Teacher Out-of-Pocket Spending Research Plan
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(Not for public release)

Summary:

In the below document, I outline the main components of my proposed analysis to explore teacher out-of-pocket spending trends: the sample of interest, the research questions, the variable definitions, and the analytic steps we'll take to answer the proposed research questions. Because there are many analytic decisions we need to make throughout (e.g. do we define teacher out-of-pocket spending in pure dollar terms, or as a proportion of the given teacher's school-related income? Should that income amount include their summer income? etc.), I delineate a *primary specification* that represents our headline specification that is most defensible from a theoretical perspective, a number of *secondary specifications* designed to explore other highly relevant aspects of the data, and several *robustness checks* designed to explore how sensitive our final results are to the variety of decisions we make. This will allow us to keep our main findings succinct, but will also allow us to cover our bases and understand how confident we can be in those results.

Sample Frame:

- **Primary Specification:** Public school teachers in traditional schools (not vocational, charter, etc.), who were working full-time, and received non-zero base salary in the prior year.
    - **Secondary Specification:** We will also be interested in examining charter school teachers separately from traditional public school teachers (though sample size for charter school teachers in the SASS data may be prohibitively small)
    - **Robustness Check**: We will also be interested in examining teachers separately by their school level (elementary versus middle versus high)
- **Primary Specification:** We will use the 03-04, 07-08, 11-12, and (if NTPS data are available) 15-16 academic year data *pooled* together, using a survey-year indicator variable to account for potential differences across years.
    - **Robustness Check:** We will also be interested in examining all following results *separately* by each survey wave allowing us to assess any changes over time.
    - **Note**: I will adjust all contemporaneous dollar figures from each survey into 2019Q4 inflation-adjusted dollars.

Outcome Variables:

- **Primary Specification**: Our outcome variable of interest across all research questions will be the *amount* of teacher out-of-pocket spending *as a proportion* of that teacher's self-reported year-round income from their current school system. This is then inclusive of their base salary, any bonuses as a result of extracurricular and leadership pay, any bonuses as a result of student performance incentives, and any teaching or non-teaching summer work conducted within *their specific* school system. This is then exclusive of any earnings they made from schools outside their school system, or any earnings from non-school employment (e.g. bartending, etc.).
    - **Secondary Specification**: We will also be interested in examining the *occurrence* of any teacher out-of-pocket spending. That is, a teacher having *any* non-zero out-of-pocket expenditures over the past academic year. While we see relatively little

action in this variable from the literature, we may still see meaningful trends as we get into more refined analyses.

- **Robustness Check:** We will also want to see whether the results look meaningfully different if teacher income is not accounted for, specifying the outcome variable in raw dollar amounts rather than as a proportion of income.

Research Questions:

- **Research Question 1:** How does the occurrence and amount of teacher out-of-pocket spending relate to the race/ethnicity of students in their school?
  - **Primary Specification**: The SASS data only includes percentage of students who are racial/ethnic minority at the school in aggregate; only the NTPS (15-16 survey year) separates between race and ethnicities at a more granular level. For our main specification, we will group schools into quartile brackets of percent of students identifying as racial/ethnic minority (0-24%, 25-49%, 50-74%, 75-100%). This allows us to make the sharp delineation at majority-minority schools (versus something like quintiles, which would have a group that spans 40-60), and also provides more flexibility in examining the relationship between student race/ethnicity and teacher spending (i.e. non-linearities in the relationship). In this primary specification, we would regress teacher spending on *just* student race/ethnicity brackets and survey year indicators for the clearest, most interpretable headline results.
  - **Secondary Specification:** We will also examine how the relationship changes when incorporating the percent of students qualifying for free and reduced-price lunch at the school (a rough proxy for student poverty). Similar to the race/ethnicity variable, we will break this variable into quartile brackets. However, to manage the close correlation between student race/ethnicity and poverty, we will *interact* the two bracket sets. This will allow us to examine whether teacher spending varies by FRPL rates *within* each race/ethnicity bracket. In other words, we'll see whether teacher spending within the 0-24% racial/ethnic minority bracket is different for schools in that category with 0-24% FRPL, 25-49% FRPL, 50-74% FRPL, and 75-100% FRPL, and so on for each other bracket of student race/ethnicity proportions.
  - **Secondary Specification:** To examine disaggregated student race/ethnicity groups in the NTPS, we will regress teacher spending on indicators for above-median proportions of Black, Hispanic, Native American, Asian, Pacific Islander, and Other identifying students, as well as survey year. This will allow us to interpret the coefficients from each variable as basically: teachers at schools with above-average proportions of X demographic spend Y more/less than teachers at schools with below-average proportions of X demographic. This specification is useful because the proportions of some demographics (e.g. Pacific Islander) are so small across most schools that the quartile brackets we use in the primary specification don't apply well (e.g. there are *so* few schools with 25%+ Pacific Islander students), nor would a linear proportion specification (because the distribution is so skewed).
  - **Secondary Specification**: While the NTPS allows us to disaggregate student race/ethnicity groups, it also allows us to regroup them. In this specification, we will construct a joint group consisting of students identifying as Black, Hispanic, or Native American and re-run the same structure as our primary specification (quartile brackets). This will allow us to examine how much our results change when we focus

on historically underserved student populations, rather than all racial/ethnic minority students.

- **Research Question 2:** How does the occurrence and amount of teacher out-of-pocket spending relate to their own race/ethnicity?
    - **Primary Specification:** Similar to the approach above, we'll start fairly simple: we will create a binary indicator for teachers identifying as a racial/ethnic minority, and regress teacher out-of-pocket spending on teacher race/ethnicity and survey year indicators.
    - **Secondary Specification**: We'll then disaggregate teacher race/ethnicity into constituent categories of Black, Hispanic, Native American, Asian, and Pacific Islander to explore whether there are differences in spending within that group.
    - **Secondary Specification**: Finally, we'll examine whether the observed trends in teacher spending by race/ethnicity remain when student demographics are taken into account, using the same crossed student race/ethnicity and FRPL brackets as in RQ1.

- **Research Question 3:** How does the occurrence and amount of teacher out-of-pocket spending relate to their own perceptions of autonomy over the materials and resources in their classroom?
    - **Primary Specification:** We will operationalize this measure of autonomy as an index of five survey response components (roughly in order of relevance):
        - To what extent do you agree or disagree with each of the following statements? (Strongly Agree/Agree/Disagree/Strongly Disagree): Necessary materials such as textbooks, supplies, and copy machines are available as needed by the staff.
        - How much actual control do you have IN YOUR CLASSROOM at this school over the following areas of your planning and teaching? (No/Minor/Moderate/A great deal): Selecting textbooks and other instructional materials
        - How much actual influence do you think teachers have over school policy AT THIS SCHOOL in each of the following areas? (No/Minor/Moderate/A great deal): Deciding how the school budget will be spent
        - How much actual control do you have IN YOUR CLASSROOM at this school over the following areas of your planning and teaching? (No/Minor/Moderate/A great deal): Selecting content, topics, and skills to be taught
        - How much actual control do you have IN YOUR CLASSROOM at this school over the following areas of your planning and teaching? (No/Minor/Moderate/A great deal): Selecting teaching techniques
    - Per conventional procedures, we will examine the extent to which these survey questions relate to the same underlying construct using Cronbach's Alpha as our primary measurement, alongside factor analysis to examine whether this index is better served as two (or more) separate constructs instead.
    - We will mirror the methodology used by NCES to construct their measure of teacher autonomy in the SASS data: create a categorical variable in which teachers

who respond with a 4 (great deal/strongly agree) to all questions are "High Autonomy," teachers who respond with an average answer of 3 or higher (moderate/agree) are "Moderate Autonomy," and all remaining teachers as "Low Autonomy." Depending on the distribution of this variable, it may be more worthwhile to take each teacher's average response and break them into tercile brackets to generate low, moderate, and high autonomy groupings.
    - Lastly, we will run a regression of teacher out-of-pocket spending on indicators for each autonomy level and survey year indicators.
    - **Secondary Specification:** We will also examine whether the aforementioned relationship changes when we include the crossed student FRPL and race/ethnicity brackets.
    - **Secondary Specification:** As just an exploratory analysis, we will run a cross-tabulation of teachers' measured autonomy on this index (High/Moderate/Low) and student race/ethnicity quartile brackets, and teachers' measured autonomy on this index and student FRPL quartile brackets. This will basically allow us to see whether autonomy of this kind correlates with student demographics as a side-exploration.

Additional Technical Notes:

- All estimates will be adjusted according to the provided survey weights, meaning that we should be able to interpret our results as nationally representative.
- Standard errors will be calculated using Balanced Repeated Replication (BRR) per the recommendation of the NCES when handling SASS data. This better accounts for the survey weights and other statistical adjustments they make to the data to produce more accurate standard errors.
- When examining teacher spending as a proportion of school-related income, we will utilize a linear regression model. When examining the *occurrence* of teacher spending, we will utilize a linear probability model rather than a logistic regression - this is a *hot* topic of debate in economics, but my preference is the go with an LPM because of the interpretability of its results. Econometricians very rarely find that results meaningfully change as a result of using LPM versus logistic regression.
    - **Robustness Check:** We will re-examine our results for the occurrence of teacher spending with a logistic regression (and all necessary adjustments to ensure compatibility with the change in model)