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Correcting the Employment Participation Elasticities Reported in Hoynes and Patel (2018, 2022)

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I. Introduction

Corinth et al. (2022) simulate the employment and anti-poverty effects of replacing the Child Tax Credit with a child allowance. A key input into their simulation is the employment participation elasticity for single mothers, which they assume for their baseline estimates is 0.75 for those with incomes low enough to receive the Earned Income Tax Credit. Despite support from the academic literature for this value (see Corinth et al. 2022, p. A21-A26),[1] some have argued that the 0.75 elasticity is too large.

Perhaps the most prominent paper that reports employment participation elasticities for single mothers of substantially less than 0.75 is Hoynes and Patel (2018).[2] They report elasticities between 0.32 and 0.45. In updated results intended to correct errors in these reported values, Hoynes and Patel (2022) report an even lower range of elasticities between 0.14 and 0.35.

In this research note, we show that there is an error in the calculations of elasticities in Hoynes and Patel (2018, 2022). The fundamental problem with their calculation is that the denominator of their elasticity formula is defined incorrectly: their numerator is the percent change in employment induced by a policy change that expanded the Earned Income Tax Credit (EITC), while their denominator is the realized percent change in the return to work before versus after the policy change. When we correct the elasticity formula in Hoynes and Patel (2018, 2022) by expressing both the numerator and denominator as percentage changes induced

[1] For example, in a review of the literature, Nichols and Rothstein (2016, p. 198) conclude that "consensus estimates of the extensive-margin elasticity [are] around 0.7 to 1.0" among single mothers.
[2] A highly influential 2019 National Academy of Sciences report (National Academies of Sciences, Engineering, and Medicine 2019) used work responsiveness estimates from Hoynes and Patel (2018) as the basis for simulating employment responses by single mothers to reforms of the Earned Income Tax Credit.

by the policy change, we calculate elasticities ranging from 0.99 to 1.36. These elasticities exceed the 0.75 value used by Corinth et al. (2022) in their simulations of replacing the Child Tax Credit with a child allowance.

We proceed as follows. Section II describes the error in Hoynes and Patel (2022). Section III describes the error in Hoynes and Patel (2018). Section IV calculates the correct elasticities using the inputs reported in Hoynes and Patel (2018, 2022).

II. Error in Hoynes and Patel (2022)

Hoynes and Patel (2022) attempt to calculate the extensive margin employment elasticity for single mothers due to a policy change increasing the generosity of the EITC. The elasticity should be calculated by dividing (i) the percent change in work ***due to the policy,*** by (ii) the percent change in the return to work ***due to the policy***.

Hoynes and Patel (2022) instead divide (i) the percent change in work ***due to the policy***, by (ii) the ***realized*** percent change in the return to work in the post-period versus the pre-period. The problem with this approach is that the ***realized*** return to work may have changed for reasons unrelated to the EITC change, such as other simultaneous policy changes, underlying changes in wages, and random variation. When estimating the change in employment due to the EITC expansions in the numerator, the authors are careful to identify the part of realized changes that can be attributed to the EITC. They control for demographics that might lead to changes in wages, tax and transfer benefits, and AFDC waivers and other factors. This same care is not reflected in the calculation of the denominator as the authors resort to using the observed change rather than the change due to the EITC expansions, thereby biasing their elasticity. In principle, this error could even lead the elasticity to have the wrong sign. Hoynes and Patel (2022) also make a second change from the conventional calculation, relying on the log approximation to a percentage change, but this only has a small effect on the calculations.

One might wonder what would lead researchers to make such an error. The reasoning behind this nonstandard elasticity calculation is never clearly articulated in the Hoynes and Patel paper, appendix, or addendum. In the case where the policy change in the numerator is a composite of many policies captured by an indicator variable one might want to include all of the policy changes in the denominator as well. Hoynes and Patel (2018), however, describe their estimation as measuring the responsiveness of labor force participation to changes in the EITC not to changes in other policies or earnings. Hoynes and Patel indicate that the Chetty et al.

(2013) paper is the source of their elasticity formula, and a calculation with some of the features of their elasticity does appear on p. 31 of that paper. Chetty et al. appear to intend that calculation to provide an elasticity based on a coefficient on a dummy variable that captures a composite of policies. Since Hoynes and Patel (2018) describe the effect being estimated as the effect of the EITC, they conceive of the numerator much more narrowly than how they define the denominator. In order to isolate the effect of this one policy, they control for other key policies, tax and transfer benefits, and for AFDC waivers effectively excluding them from the effect estimated by the numerator.[3] Most importantly, they include in the denominator, contrary to the approach of Chetty et al., changes in underlying earnings, which they have at least partially accounted for already through controls for demographic characteristics, unemployment interacted with the presence of children, as well as other explanatory variables. These ***realized*** earnings are subject to many other influences including the endogenous realization of who is working and their hours of work.

Hoynes and Patel estimate that the ***realized*** return to work increased by $3,335. But they estimate that the change in EITC policy increased the average EITC benefit by only $422.[4] Thus, taking the change in the average EITC benefit as the effect of the studied policy on the return to work implies that the ***realized*** change in the return to work used by Hoynes and Patel (2022) in their elasticity calculations is approximately eight times as large as the policy-induced change in the return to work.

To illustrate the problem, we can calculate the erroneous result reported by Hoynes and Patel (2022), without their logarithmic approximation, using the final column (means for the treatment group with 2+ children) of their "Corrected" Appendix Table 7 for the main sample. For this group, Hoynes and Patel (2022) report an extensive margin elasticity of 0.14. Using the standard percentage change elasticity formula and defining the denominator in the same way as Hoynes and Patel (2022), we obtain a similar value:

[3] This reasoning also implies that some of the elasticity calculations in the Chetty et al. survey are incorrect. Some of the changes in after-tax and transfer earnings used in the denominators in that survey are already accounted for by covariates. Additionally, the after-tax and transfer earnings calculations value Medicaid at cost. Valuation at cost was rejected by Meyer and Rosenbaum (2001) and has been more extensively examined by Finkelstein et al. (2019). They suggest a range for Medicaid's valuation with a central tendency of about 30 cents on the dollar. In a future research note we will provide corrected elasticities for the papers surveyed in Chetty et al.

[4] This estimate is produced in the code provided by Hoynes and Patel (2022). It can also be inferred from Appendix Table A7 of Hoynes and Patel (2018), in which they report that a $1,000 increase in the EITC increases employment participation by 5.6 percentage points, while the policy increased employment by 2.4 percentage points. This implies that the policy increased the average EITC amount by (2.4/5.6) X $1,000, or approximately $430.

$$\epsilon = \frac{\%\ \Delta \text{ in } Work\ (due\ to\ policy)}{\%\ \Delta \text{ in } Return\ to\ Work\ (realized)} = \frac{0.024/0.674}{\$3{,}335/\$11{,}914} = 0.13 \qquad (1)$$

In equation (1) above, 0.024 is the percentage point change in employment ***due*** to the policy change, 0.674 is the baseline employment rate, $3,335 is the ***realized*** change in the return to work, and $11,914 is the baseline return to work. Each of these values is reported in Hoynes and Patel (2018, 2022). The 0.13 elasticity value in equation (1) differs slightly from the 0.14 value reported in Hoynes and Patel (2022) because of their use of log approximation to percentage changes. Specifically, they divide (i) the difference in natural logarithms of employment due to the policy change, by (ii) the difference in natural logarithms of the realized return to work.

In Table 1, we report our incorrect elasticity estimates using the standard percentage change formula corresponding to each of the incorrect elasticity estimates reported in Table 7 of Hoynes and Patel (2022). For each case, the incorrect estimate we obtain using the standard formula is very close to the incorrect estimate reported by Hoynes and Patel (2022) using the logarithmic approximation formula.

III. Error in Hoynes and Patel (2018)

Hoynes and Patel (2018) makes the same basic error as Hoynes and Patel (2022). The only difference is that Hoynes and Patel (2018) scale the employment effect in the numerator by the increase in the EITC (in thousands of dollars) due to the policy change, so that the numerator represents the percent increase in work due to a scaled-up policy that increases the average EITC by $1,000, rather than the percent increase in work due to the actual policy that increased the average EITC by $422.

To illustrate the problem in this case, we can calculate, without their logarithmic approximation, the erroneous result reported by Hoynes and Patel (2018) using the results from the final column of their Appendix Table 7 for those with 1 vs. 2+ children, in which they report an extensive margin elasticity of 0.32. Using the standard elasticity formula and defining the denominator in the same way as Hoynes and Patel (2018), we obtain a similar value:

$$\epsilon = \frac{\%\ \Delta \text{ in } Work\ (due\ to\ scaled\ policy)}{\%\ \Delta \text{ in } Return\ to\ Work\ (realized)} = \frac{0.056/0.674}{\$3{,}335/\$11{,}914} = 0.30 \qquad (2)$$

In equation (2) above, 0.056 is the percentage point increase in employment due to a $1,000 increase in the EITC, reported in Hoynes and Patel (2018). The remaining values in equation (2) are the same as in the elasticity calculation above using the Hoynes and Patel (2022) method and can be found in the tables described above.

See Table 1 for our elasticity estimates using the standard percentage change formula and the erroneous Hoynes and Patel (2018) estimates corresponding to all of the incorrect estimates reported by Hoynes and Patel (2018) using the logarithm formula.

IV. Correct Elasticity Calculation

Correcting the elasticity formulas above by using the scaled policy-induced percentage changes in the numerator (employment) and denominator (return to work), we obtain:

$$\epsilon = \frac{\%\,\Delta \text{ in } Work\ (due\ to\ scaled\ policy)}{\%\,\Delta \text{ in } Return\ to\ Work\ (due\ to\ scaled\ policy)} = \frac{0.056/0.674}{\$1{,}000/\$11{,}914} = 0.99 \qquad (3)$$

Equation (3) is the result of using the same numerator as Hoynes and Patel (2018) in equation (2) and changing the denominator appropriately to reflect the percentage change in return to work due to a $1,000 increase in the EITC relative to the $11,914 baseline return to work.

We can also calculate an arc elasticity in which we divide the change in employment by the average of (i) the baseline employment level and (ii) the employment level after the effect of the policy, and in which we divide the change in the return to work by the average of (i) the baseline return to work and (ii) the return to work after incorporating the policy change.

$$\epsilon = \frac{\dfrac{0.056}{0.5 * (0.674 + (0.674 + 0.056))}}{\dfrac{\$1{,}000}{0.5 * (\$11{,}914 + (\$11{,}914 + \$1{,}000)}} = 0.99 \qquad (4)$$

Under both correct methods, we obtain the same elasticity of 0.99.

Table 1 reports the correct elasticity values corresponding to each specification in Hoynes and Patel (2018, 2022) using both the standard percentage change elasticity and arc elasticity formulas. The elasticities we calculate after implementing the corrections outlined above range from 0.99 to 1.38. Using the arc elasticity formulas, the corrected elasticities range from 0.99 to 1.36.

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Table 1. Replication of Incorrect Elasticity Estimates in Hoynes and Patel (2018, 2022), and Corrected Elasticity Estimates

	1+children, few controls	1+children, more controls	2+children, few controls	2+children, more controls
Employment				
Employment, pre-period	0.750	0.750	0.674	0.674
Employment change due to policy	0.061	0.047	0.062	0.024
Employment change per $1,000 EITC	0.073	0.074	0.078	0.056
Return to work				
Income, pre-period, working	$24,020	$24,020	$24,477	$24,477
Income, pre-period, not working	$11,331	$11,331	$12,563	$12,563
Income, post-period, working	$25,892	$25,892	$26,218	$26,218
Income, post-period, not working	$9,547	$9,547	$10,969	$10,969
Return to work, pre-period	$12,689	$12,689	$11,914	$11,914
Return to work, post period	$16,345	$16,345	$15,249	$15,249
Realized change in return to work	$3,656	$3,656	$3,335	$3,335
Replication of incorrect extensive margin elasticity estimates				
Hoynes & Patel (2022, p. 6)	0.31	0.24	0.35	0.14
Replication, standard formula	0.28	0.22	0.33	0.13
Hoynes & Patel (2018, Appendix, p. 17)	0.36	0.37	0.45	0.32
Replication, standard formula	0.34	0.34	0.41	0.30
Corrected elasticity estimates				
Extensive margin elasticity	1.24	1.25	1.38	0.99
Extensive margin arc elasticity	1.22	1.24	1.36	0.99

Source: Hoynes and Patel (2018); Hoynes and Patel (2022); Authors' calculations
Notes: The four columns in this table correspond in the same order to the four columns in Appendix Table 7 of Hoynes and Patel (2018), which have different estimates due to different treatment groups and different sets of control variables for estimating the effect of the EITC expansion on employment among single mothers with less than a college degree. Pre-period employment rates are reported in Hoynes and Patel (2022, p. 3). Employment changes due to the policy and per $1,000 of EITC are reported in Hoynes and Patel (2018, Appendix, p. 17). Income (after taxes and transfers) when working and not working, both in the pre-period and post-period, are reported in Hoynes and Patel (2022, p. 3). Return to work and realized change in the return to work are calculated by the authors based on these income values. The Hoynes and Patel (2022) and Hoynes and Patel (2018) elasticities are calculated using a natural logarithm approximation of the standard elasticity formula, which can be found at Hoynes and Patel (2018, Appendix, p. 4). Our replications using the standard elasticity formula are described in the text, with the numerator and denominator defined incorrectly to match the error in the Hoynes and Patel papers. The corrected elasticity values are our calculations, in which the numerator and denominator are defined correctly based on the scaled-up effect of the policy on employment and the return to work, as described in the text.