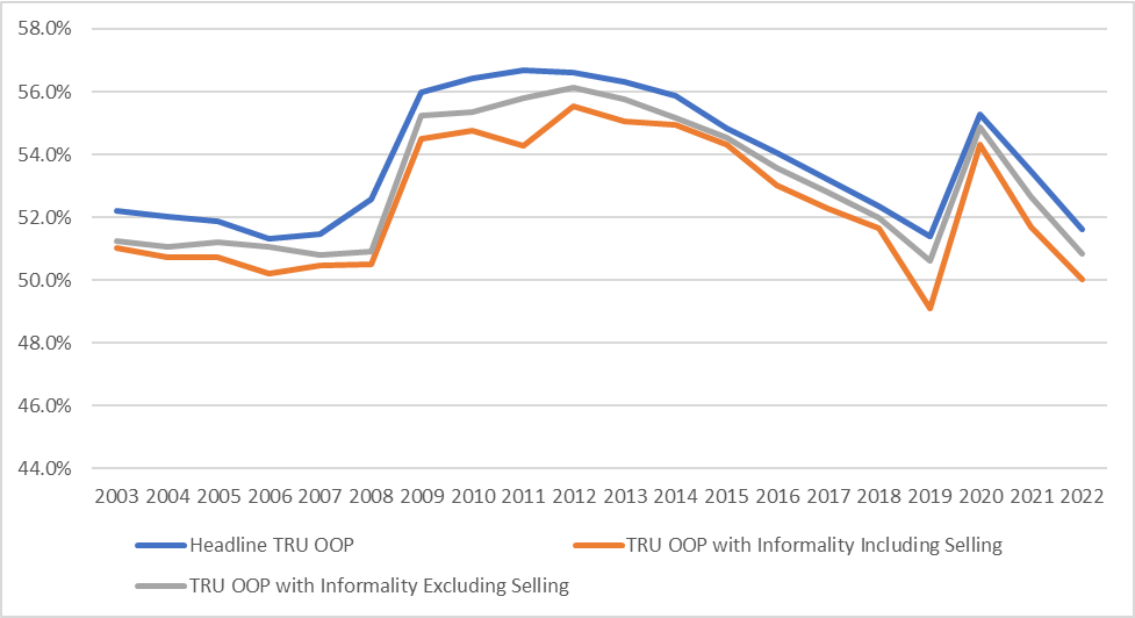


Figure 15: Classifying all selling activities does not significantly reduce the TRU Out of the Population (Scenario B)

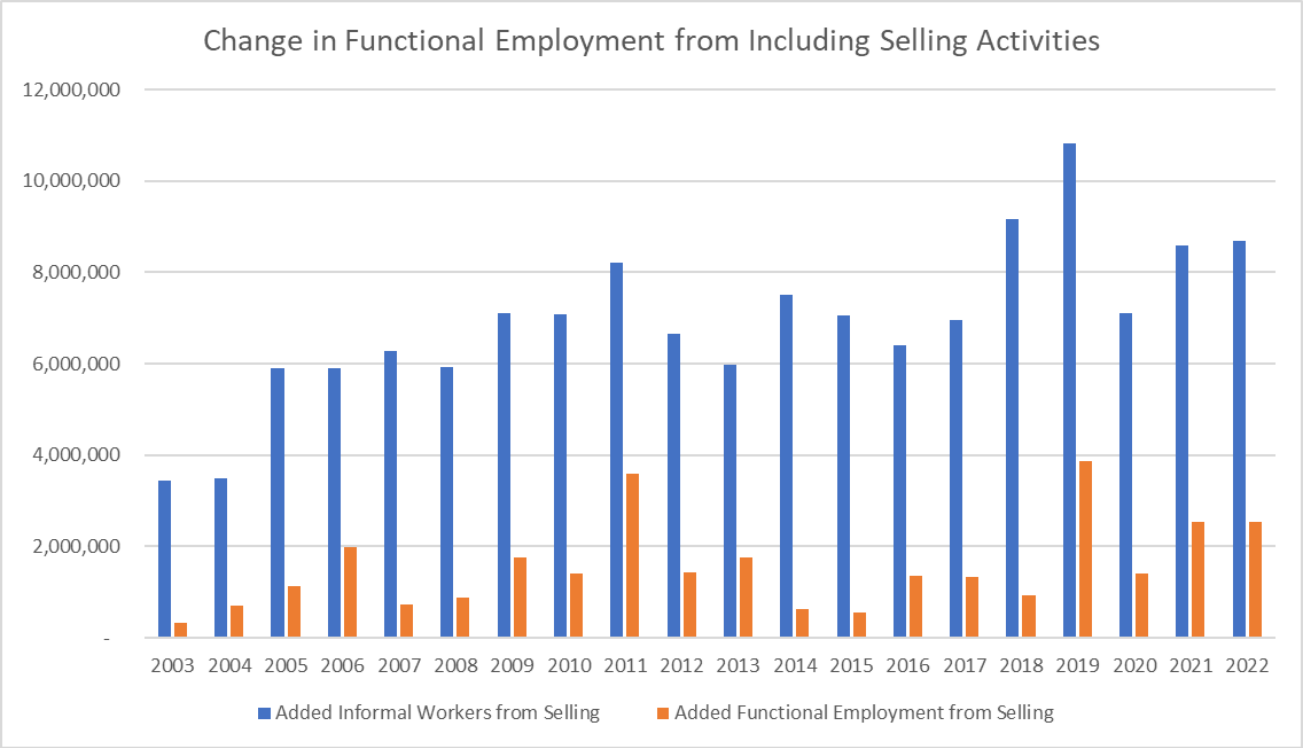


Figure 16: Including selling increases functional employment considerably less than informal labor

For the self-employed underreporting income, LISEP considered the possibility that those with lower declared earnings report a smaller share of their income than those with higher earnings. Basically, the self-employed who report less of their income would have lower earnings than those who report their income accurately. And, if assuming that meeting basic costs is the primary incentive to not report earnings, the self-employed struggling to make ends meet would report less of their earnings. Consequently, LISEP also calculated a scenario for underreporting income where the self-employed who are functionally unemployed fail to report half of their earnings instead of 30%. Again, even though this would significantly impact measures of functional employment among the self-employed, the overall TRU would only fall by an additional 0.4 pp. (Table 3).[45] This does not fundamentally change the TRU's portrayal of the labor market.

Table 4: The effect on functional employment when the self-employed don't report 30% vs 50% of their income

	Estimates with 30% SE underreporting	Estimates with 50% SE underreporting
Average Change in TRU	-0.57 pp.	-0.97 pp.
Average Change in TRU OOP	-0.39 pp.	-0.67 pp.

[45] These estimates only account for the effect of self-employed workers not reporting income, so it does not account for informal employment estimates from the ATUS.

Average Increase in Functional Employment per year	954,341	1,614,309
Average Change in SE Functional Employment Rate	5.8 pp.	9.9 pp.

Appendix K: Income-generating Activities that Are Not Classified as Work (ATUS)

03	**Other Income-generating Activities**		
	01	**Income-generating hobbies, crafts, and food**	
		preparing food or drink for sale	making baskets for sale
		drawing, painting, or sketching for sale	doing woodworking for sale
		making pottery for sale	making tapestries/quilts for sale
		making furniture for sale	making dinners for sale
	02	**Income-generating performances**	
		playing in a band for pay	singing for pay
		acting in a play for pay	dancing for pay
	03	**Income-generating services**	
		babysitting for pay	shoveling snow for pay
		mowing lawns for pay	home improvements for pay

Figure 15: Income-generating activities classified as informal work

04	**Income-generating rental property activities**	
	maintaining/renovating rental property	making repairs to rental property
05	**Waiting associated with other income-generating activities**	
99	**Other income-generating activities, n.e.c.***	
	redeeming winning lottery ticket	listing/selling items online
	selling items at auction, yard sale	listing/selling items on e-bay
	selling items at flea market	collecting aluminum cans to sell for self
	selling own used textbooks for pay	selling items at a garage sale
	sorting items for garage sale	organizing items for yard sale

Figure 16: Renting and selling activities are not classified as informal work