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ABSTRACT

We examine the initial post-college geographic location decisions of students from hometowns in the Appalachian region that often lack substantial high-skilled job opportunities, focusing on the role of non-pecuniary considerations. Novel survey questions in the spirit of the contingent valuation approach allow us to measure the full non-pecuniary benefits of each relevant geographic location, in dollar equivalents. A new specification test is designed and implemented to provide evidence about the quality of these non-pecuniary measures. Supplementing perceived location choice probabilities and expectations about pecuniary factors with our new non-pecuniary measures allows us to estimate a stylized model of location choice and obtain a comprehensive understanding of the importance of pecuniary and non-pecuniary factors. We also combine the non-pecuniary measures with realized location and earnings outcomes to characterize inequality in overall welfare.

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1 Introduction

The decisions of individuals typically depend on not only pecuniary factors, but also on non-pecuniary factors. For example, in many substantive contexts utility can be viewed as coming from two components: a wage component and a non-pecuniary component, which takes into account all other benefits. The total amount, or full value, of non-pecuniary benefits received under each alternative that a person considers is of central importance for understanding (or predicting) decisions. It is also important for conclusions about other objects of interest. For example, conclusions about inequality may change if, in addition to accounting for inequality in income, one also takes into account the full value of the non-pecuniary benefits that a person receives. The importance and challenges of characterizing non-pecuniary utility have received substantial attention, with the most recent evidence coming from a literature recognizing the value of expectations data (e.g., Boneva and Rauh, 2017; Aucejo, French, and Zafar, 2021; Koşar, Ransom, and van der Klaauw, 2021).[1]

In this paper, we propose a survey-based approach to provide new evidence about these non-pecuniary benefits, focusing specifically on characterizing their total value. Taking advantage of unique data from the Berea Panel Study, we apply our approach to study the initial post-college geographic location decisions of students and the implications of these decisions for subsequent outcomes such as inequality. Non-pecuniary considerations may be of particular policy interest in this context if, for example, attachments to hometowns entice college graduates to return home to even economically disadvantaged areas, where job opportunities might be limited. This motivates our study of a sample of college students from the Appalachian region, a region that is noteworthy because it has often been viewed as a type of barometer for the state of rural poverty in the United States (Black, Daniel, and Sanders, 2002; Black, McKinnish, and Sanders, 2005; Black and Sanders, 2012; Durlauf, 2012; Ziliak, 2012; Vazzana and Rudi-Polloshka, 2019).[2] Of particular relevance for issues related to geographic mobility, the region suffers from a lack of high-skilled jobs (Bollinger, Ziliak, and Troske, 2011), and it is recognized that it tends to exert a particularly strong geographic attachment over its residents (Betz and Partridge, 2013).

Traditionally, with access to only observational data, a way to provide evidence about

[1] For more traditional literature where issues related to non-pecuniary benefits are relevant see, e.g., Altonji and Paxson (1992); Arcidiacono (2004); D'Haultfoeuille and Maurel (2013); Sullivan and To (2014); Jacob, McCall, and Stange (2018).

[2] In 1964, the formation of the National Commission on Rural Poverty was announced in a small town (Inez) in eastern Kentucky.

the importance of non-pecuniary benefits is to estimate a choice model that relates realized decisions to not only wage expectations, which are typically constructed using observed wages, but also a set of other observable factors that are meant to capture non-pecuniary benefits (see Kennan and Walker, 2011, for a prominent example in the context of location decisions).[3] However, there are two unavoidable issues that arise when using this approach. First, constructing wage expectations from observational data may be difficult because of well-known selection issues or because students may not have rational expectations.[4] A recent expectations literature addresses these issues by collecting expectation information about wages under each decision alternative (see, e.g., Arcidiacono, Hotz, and Kang, 2012; Stinebrickner and Stinebrickner, 2014b; Arcidiacono et al., 2020; Boneva, Golin, and Rauh, 2021). It is worth-nothing that, even with data on income expectations, one might still need strong assumptions such as Rational Expectations or time-invariant expectations if the only information about choices comes from observing realized decisions. This is the case because income expectations data are generally collected before actual decision-making, so that the relevant dependent variable at the time of the survey is the perceived probability of making a particular decision in the future, rather than the realized decision in the future.

A second issue is that, unlike pecuniary factors such as wages, many sources of non-pecuniary benefits may be hard to measure or even describe (Gong et al., 2019). In this case, the natural, traditional approach for capturing non-pecuniary benefits - including observable factors that intuition suggests are likely to be related to these benefits - may present an incomplete view of the total value of non-pecuniary benefits. One implication of not fully capturing the total value is that omitted variables bias may exist. For example, researchers may incorrectly attribute some of the benefits associated with unmeasured non-pecuniary factors to measured pecuniary factors, which is important because the impact of many policies depends on the sensitivity of decisions to pecuniary factors. A second implication is that it will be hard to know whether the residual term in one's model should be interpreted as representing unmeasured pecuniary benefits, unmeasured non-pecuniary benefits, or other types of measurement or specification error. This interpretation issue is of direct relevance

[3]Also in the context of location choice, a worker's preference towards certain local amenities, such as weather, life convenience, and crime is identified using their actual location choices (see, e.g., Rosen, 1979; Roback, 1982; Albouy, 2008; Diamond, 2016). In addition, in the context of higher education, the non-pecuniary benefits associated with different schooling options are often identified from students' realized schooling decisions (see, e.g., Keane and Wolpin, 1997, 2001; Heckman, Lochner, and Todd, 2006; Abbott et al., 2019; Guo and Leung, forthcoming).

[4]For recent empirical evidence of non-rational income expectations, see, e.g., Crossley et al. (2021) and D'Haultfoeuille, Gaillac, and Maurel (2021).

for characterizing objects such as welfare inequality.

Our contribution comes from collecting and combining 1) perceived location probabilities, 2) counterfactual wage expectations data, and 3) additional information from new survey questions that were designed to elicit the full non-pecuniary benefits associated with each alternative a person considers, in our environment each geographic location. One virtue of our data is that all three pieces of information were collected at the same time (the last year in college).

Perhaps most novel is our non-pecuniary measure. In the spirit of the compensating wage differentials literature, our survey questions elicit the amounts of additional wage earnings that would be necessary to induce a student to move across locations. Thus, our survey questions, which have a natural connection to the method of contingent valuation, produce a direct measure of non-pecuniary benefits that has two appealing features. First, by design, it incorporates the value of all non-pecuniary factors that are relevant. That is, it elicits the full value of non-pecuniary benefits. Second, it has a straightforward, desirable interpretation because it is measured in dollar equivalents. Conceptually, if our approach is successful, we directly address the omitted variables problem and interpretation issues discussed earlier.

Feedback from respondents at the time of survey completion suggested that the questions were of a form that was straightforward to understand and answer. Nonetheless, to provide direct, formal evidence about the quality of our measure, we make a methodological contribution by designing and implementing a specification test. The test exploits two implications that would hold if our survey questions achieve their potential promise of capturing all relevant non-pecuniary benefits in dollar equivalents. We do not reject the two implications at any commonly used significant level (p-value = 0.27).

Our approach is related in spirit to the recent use of a hypothetical choice probability methodology (see, e.g., Blass, Lach, and Manski, 2010; Wiswall and Zafar, 2018; Giustinelli and Shapiro, 2019). This approach has often been employed when the objective is to characterize the value of specific non-wage benefits. Of particular relevance is recent work by Koşar, Ransom, and van der Klaauw (2021), which characterizes the willingness to pay for various non-pecuniary attributes that are relevant in a context similar to what we study in this paper - migration decisions. We stress that our approach directly complements the choice probability literature. While we motivate why the full non-pecuniary benefits of each alternative, which is the focus of our paper, is often a fundamental object of interest, in many situations a policymaker will also be interested in the utility that is derived from specific attributes. To build a bridge between the two approaches, we examine how our measure of the full non-pecuniary value of a location relates to characteristics of the location that have been shown to be important in the literature, such as the presence of family/friends and the population of the location.[5]

Our approach is also related to an information experiment approach, which represents another expectations-based approach for identifying the effect of pecuniary (and non-pecuniary) factors on choice probabilities (e.g. Wiswall and Zafar, 2015). Our approach avoids the need for an assumption that has often been imposed when implementing this approach - that an individual's uncertainty about a factor does not change when the individual is provided with information about the factor. Recent evidence suggests that this assumption may be problematic, in practice (Giustinelli, Manski, and Molinari, 2022a).

Our analysis of the initial post-college geographic location decision of college graduates takes advantage of the longitudinal Berea Panel Study, which follows two cohorts of students at Berea College in great detail from the time of college entrance through the early portion of their working lives. Located in central Kentucky, Berea operates under a mission - providing educational opportunities to individuals of great promise but limited economic resources - that produces a population of students from low income families, with the large majority coming from the Appalachian region. As discussed above, the low income demographic in our data is of direct relevance in this context. The decision of where to live soon after leaving college is likely to be of specific importance in determining one's future outlook, given the existence of search frictions and the reality that the costs of mobility may increase over time due to marriage and fertility.[6] Thus, the potential for education to change the economic trajectory of individuals from poor areas may be dampened if post-college geographic decisions are influenced by non-pecuniary considerations such as attachments to home areas.[7]

We begin with descriptive evidence motivating our interest in non-pecuniary considerations in this context. Taking advantage of longitudinal location data, which identifies both a student's hometown and the place where he/she lives after graduation, we find that, on average, Berea graduates are more likely to live near their hometowns when compared to college graduates elsewhere. Further, we find that a substantial number of students come

[5]See e.g., Huttunen, Møen, and Salvanes (2018) and Büchel et al. (2020) for other literature that examines various individual characteristics on location decisions.

[6]Roca and Puga (2017) document that workers in bigger cities accumulate more valuable experience, which contributes to their life-time earnings even if they leave big cities.

[7]See, e.g., Ziliak (2007) for a discussion of the potential role of investments in education in reducing persistent poverty in regions such as Appalachia.

from hometowns with small populations. Given that these locations are unlikely to attract residents for pecuniary reasons, non-pecuniary considerations may play a central role in students' location decisions.

Our direct measure of the full value of non-pecuniary benefits provides evidence that the non-pecuniary preferences for specific locations are indeed strong. For example, we find a quite sizable home attachment; on average, the non-pecuniary benefit associated with the hometown and nearby areas (Home-Area) is $6,400 per year larger than the non-pecuniary benefit associated with a base category that includes locations that are generally a non-trivial distance from the Home-Area. Further, we find that differences in non-pecuniary benefits across locations are substantially larger than perceived differences in earnings across locations.

Because our measure of non-pecuniary benefits is denominated in dollar equivalents, we are able to construct the overall benefits associated with each geographic location by summing the pecuniary and non-pecuniary benefits associated with that location. Turning to understanding location decisions, a key object of interest is the marginal effect of overall benefits in a particular location on the fraction of students who would choose this location. We estimate a model that describes how a student's perceived probabilities about post-college locations depend on our pecuniary and non-pecuniary measures about these locations. We find that location decisions are very sensitive to overall benefits. For example, a one thousand dollar increase in the annual overall benefits associated with the Home-Area would lead to a 0.92 percentage point increase in the average perceived probability of living in the Home-Area.

Our direct measures of the full non-pecuniary benefits, as well as pecuniary benefits, allow us to use our estimated model to quantify the importance of pecuniary and non-pecuniary considerations for location decisions. Counterfactual experiments show that non-pecuniary considerations play a much more important role for location decisions than pecuniary considerations. Because individuals perceive vastly different non-pecuniary benefits across locations, equalizing the non-pecuniary benefits across locations leads to a sizable change in the average perceived location probabilities. In fact, the average perceived location probabilities become very similar across locations. In contrast, because perceptions about pecuniary benefits are much more similar across locations, equalizing pecuniary benefits across locations has almost no impact on the average perceived location probabilities. Put another way, our non-pecuniary measures are able to nearly fully account for the substantial differences in average perceived location probabilities that exist across locations in the data, but we are not able to account for these differences when we rely on pecuniary measures alone.

In general, one might expect that strong home attachment would create negative effects on labor market outcomes in contexts like ours where hometowns are relatively small, and therefore may tend to be lacking in high-skilled opportunities. Interestingly, counterfactual experiments indicate that this is not what the respondents in our sample would expect. An experiment that induces movement by entirely removing home attachment does lead to a substantial decrease in the average perceived probability of living in the Home-Area. However, the results suggest that average expected annual earnings would not increase substantially in this case because affected graduates would instead perceive a much higher probability of choosing the Job-Search-State, which tends to share similar characteristics, such as income and college share, to the Home-Area. A second experiment provides a direct financial incentive to move to our base location category, which, a priori, seems most likely to contain locations that are substantially different than the Home-Areas. However, even in this case we find that, on average, individuals perceive only a small increase in the annual earnings associated with the first post-college job. In our conclusions, we discuss possible reasons for this small increase. The reality that this finding might be quite different if expectations data were not available to characterize perceptions about wages across locations has important implications for policy and future research.

Our non-pecuniary measures also allow us to directly quantify welfare inequality, in addition to income inequality. The post-college portion of the BPS contains information about the 1) annual earnings, 2) location, and 3) job type associated with each student's first post-college job. Combining 2) and 3) with non-pecuniary preferences described in the second paragraph, we construct the realized non-pecuniary benefit for each student. Overall welfare is obtained as the sum of earnings and non-pecuniary benefits. We consider both the standard deviation and the coefficient of variation as measures of inequality. We find that, because non-pecuniary benefits vary substantially across individuals and are positively correlated with earnings, both measures of inequality are larger for overall welfare than for earnings. Importantly, we discuss scenarios under which our inequality measure should be viewed as an informative lower bound for the true welfare inequality.

Our approach represents a contribution to the literature interested in understanding whether welfare inequality differs substantially from earnings inequality (Diamond, 2016; Moretti, 2013). Previous work effectively assumes that non-pecuniary benefits are homogeneous conditional on a set of observables in the calculation of welfare inequality. Our individual-level measures of non-pecuniary benefits allow us to account for traditionally unobserved heterogeneity.[8] It is also worth stressing that while previous work mostly studies inequality at the population level, the nature of our sample implies that we focus on the income and welfare inequality for a group of college graduates from low income backgrounds. Our results suggest that substantial inequality remains even among college graduates from the same school who have similar backgrounds. Further, this inequality becomes even larger once we take into account non-pecuniary benefits.

2 Non-pecuniary Benefits and Location Decisions: A Conceptual Framework

In this section, we introduce a simple model of location decisions, which incorporates the role of pecuniary and non-pecuniary considerations. A discussion of model identification guides our data collection by highlighting the importance of having measures of the total value of non-pecuniary benefits (Sections 3 and 4). The estimated model is subsequently used to provide evidence about the importance of pecuniary and non-pecuniary considerations and to conduct counterfactual policy analyses (Section 5).

Consider our case where, at the beginning of the last year in college (time t), each student i reports her perceived probability of choosing post-graduation location l, P_{il}, for $l = 1, 2, ..., \mathcal{L}$. The student knows that, at the time of graduation (time t^*), she will choose the location that has the highest expected future utility, or value. At time t, uncertainty exists about what decision she will make because new information about the value of each location will become available between t and t^*.

We assume that at t^* the location decision can be described using a standard multinomial logit model. Let $u_{il} = \bar{u}_{il} + \frac{1}{\beta}\eta_{il} + \epsilon_{il}$ denote the value of choosing location l for individual i, where $\bar{u}_{il}$ is known to individual i at time t, η_{il} follows the Type-1 GEV distribution and will be realized between time t and the time of decision making, t^*, and ϵ_{il} has a mean of zero and represents the shock that will not be resolved before decision making. Thus, $\frac{1}{\beta}\eta_{il}$

[8] As we discuss later in Section 6.2, our non-pecuniary measures could differ from actual realized non-pecuniary benefits for reasons related to 1) mean-zero unmeasured non-pecuniary benefits and/or 2) updating in preferences between the time of belief-elicitation (last year in college) and the first year after graduation. Because of this, it is perhaps best to view our welfare inequality measure as a complement, instead of a refinement to existing inequality measures.

represents resolvable risk. Its importance is characterized by $\frac{1}{\beta}$, which determines the variance of the resolvable risk. We note that, while the econometrician has (potentially partial) information about $\bar{u}_{il}$, neither η_{il} nor ϵ_{il} are observed by the econometrician. These timing and distributional assumptions are shared by both the students and the econometrician.

The decision at t^* will be made by comparing the expected utilities of the alternatives.[9] With η_{il} realized before t^* and ϵ_{il} unresolvable and mean zero, the expected value of location l at time t^* is given by $\bar{u}_{il} + \frac{1}{\beta}\eta_{il}$, so that at t^* student i chooses this location if $\bar{u}_{il} + \frac{1}{\beta}\eta_{il}$ is greater than $\bar{u}_{il'} + \frac{1}{\beta}\eta_{il'}$ for all $l' \neq l$. Hence, the perceived probability at time t of choosing location l can be obtained by integrating over the joint distribution of all the resolvable risks, $F(\eta_{i1}, \eta_{i2}, ..., \eta_{i\mathcal{L}})$.

$$\begin{aligned} P_{il} &= \int \mathbb{1}(\bar{u}_{il} + \frac{1}{\beta}\eta_{il} > \bar{u}_{il'} + \frac{1}{\beta}\eta_{il'}, \forall\ l' \neq l) dF(\eta_{i1}, \eta_{i2}, ..., \eta_{i\mathcal{L}}) \\ &= \frac{exp(\beta \bar{u}_{il})}{\sum_{l'=1}^{\mathcal{L}} exp(\beta \bar{u}_{il'})}, \ l = 1, 2, ..., \mathcal{L}, \end{aligned} \tag{1}$$

where $\mathbb{1}(\cdot)$ is the indicator function and the second line follows from the well-known properties of the logistic distribution, which results from differencing the extreme value errors, η_{il} and $\eta_{il'}$, in the first line.

In our context, $\bar{u}_{il}$ is comprised of a pecuniary component $\bar{u}_{il}^P$ and a non-pecuniary component $\bar{u}_{il}^N$. We follow most of the literature by assuming these components are additive, so that $\bar{u}_{il} = \bar{u}_{il}^P + \bar{u}_{il}^N$, but in Appendix C we show that our results are robust to an alternative multiplicatively separable specification. Given that some factors that affect pecuniary and non-pecuniary utility will potentially be known by the agent at time t but not observed by the econometrician, we further decompose $\bar{u}_{il}^P$ as the sum of a measured component $\bar{u}_{il}^{P,M}$ and an unmeasured component $\bar{u}_{il}^{P,U}$, and similarly decompose $\bar{u}_{il}^N$ as the sum of a measured component $\bar{u}_{il}^{N,M}$ and an unmeasured component $\bar{u}_{il}^{N,U}$.

We choose the last alternative ($l = \mathcal{L}$) as the base alternative. Taking the logarithm of the odds ratio, $\frac{P_{il}}{P_{i\mathcal{L}}}$, yields the well-known log-odds-ratio representation of multinomial logistic

[9] One implicit assumption here is that each student is independently making post-college location decisions. This assumption would be violated if, for example, students who have a partner (boyfriend/girlfriend/spouse) jointly search for jobs and make location decisions with their partner. Taking advantage of additional survey questions in the BPS, we find that this is not a major concern for our sample because 86% of the students in our sample either did not have a partner or were not searching jointly with their partner.

models:

$$log(\frac{P_{il}}{P_{i\mathcal{L}}}) = \beta(\bar{u}_{il} - \bar{u}_{i\mathcal{L}})$$
$$= \beta(\bar{u}_{il}^{P,M} - \bar{u}_{i\mathcal{L}}^{P,M}) + \beta(\bar{u}_{il}^{P,U} - \bar{u}_{i\mathcal{L}}^{P,U}) + \beta(\bar{u}_{il}^{N,M} - \bar{u}_{i\mathcal{L}}^{N,M}) + \beta(\bar{u}_{il}^{N,U} - \bar{u}_{i\mathcal{L}}^{N,U})$$
$$\equiv \beta\Delta\bar{u}_{il}^{P,M} + \beta\Delta\bar{u}_{il}^{P,U} + \beta\Delta\bar{u}_{il}^{N,M} + \beta\Delta\bar{u}_{il}^{N,U},\ l = 1, 2, ..., \mathcal{L} - 1. \quad (2)$$

We refer to the differenced terms $\Delta\bar{u}_{il}^{P,M}$ and $\Delta\bar{u}_{il}^{P,U}$, respectively, as measured and unmeasured pecuniary *premiums* associated with location l (relative to location $\mathcal{L}$) and refer to the differenced terms $\Delta\bar{u}_{il}^{N,M}$ and $\Delta\bar{u}_{il}^{N,U}$, respectively, as measured and unmeasured non-pecuniary *premiums* associated with location l.

Gong, Stinebrickner, and Stinebrickner (2019, forthcoming) provide evidence that survey responses to perceived probability questions can contain considerable measurement error, while the magnitude of measurement error contained in survey responses eliciting expectations about pecuniary benefits such as wage earnings tends to be small. Consistent with these findings, we allow the log-odds-ratio (constructed from reported probabilities) $log(\frac{\tilde{P}_{il}}{\tilde{P}_{i\mathcal{L}}})$ to contain classical measurement error ξ_{il}[10]:

$$log(\frac{\tilde{P}_{il}}{\tilde{P}_{i\mathcal{L}}}) = \beta\Delta\bar{u}_{il}^{P,M} + \beta\Delta\bar{u}_{il}^{P,U} + \beta\Delta\bar{u}_{il}^{N,M} + \beta\Delta\bar{u}_{il}^{N,U} + \xi_{il},\ l = 1, 2, .., \mathcal{L} - 1. \quad (3)$$

A key parameter of interest is β, which represents the effect of pecuniary and non-pecuniary premiums on location probabilities. If the total value of each type of premium is directly measured, (i.e., $\Delta\bar{u}_{il}^{P,U}$ and $\Delta\bar{u}_{il}^{N,U}$ are not present), the β parameter can be estimated from the following simple linear two-equation system:

$$log(\frac{\tilde{P}_{il}}{\tilde{P}_{iL}}) = \beta(\Delta\bar{u}_{il}^{P,M} + \Delta\bar{u}_{il}^{N,M}) + \xi_{il} \equiv \beta\Delta\bar{u}_{il}^{M} + \xi_{il},\ l = 1, 2, ..., \mathcal{L} - 1 \quad (4)$$

where $\Delta\bar{u}_{il}^{M} \equiv \Delta\bar{u}_{il}^{P,M} + \Delta\bar{u}_{il}^{N,M}$.

Compared to a standard linear regression equation, Equation (4) is unique in that 1) it has no intercept term and 2) there is a common slope coefficient β shared by two regressors. Conceptually, this would not be the case if our survey questions were not successful in fully capturing pecuniary and non-pecuniary values. We develop and implement a formal test of

[10] Of course, non-classical measurement error may also arise due to, for example, rounding/bunching in responses to survey questions (Manski and Molinari, 2010; Pantano and Zheng, 2013; Giustinelli, Manski, and Molinari, 2022b).

whether this is the case in Section 5.2.2.

We assume that the measurement error terms ξ_{il}, $l = 1, 2, ..., \mathcal{L} - 1$ are classical, i.e. 1) $E\begin{pmatrix} \xi_{i1} \\ ... \\ \xi_{i\mathcal{L}-1} \end{pmatrix} = \begin{pmatrix} 0 \\ ... \\ 0 \end{pmatrix}$ and 2) $\begin{pmatrix} \xi_{i1} \\ ... \\ \xi_{i\mathcal{L}-1} \end{pmatrix}$ is independent of any other factors. Under this assumption, we can interact the measurement error terms with pecuniary and non-pecuniary premiums to construct moment conditions and consistently estimate β using the Generalized Method of Moments.

In addition to facilitating an easy-to-implement estimation of β, having direct measures of both types of premiums also allows us to characterize the joint distribution of these two premiums without estimating the model. This is desirable because the joint distribution is able to convey important information about the total impact of pecuniary premiums on location decisions **relative** to non-pecuniary premiums, regardless of the value of β, as both pecuniary and non-pecuniary premiums have the same marginal effect on location decisions (i.e., the same β).

Unfortunately, in traditional data sources, while measures of pecuniary benefits such as earnings are commonly available, many potentially important non-pecuniary factors are either hard to measure or entirely unobserved.[11] We illustrate the benefits of observing the total value of the non-pecuniary premiums for estimating β by considering an extreme version of this reality - where pecuniary premiums are fully measured and non-pecuniary premiums are completely unobserved, i.e., $\Delta\bar{u}_{il}^{P,U}$ and $\Delta\bar{u}_{il}^{N,M}$ are not present.

In this scenario, the identification of β requires the strong assumption that pecuniary premiums $\Delta\bar{u}_{il}^{P,M}$ are uncorrelated with unmeasured non-pecuniary premiums $\Delta\bar{u}_{il}^{N,U}$ and measurement error ξ_{il}. As one of many potential examples that this assuming away of potential omitted variable bias may be generally concerning in our substantive context, both wages and amenities may be higher in large metropolitan areas (Diamond, 2016).[12] In Section 5.2 we provide evidence that this type of bias is relevant in our application. Further, even if the assumption does hold, identifying the distribution of $\Delta\bar{u}_{il}^{N,U}$ requires the additional assumption that measurement error, ξ_{il}, does not exist. If, as suggested by Gong, Stinebrickner, and Stinebrickner (2019, forthcoming) this additional assumption is problem-

[11]Of course, information about expected earnings across a variety of locations would not typically be observed in standard data.

[12]Under this assumption, β and the distribution of $\beta\Delta\bar{u}_{il}^{N,U} + \xi_{il}$ can be consistently estimated using standard semiparametric estimation techniques. If the assumption does not hold, β will incorrectly capture some of the effects of the unmeasured non-pecuniary premiums.

atic, then, roughly speaking, the measurement error will be incorrectly subsumed into the non-pecuniary utility term. This will result in an overstatement of the importance of non-pecuniary premiums in creating variation in location decisions. Moreover, this overestimation of variation in non-pecuniary premiums could lead to an upward bias in well-being/welfare inequality when non-pecuniary premiums are combined with pecuniary factors to compute well-being/welfare inequality.

3 Data

3.1 Berea College and the Berea Panel Study

Designed and administered by Todd Stinebrickner and Ralph Stinebrickner, the Berea Panel Study (BPS) is a multipurpose longitudinal survey project, which collected detailed information for understanding a wide variety of issues related to higher education and the early part of the post-college period. The BPS has been used to study a broad set of issues, including grade determination, college decisions such as dropout and major, and post-college wage determination (see, e.g., Stinebrickner and Stinebrickner, 2012, 2014a,b; Stinebrickner, Stinebrickner, and Sullivan, 2019). It followed all students who entered Berea College in the fall of 2000 and the fall of 2001, from the time of college entrance until 2014. Respondents were surveyed approximately 10-12 times each year while they were in school. Approximately 85% of students in the two cohorts completed the baseline BPS survey, and the participation rate on subsequent in-school surveys was typically around 90%. Berea graduates, who are the focus of this paper, were surveyed annually after leaving Berea. Response rates were above 90% at the beginning of the post-college period and remained above 80% for most of the period. The BPS survey data is merged with detailed individual-level data from the school's administrative records.

In important respects, Berea College is quite typical to many other post-secondary institutions. The school operates under a standard liberal arts curriculum and per-student expenditures are near the middle of the college distribution (Gong et al., 2019). Students at Berea are similar in terms of measures of academic quality such as college entrance exam scores to students at nearby schools, e.g., the University of Kentucky (Stinebrickner and Stinebrickner, 2008). Further, academic decisions and outcomes at Berea are similar to those found elsewhere. Stinebrickner and Stinebrickner (2003) shows that dropout rates are similar to the dropout rates at other schools (for students from similar backgrounds) and

Stinebrickner and Stinebrickner (2014b) shows that patterns of major choice and major-switching are similar to those found in the NLSY by Arcidiacono (2004).

In terms of certain basic demographic characteristics, students at Berea are similar to students elsewhere. For example, approximately 60% of students are female.[13] However, Berea's demographic focus - students with limited resources from the Appalachian region - implies that students come from the types of disadvantaged backgrounds that are of particular interest to policymakers interested in issues such as inequality. Less than half (34%) of students have a parent who completed a college degree and, on average, the income of students' families is roughly $26,000 at the time of college entrance (Stinebrickner and Stinebrickner, 2014a).[14] Approximately 64% of the students come from the Appalachian region, as defined by the Appalachian Regional Commission, which covers 420 counties across 13 states and has a total population of around 25 million.[15]

Berea College is located in the city of Berea, Kentucky. The city has a population of approximately 10,000 and describes itself as being located where the "Bluegrass region meets the foothills of the Appalachian mountains." This is an apt description since the county where Berea is located (Madison County) falls in the Appalachian region, while the counties immediately to its west (Garrard and Jessamine) do not. Berea's location at the very edge of the Appalachian region suggests that graduating students will likely be aware of a variety of heterogeneous location options, in addition to the option of returning to their home areas.

3.2 Survey Questions

The user-led nature of the BPS provided complete flexibility with respect to survey timing and content. This flexibility allowed the design of survey questions to be guided closely by economic models of the type described in Section 2.

3.2.1 Location Information

To operationalize our data collection, it is necessary to partition the set of possible geographic locations for an individual into a set of mutually exclusive and collectively exhaustive categories. Given the specifics of our data collection, we examine three categories ($\mathcal{L} = 3$).

[13] Approximately 18% of students are black.

[14] As a comparison, about 36 percent of college students in Kentucky have at least one parent who is a college graduate and the average family income of these students is $57,405 (American Community Survey 2000 and 2001).

[15] See https://www.arc.gov/about-the-appalachian-region for more detail.

Our paper has a natural focus on issues related to a student's hometown. The primary source for this information is the student's answer to Survey Question 1 (all survey questions are shown in Appendix A), which, in the last year of college, elicited a student's hometown city, county, and state.[16] We define the student's Home-Area ($l = 1$) to be her hometown and the "surrounding" area.[17]

Ideally, one would partition the remainder of the possible location space into a large number of fine categories, for example all of the states in the United States. However, natural constraints on survey length implied that it was only feasible to have a modest number of location categories. As such, we chose to have students identify, in Survey Question 2, the state in which they were most likely to search for jobs, excluding the Home-Area.[18] We refer to this state as the student's Job-Search-State ($l = 2$). Finally, we refer to all locations outside the person's Home-Area and Job-Search-State as Somewhere-Else ($l = 3$). As discussed throughout the remainder of the paper, our partition yields a situation where each location category tends to be relevant in terms of both perceived location probabilities and actual location decisions.[19]

The student's initial post-college location is available through our address database.[20] A general concern in studies of migration is that survey non-response might be related to

[16] We have hometown information for all students because, in cases where a student did not answer Question 1, we are able to take advantage of the fact that each student's home address is contained in the administrative data. As expected, we find a very strong consistency between the survey information and administrative information.

[17] The survey asks students to consider the surrounding area. When characterizing actual post-college locations, we operationalize this by considering the metropolitan area where the hometown is located. As a robustness check, we have also considered an alternative in which the surrounding area is the county where the hometown is located. We find similar results.

[18] One might think about decreasing the size of this job search area, to, e.g., the county level. However, this may lead to a case where the location category is often quite unlikely to be chosen.

[19] Our model implicitly assumes that, within each location category, each person is thinking about one specific location (e.g., a city), and that the perceived location probability, the pecuniary premium, and the non-pecuniary premium are based on this specific location. It is worth outlining the conditions under which these assumptions represent reasonable approximations within a full location choice model, that is when the value (i.e., expected utility) of this specific location is close to the value of the location category. In a full model, the value of a location category is the expected maximum of the value of all locations within the category ("EMax"), where the expected value is with respect to the uncertainty that will be resolved between the time of belief elicitation and the time of the location decision. If the specific location represents the most likely location, its value coincides with the maximum of the expected values of all locations within the category ("MaxE"). As is well-known, the EMax and MaxE will be similar when: 1) the most likely location has an expected value that is substantially higher than other locations, 2) the amount of uncertainty that will be resolved within a location category is relatively small, and/or 3) the new information associated with all locations within a category are strongly positively correlated.

[20] In an effort to avoid capturing short-term transitory post-college locations we characterize the initial post-college location using the student's address in 2008, when students have been out of college for a consequential amount of time.

location/mobility if survey administrators are more likely to lose track of respondents who move. Our annual post-college survey was a paper survey sent to students by mail. Thus, maintaining accurate addresses was of fundamental importance for obtaining a high response rate, and was a central focus of our post-college survey operation. Greatly aiding in this process, at the end of college we collected detailed contact information (phone number, email address, home address, and post-college address) for not only the survey respondent, but also for family members or friends who could provide address (or contact) information in the future. In addition, when necessary, we were able to obtain information about a respondent's current address by reaching out to her friends from Berea (because the in-school portion of the BPS collected detailed social network data) or by taking advantage of the type of resources that, e.g., alumni offices use to locate students. Each year, we confirmed addresses with students (or other contacts) before mailing surveys. Thus, we are confident that we had correct up-to-date addresses for almost every student. Perhaps the best direct evidence of the quality of our address database is that more than 90% of all graduates from the 2000 and 2001 cohorts received and completed our post-college survey in each year of the early post-college period.[21] In all, we observe a post-graduation address and hometown from one of our two sources for 540 Berea graduates.

3.2.2 Non-pecuniary measures, Pecuniary measures and perceptions about post-college locations

Non-pecuniary Measures

The discussion in Section 2 emphasizes the importance of characterizing the full non-pecuniary benefits associated with each of our location alternatives - Home-Area, Job-Search-State, and Somewhere-Else. To do this, we take advantage of two multi-part survey questions administered in the last year of college. The first question characterizes the utility/benefits of desirable features and other non-pecuniary benefits that would be received from living in each location, holding non-wage aspects of jobs constant.[22] The second question characterizes the non-wage utility/benefits associated with the working conditions in different types of jobs, which can influence the overall non-pecuniary benefits associated with different locations if certain types of jobs are more readily available in certain locations. These survey questions have two desirable features. First, the non-pecuniary benefits are elicited

[21]Our post-college surveys were sent to all graduates, regardless of in-school participation.

[22]Among others, Hudomiet, Hurd, and Rohwedder (2018) provides evidence that respondents can hold unspecified characteristics constant when answering questions about hypothetical scenarios.

in dollar equivalents, giving survey answers a direct quantitative interpretation as the willingness to pay. Second, the wording of these questions implies that, when combined, they elicit the full non-pecuniary benefits associated with a particular location alternative. We note that, while our motivation for using the term "non-pecuniary" benefits comes from its widespread acceptance in the literature, in our context it would technically be more precise to refer to these benefits as "non-wage" benefits. This means our non-pecuniary measures can potentially capture factors such as housing costs. We investigate whether housing costs are perceived to be important in Section 4.3.

Survey Question 3 shows how we elicited preferences about non-pecuniary benefits, holding job type constant (i.e., the first survey question). The question first establishes which of the three possible locations would be chosen by the respondent (i.e., which would be the most desirable) if an identical job was available in each location. Of importance given the objective of directly eliciting a full characterization of all of the non-pecuniary benefits unrelated to employment, the preamble to the question notes the relevance of all of the features of a particular location as well as, for example, whether the respondent has family/friends in that location. Appealing directly to the concept of compensating wage differentials, it then elicits the amount of additional earnings that would be needed to induce the person to choose each of the two non-preferred locations if the identical job paid $30,000 in the preferred location.[23] Thus, these two amounts represent the non-pecuniary preference in dollar equivalents of living in one's preferred location relative to each of the two non-preferred locations, holding non-wage aspects of jobs constant. We refer to these non-pecuniary preferences as the non-job-related location preferences. Given that the preferred location will vary across respondents, we facilitate comparisons across respondents by using the two amounts to construct the preference for living in one's Home-Area relative to living Somewhere-Else and the preference for living in one's Job-Search-State relative to living Somewhere-Else. We refer to the former preference as one's "home attachment," and note that this preference will be negative if the person prefers living Somewhere-Else to living in her Home-Area.[24]

Survey Question 4 shows how we elicited the individual-specific preferences associated with different types of jobs (i.e., the second survey question). The question is similar in

[23]This number was chosen because it was roughly the starting earnings of college graduates at the time of the survey.

[24]The form of the survey question was guided by feedback from previous survey questions that had been used to study other substantive topics, but which had similar purposes. This feedback suggested the benefits of the expanded format used here - first asking about a preferred location and then having an explicit subsection for each possible preferred location.

spirit to Question 3. It first establishes which of three possible types of jobs defined earlier in the survey - jobs that do not require a college degree (Non-Degree), jobs that require any type of college degree (Any-Degree), and jobs that require a college degree in a person's specific major area (My-Degree) - would be chosen (i.e., would be the most desirable) if pay was identical across jobs. It then elicits the amount of additional earnings that would be needed to induce the person to choose each of the two non-preferred job types. Thus, these two amounts represent the non-pecuniary preference in dollar equivalents of working in the preferred type of job relative to each of the non-preferred types of jobs. We facilitate comparisons across respondents by using the two amounts to construct the preference for working in an Any-Degree job relative to a Non-Degree job and the preference for working in a My-Degree job relative to a Non-Degree job. We refer to these preferences as job-type preferences.

Pecuniary Measures

In terms of the pecuniary aspects of locations, we elicited information about expected earnings using Survey Question 5. The crucial feature of this survey question is that it elicits beliefs about the expected earnings associated with seven possible factual and counterfactual combinations of location and job-type: Non-Degree jobs in any location, Any-Degree jobs in Home-Area, Any-Degree jobs in Job-Search-State, Any-Degree jobs Somewhere-Else, My-Degree jobs in Home-Area, My-Degree jobs in Job-Search-State, and My-Degree jobs Somewhere-Else. Note that, in order to reduce the number of combinations, the survey abstracted away from differences in expected earnings of non-degree jobs across locations.[25]

Perceptions about Post-college Locations

Each person's perceived probability of choosing each possible location, which is used to construct the dependent variable for the model of location choice in Section 2, is obtained from Survey Question 6. Important for estimation, these perceived probabilities were elicited at the same time as the non-pecuniary and pecuniary measures.

In all, 363 students answered the survey in their last year of college which contains the preference questions and perceived probability questions. This number is smaller than the sample for which locations are observed (540 students) because: 1) some in-school survey participants did not answer this survey and 2) students who did not participate in the in-school portion of the BPS were made eligible for the post-school portion of the BPS.

[25] Consistent with our conceptual framework (Section 2), respondents were not asked to report the expected earnings conditional on a particular combination being optimal, but rather the unconditional expected earnings for the combination.

Nonetheless, we find that the two samples have very similar demographic characteristics. For example, the fraction of male students is 35.7% in the 540 students sample and 34.2% in the 363 students sample. The racial composition, ACT score, and high school GPA are also very similar in the two samples.

3.2.3 Other Post-college Information

Post-college realized annual earnings and job type are crucial for our examination of inequality. Information about realized wages was collected using Survey Question 7, which allowed respondents flexibility to report their compensation per hour, per week, per month, or per year. For our primary analysis in Section 6, we utilize the starting annual earnings associated with the first post-college job, although we also examine robustness using earnings over the first several years. Information about job type also came from a component of Survey Question 7, used extensively in Agopsowicz et al. (2020), which asked a respondent whether her job was best described as Non-Degree, Any-Degree, or My-Degree.

4 Descriptive Statistics

4.1 Hometown Information

This paper is motivated, very generally, by the open question of whether attachment to hometowns tends to lead to a lack of labor mobility, and consequently poorer wage outcomes for college graduates. We first provide two pieces of descriptive evidence that this concern cannot be dismissed out of hand for the graduates in our study.

First, we show that students are indeed quite likely to move home after graduating from college. For the 540 students for which we have both post-college addresses and hometown locations, Figure 3 shows the cumulative distribution function for the distance between a student's hometown address and post-college address. Roughly 30% of the students live within 10 miles of their home counties, and about 60% of the students live within 100 miles of their home counties. These percentages for our college graduates are, if anything, higher than what Zabek (2019) finds for a nationally representative sample of individuals across all education levels even though mobility tends to increase with education. Thus, the percentage of Berea graduates that return home is substantial.[26] This is consistent with

[26] As evidence that mobility increases with education, we find that 67 percent of the non-college population live in their birth state, while only 53 percent of college graduates stay in their birth state, using the American

previous findings about mobility in the Appalachian region (Bollinger, Ziliak, and Troske, 2011; Betz and Partridge, 2013).

It is also of relevance how far individuals travelled from their hometown to attend Berea in the first place. A person's college and post-college location decisions might both depend on one's home attachment. In this case, if students at Berea are attending college closer to their hometowns than other students in Appalachia, a possible concern might be that Berea students have substantially stronger home attachments than other Appalachian students. However, we find that, if anything, Berea students travel further to college than other students. The median distance from home to college is 130 miles for students at Berea College, while the median distance for all students in Kentucky, Tennessee, and West Virginia (some states in the Appalachian region) are 53 miles, 79 miles, and 53 miles, respectively(Mattern and Wyatt, 2009).

Second, we show that many students come from the type of hometowns that may be lacking in high-skilled opportunities. Figure 1 shows the fraction of students coming from each of the states in the U.S. We focus on population as a proxy for high-skilled job opportunities. The recognition in the literature (Glaeser and Resseger, 2010) that this characteristic is generally an informative proxy of available job opportunities is bolstered by results in Appendix B, which show that, in our sample, population has a strong, positive correlation both with average income and with the percentage of the population who hold a college degree for our sample. Using Census data, Figure 4a displays the population distribution of home counties in the year 2000. As a comparison, the dashed line plots the county-level population distribution of the whole U.S. Figure 4a suggests that most of the Berea students are from small to middle-sized counties.[27]

While the Home-Area is of particular interest in this paper, it is also directly relevant whether a person's Job-Search-State tends to be substantially different than the Home-Area. Figure 2 shows the fraction of students that have each of the states as their Job-Search-State. Consistent with the notion that the appeal of the Appalachian region may have a large impact on decisions, we find that Job-Search-States have a strong relationship to Home-Areas. Putting the information used to construct Figures 1 and 2 together, we find that the Job-Search-State is the home state for 54% of respondents, and the Job-Search-State

Community Survey 2010 sample.

[27] In addition to population, Appendix B describes the distribution of family income and the share of college graduates in students' home counties and compares them with the corresponding national distribution. We find that the majority of the Berea students are from low income and less educated counties.

is adjacent to the home state for another 17.6% of respondents. Then, not surprisingly, Job-Search-States tend to have relatively low income and few high-skilled job opportunities. For 84% of respondents, the Job-Search-State has an average wage income that is lower than the national average, and, for 83% of respondents, the college share of employed workers in the Job-Search-State is smaller than the national average college share.[28]

Figure 1: Geographic Distribution of Home States

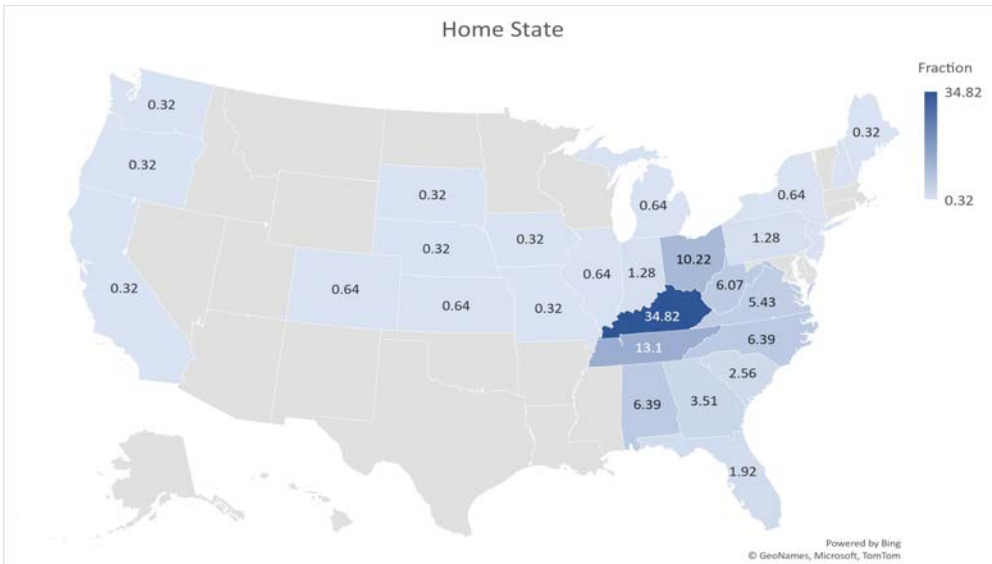
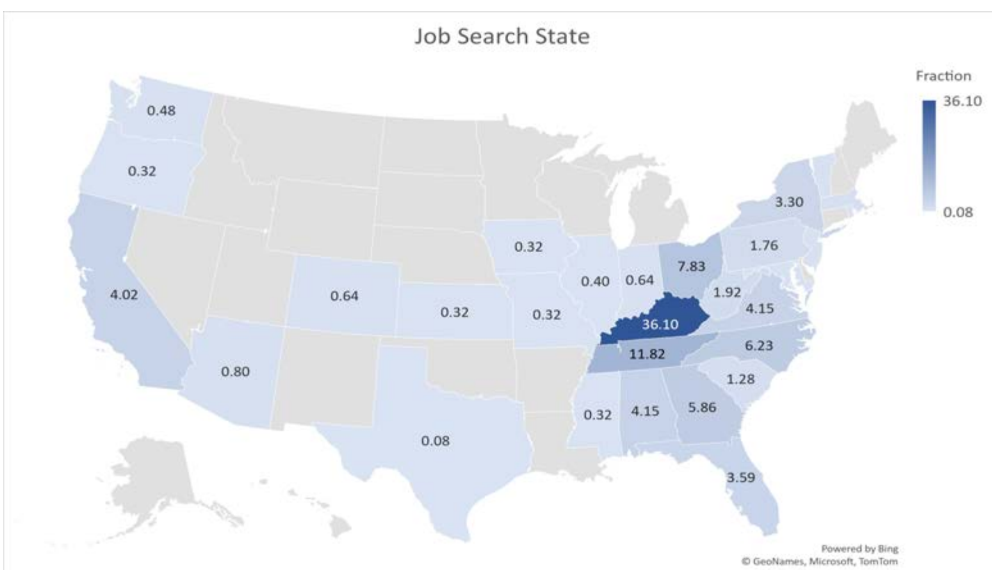
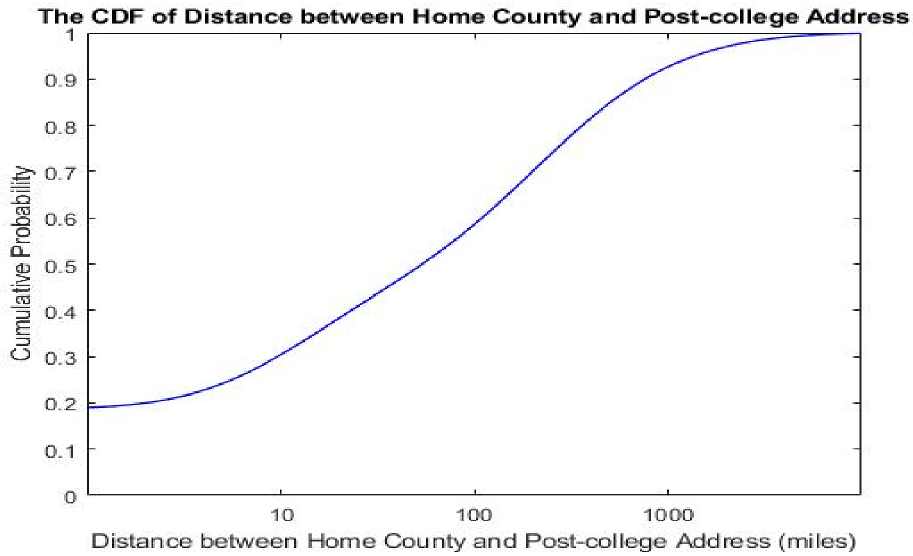


Figure 2: Geographic Distribution of Job-Search-States



[28]We provide more detailed information about the Job-Search-State in Appendix F.

Figure 3: CDF of Distance between Home County and Post-college Address



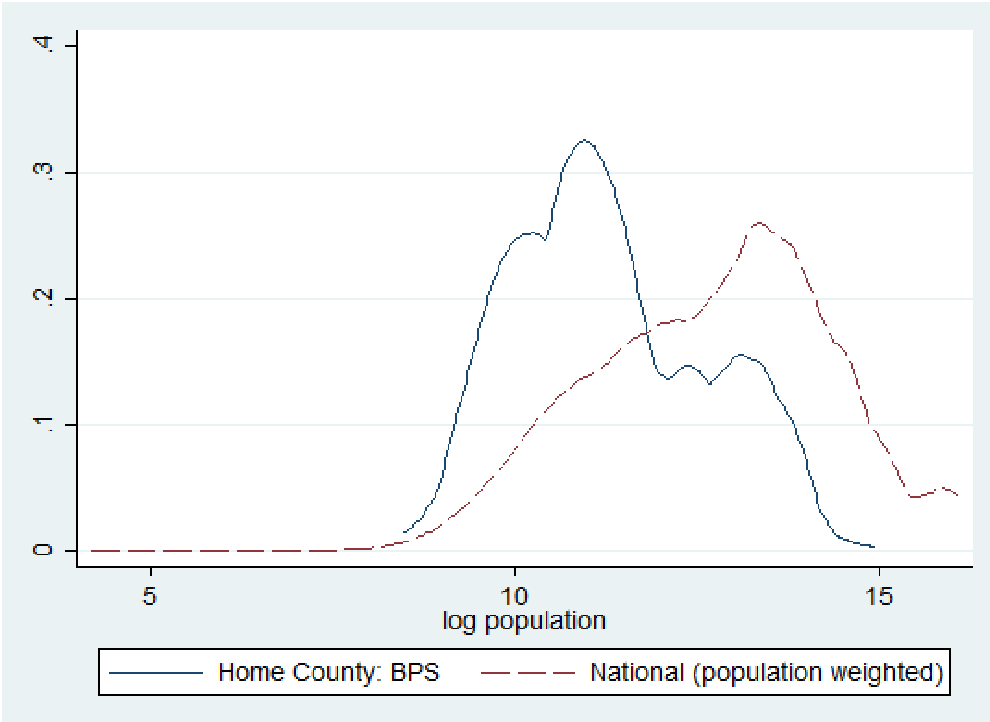
4.2 Descriptive Evidence about Non-pecuniary and Pecuniary Measures

4.2.1 Non-Pecuniary Measures

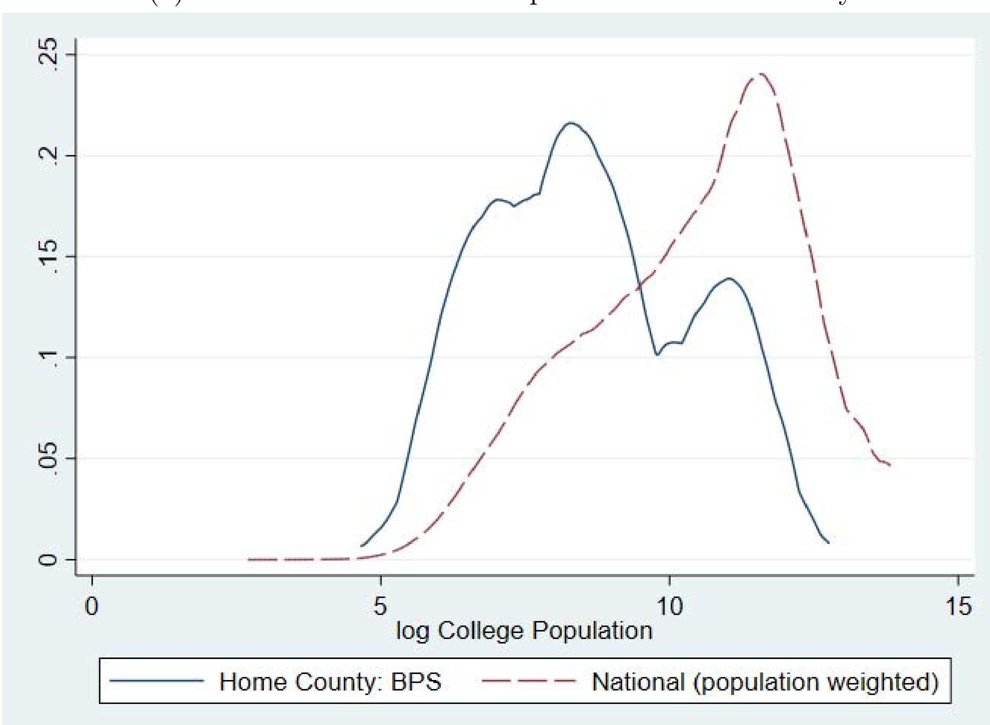
As discussed in Section 3.2.2, the total non-pecuniary benefits in a particular location consists of two components, job-related location preferences and non-job-related location preferences. The latter is directly elicited using Survey Question 3. The former can be computed for a particular location by combining 1) job-type preferences elicited using Survey Question 4 and 2) information about how likely a person is to obtain each type of job in that location. Here we present descriptive statistics separately for non-job-related location preferences and job-type preferences, leaving a discussion of how we compute the job type probabilities for Section 5.1.

Non-Job-Related Location Preferences

Table 1 describes the distributions of the non-job-related location preferences as defined in Section 3.2.2 for the 342 respondents who have valid responses to Survey Question 3. The first row presents the first evidence that location has the potential to play an important role in determining non-pecuniary utility. Holding all non-wage aspects of jobs constant, respondents on average have a substantial preference, $6,450 per year, for living in their Home-Area relative to living Somewhere-Else, with this home attachment statistically significant at a 1% level. Further, considerable heterogeneity exists in this preference, so that some students



(a) PDF of Distribution of Population in Home County



(b) PDF of Distribution of College-educated Population in Home County

Figure 4: PDF of Distribution of Population and College Population in Home County

have very strong attachments to their Home-Areas. For example, while the 25th percentile of zero shows that at least three-quarters of students find living in their Home-Area at least as desirable as living Somewhere-Else, perhaps more striking is the 75th percentile, which shows that a quarter of respondents have a home attachment of at least $15,000.[29] The second row of Table 1 shows results that are similar in spirit for the Job-Search-State. It is not surprising that, on average, the non-job-related location preference for the Job-Search-State is even larger than the home attachment because 1) the fact that the Job-Search-State is the one where a student is most likely to search likely reveals something about her preferences for the non-pecuniary (and pecuniary) aspects of the state and 2) the Job-Search-State is often the state that contains a person's hometown or an adjacent state, in which case locations in a Job-Search-State might offer some of the potential benefits of being close to family etc., while possibly offering more ideal local amenities.

Table 1: Non-Job-Related Location Preferences (Relative to Somewhere Else)

Sample Size: 342	Mean	Standard Deviation	25th Perc.	Median	75th Perc.
Home-Area	6.45	16.04	0	5	15
Job-Search-State	11.44	17.20	2	10	18

Notes: All numbers are in units of one thousand dollars. For example, the upper-left entry in the table shows that, on average, respondents have a preference of $6,450 for living in their Home-Area relative to living in the Somewhere-Else area. We exclude observations for which the reported preference is higher than the 99th percentile or lower than the 1st percentile of the cross-sectional distribution of the reported preferences.

Job-Related Location Preferences

Table 2 shows the mean and standard deviation of these preferences for the 345 respondents who have valid responses to the job-type preference questions (Question 4). The first row shows that, on average, a respondent thinks that a job requiring a college degree in any major is $3,000 (per year) more enjoyable than a job that does not require a college degree. As shown in the second row, this preference is $13,230 for jobs that require a college degree in the student's specific major. Both preferences are significant at a 1% level.

While there exists considerable cross-sectional heterogeneity in job-type preferences, we find that most students prefer My-Degree to Non-Degree jobs, with 299 out of 345 students (87%) reporting that they prefer My-Degree jobs and 22 additional students (5%) reporting

[29] 58% of the respondents find living in their Home-Area strictly more desirable than living Somewhere-Else.

that they are indifferent between the two options. There is a somewhat weaker preference for Any-Degree jobs relative to Non-Degree jobs, with 149 students (43%) reporting that they prefer Any-Degree jobs and 142 (41%) additional students reporting that they are indifferent between the two options.

Table 2: Job-Type Preferences (Relative to Non-Degree Jobs)

Sample Size: 342	Mean	Standard Deviation	25th Perc.	Median	75th Perc.
Any-Degree	3.00	8.54	0	0	5.00
My-Degree	13.23	13.90	5.00	10.00	20.00

Notes: All numbers are in units of one thousand dollars. For example, the lower-left entry in the table shows that, on average, respondents have a preference of $13,230 for working in a job that requires a college degree in their area of specialization relative to working in a job that does not require a college degree. We exclude observations for which the reported preference is higher than the 99th percentile or lower than the 1st percentile of the cross-sectional distribution of the reported preferences.

Table 3: Locations, Job Type and Expected Annual Earnings

Sample Size = 345	Non-Degree	Home-Area Any-Degree	Home-Area My-Degree	Job-Search-State Any-Degree	Job-Search-State My-Degree	Somewhere-Else Any-Degree	Somewhere-Else My-Degree
Mean	20.45	25.60	28.66	26.83	29.48	28.68	30.98
Standard Deviation	7.31	7.08	8.84	7.30	7.80	8.60	9.07
Median	20.00	25.00	28.00	26.00	30.00	30.00	30.00
Interquartile Range	10.00	10.00	7.00	8.00	10.00	12.00	10.00

Notes: This table reports the expected annual starting salary associated with the first post-college job (typically in Year 2005 or 2006). All numbers are in units of one thousand dollars. A particular column shows descriptive statistics for one of the seven location - job type combinations for which beliefs about expected earnings were elicited. For example, in the second panel, 25.60 shows that the average expected earnings in our sample is $25,600 for the scenario in which a person lives in her Home-Area and works in a job that requires a college degree of any type (Any-Degree).

4.2.2 Pecuniary Measures

The expected earnings in a particular location (Home-Area, Job-Search-State, Somewhere-Else) can be computed by combining 1) the elicited expected earnings for each type of job (Non-degree, Any-Degree, My-Degree) in that location with 2) information about how likely a person is to obtain each type of job in that location. As before, here we present descriptive statistics related to 1), again leaving a discussion of how we compute the probabilities associated with 2) for Section 5.1. Table 3 shows the sample mean and standard deviation of the elicited expected earnings associated with the seven job-type/location combinations discussed in Section 3.2.2. Comparing the first column to the remaining columns reveals that students believe that college jobs pay substantially more than non-college jobs. Comparing the My-Degree entry to the Any-Degree entry within Panel 2, Panel 3, or Panel 4 reveals that students tend to think that having a job that requires their specific major will pay more than having a job that requires a college degree of any type. Holding job type constant and comparing entries across Panel 2, Panel 3, and Panel 4 reveals that, overall, students expect somewhat lower earnings in their Home-Area than in other locations and somewhat higher earnings Somewhere-Else than in other locations.

4.3 Predictors of Non-Pecuniary and Pecuniary Measures

Examining the predictors of our non-pecuniary (and pecuniary) measures is useful for two reasons. First, while our focus on characterizing the full value of non-pecuniary benefits has a strong motivation, it is useful for a variety of reasons to have a sense of why non-pecuniary benefits arise. As such, examining prediction creates a bridge between this paper and research such as Koşar, Ransom, and van der Klaauw (2021), whose goal is to provide evidence about the importance of specific features of locations rather than the full value of non-pecuniary benefits. Second, because the survey questions that elicit these measures are novel, they share an important issue with a recent literature interested in the direct elicitation of expectations: while the questions are powerful from a conceptual standpoint, the quality of answers to these questions is not directly verifiable. Examining prediction is consistent with the approach often taken in the expectations literature to establish confidence in the quality of new questions - examining whether elicited beliefs are related to variables that intuition suggests should affect these beliefs. Of course, there are obvious limitations of this type of informal examination of quality. In Section 2, we suggest and implement a specification test to provide formal evidence that our non-pecuniary measures capture all relevant non-pecuniary premiums, in dollar equivalents.

In terms of non-pecuniary benefits, our examination of prediction focuses on the Home-Area location. Our measures of non-job-related location preference ("home attachment") were designed to capture all of the non-pecuniary benefits associated with a location (holding employment constant), including, for example, the benefits arising from local amenities as well as the benefits that one might receive from living close to friends and family. We use a linear regression model to examine whether there exist relationships between the elicited home attachment and 1) features of one's Home-Area such as population (of their home counties in 2000), 2) the presence of families and friends in the Home-Area, and 3) students' academic and demographic characteristics. Our analysis examines 317 students for whom non-pecuniary benefits and all explanatory variables in the regression are observed.

The results in Panel A of Table 4 show that home attachment is indeed significantly related to certain characteristics that intuition suggests might matter in ways that are consistent with Koşar, Ransom, and van der Klaauw (2021). With respect to 1) above, home attachment is significantly related to population (p-value less than 0.01).[30] With respect to 2), we find an extremely important role of family, friends, and significant others. Most notably, having a significant other in a particular location produces a non-pecuniary benefit of almost $9,000, with a p-value of less than 0.01.[31] With respect to 3), we find that home attachment has a positive, significant relationship with whether a person is male (at a 1% level); male students have $5,990 higher home attachment than female students. Interestingly, we find that there does not exist a statistically significant relationship between home attachment and measures of cost of living in the hometown, i.e., housing prices and rents.[32] Motivated by the observation that most graduates are renters during first several years after college, we also considered an alternative specification where we removed housing prices from the regression; we found similar results.

Earlier we described why housing costs might potentially be captured as part of our non-pecuniary measures. While the regression results suggest that housing costs are not particularly important, a certain degree of caution is needed because the estimator is relatively imprecise. As a result, we take a somewhat different approach for providing additional

[30]In a robustness specification, we replace the population and college share variables with a variable measuring the size of the college-educated population. We find a coefficient of 0.048, which is significant at a 1% level. This implies that an increase of one thousand college graduates in the Home-Area is associated with a 48 dollar increase in home attachment.

[31]This finding is consistent with Vazzana and Rudi-Polloshka (2019), which also finds evidence of an important role for spouses/partners in labor mobility and location decisions. In addition, the estimated coefficients associated with Parents, Siblings, Other-Family-Members, and Friends are all positive. While the coefficient associated with Other-Family-Members is significant at 5% and the other three coefficients are not, we do not reject the null hypothesis that the coefficients on these four categories are the same at standard significance levels.

[32]Considering why housing costs might not play a statistically significant role in explaining differences in non-pecuniary benefits across locations, one possibility is that, when considering where they might live within location categories, individuals may tend to mostly consider locations that are similar in terms of housing costs. Appendix G shows that most students are from, tend to look for jobs in, and eventually move to states where housing expenses are relatively low. In addition, the differences in housing costs between job-search-states and home states are small, as are the differences between students' home state and post-college residential states.

Table 4: Differences between Home-Area and Somewhere-Else: Regression Results

	Panel A: Home Attachment	Panel B: Earnings Differences		
		Any-Degree	My-Degree	Average
Constant	-4.6378	-4.7068	5.4873	0.3903
	(10.9706)	(4.5284)	(5.1463)	(4.0382)
Population	0.0115***	0.0047***	0.0036*	0.0041***
	(0.0043)	(0.0018)	(0.0020)	(0.0016)
Average Annual Income	-0.0926	0.0868	0.0856	0.0862
	(0.2109)	(0.0855)	(0.0971)	(0.0762)
College Share	-6.3528	6.3312	0.2746	3.3029
	(19.3555)	(7.8595)	(8.9319)	(7.0087)
Median Housing Price	0.0015	-0.0228	0.0093	-0.0067
	(0.0423)	(0.0159)	(0.0181)	(0.0142)
Median Rent	-0.4253	0.5072	-1.0090	-0.4810
	(1.3817)	(0.5581)	(0.6343)	(0.4977)
Parents	1.6627	-0.2939	-0.8479	-0.5709
	(2.6706)	(1.0976)	(1.2473)	(0.9788)
Brothers/Sisters	2.7105	-0.1664	-0.5703	-0.3683
	(2.1846)	(0.8775)	(0.9972)	(0.7825)
Other Family Member	4.7380**	-1.6840**	0.1187	-0.7827
	(2.0644)	(0.8451)	(0.9604)	(0.7536)
Boyfriend/Girlfriend/Spouse	8.9698***	-2.2364**	-2.1693*	-2.2029**
	(2.6891)	(1.1047)	(1.2554)	(0.9851)
Friends	2.6069	0.6708	-1.4459	-0.3876
	(2.1217)	(0.8664)	(0.9846)	(0.7726)
Black	-2.3252	-0.4283	-1.0774	-0.7529
	(2.6224)	(1.1043)	(1.2550)	(0.9847)
Male	5.9906***	2.1822***	0.9948	1.5885**
	(1.9881)	(0.8150)	(0.9262)	(0.7268)
HS GPA	1.3471	-0.5950	0.0566	-0.2692
	(2.4448)	(1.0236)	(1.1633)	(0.9128)
College GPA	-1.7726	0.4826	-1.1463	-0.3319
	(2.3142)	(0.9589)	(1.0897)	(0.8551)
Sample Size	317	323	323	323

*Notes: Home attachment, annual earnings, average annual income, median housing price and median annual rent are measured in $1,000s. Population is measured in one thousand people. Standard errors are in parentheses. *: p-value < 10%, **: p-value < 5%, ***: p-value < 1%. Independent variables in the regressions include 1) the population size, average annual income, share of residents that have a college degree, median housing price, and median rent for a student's hometown, 2) whether a respondent has parents, brothers/sisters, other family member, boyfriend/girlfriend/spouse, or friends living in her Home-Area, and 3) gender, race, high school GPA, and college GPA. We obtain information about 1) from IPUMS-NHGIS, obtain information about 2) from the graduation year survey in the BPS, and obtain information about 3) from administrative data provided by the Berea College.*

evidence about the importance of housing costs. Specifically, taking advantage of additional data on actual rent paid by Berea students after graduation, we see that students living in their home areas pay roughly \$1,300 less in rent per year than students living elsewhere. A virtue of the actual rent paid data is that it takes into account the possibility that people might have the option of living with their parents and paying less rent.[33] A back-of-the-envelope calculation suggests that, on average, 1,300/6,400 = 20% of the home attachment can be explained by housing costs. We note that this fraction should be best viewed as a suggestive upper bound for the importance of housing costs given that higher rents are often accompanied by better non-pecuniary amenities.[34]

We conduct a similar regression analysis to examine the prediction of our more standard pecuniary measures. For both the Any-Degree and My-Degree job types, we regress the difference between the expected annual earnings in one's Home-Area and the expected annual earnings Somewhere-Else on the set of regressors described above. Our analysis examines 323 students for whom we observe expected earnings and all explanatory variables in the regression. The results are reported in Panel B of Table 4. Perhaps most notably, the results indicate a significant role for population in all three columns of Panel B. Thus, population is positively correlated with both pecuniary and non-pecuniary benefits.

5 Model Estimation and Counterfactual Analysis

5.1 Measuring Pecuniary and Non-pecuniary Premiums

Given that our survey questions were designed to elicit the full pecuniary and non-pecuniary benefits, the objects needed to estimate our model in Equation (4) are $\Delta\bar{u}_{il}^{P,M}$ and $\Delta\bar{u}_{il}^{N,M}$. In this section we provide details of the construction of these objects, along with descriptive statistics.

5.1.1 Definition

Computing $\Delta\bar{u}_{il}^{P,M} = \bar{u}_{il}^{P,M} - \bar{u}_{i3}^{P,M}$

[33] Of relevance for understanding why the difference in rent is not larger, we find that only approximately 0.30 of students living in their home areas live with parents/family in the first year after graduation and many of this 0.30 pay some amount of rent.

[34] This upper bound view is consistent with our finding that the estimate of the coefficient on median rent (-0.43) is substantially smaller than one in absolute value.

Our measure of the pecuniary benefits associated with location l, $\bar{u}_{il}^{P,M}$, is the (subjective) conditional expectation (at time t) of the wage earnings associated with student i's first post-college job given location choice l.[35] Table 1 showed descriptive statistics (obtained from Survey Question 5) for i's expected wage earnings conditional on living in location l (Home-Area, Job-Search-State, Somewhere-Else) and having a type j job (Non-Degree, Any-Degree, My-Degree). Denoting this object as μ_{ijl}, we can express $\bar{u}_{il}^{P,M}$ as the probability-weighted sum

$$\bar{u}_{il}^{P,M} = \sum_{j=1}^{3} P_{ij}^{l} \mu_{ijl}, \tag{5}$$

where P_{ij}^{l} is student i's perceived probability of obtaining a type j job conditional on living in location l.

The BPS does not contain direct information about location-specific perceived job type probabilities, P_{ij}^{l}.[36] We assume that students have rational expectations about these conditional probabilities and approximate P_{ij}^{l} by the actual fraction of students who had type j jobs for each location l. Motivated by the possibility that the type of jobs available in small hometowns may be different than the type of jobs available in larger hometowns, we also allow the conditional job type probabilities for Home-Area, P_{ij}^{1}, to depend on the population of student i's hometown, by computing P_{ij}^{1} separately for students whose hometown has fewer than 35,143 people (the 10th percentile nationally) and for students whose hometown has more than 35,143 people. We find that students from small hometowns are more likely to obtain Non-Degree jobs at home compared to students from larger hometowns (51.35% vs 42.86%). With $\bar{u}_{il}^{P,M}$ computed using Equation (5), the pecuniary premium $\Delta\bar{u}_{il}^{P,M}$, for l=1,2, is constructed as the difference between $\bar{u}_{il}^{P,M}$ and $\bar{u}_{i3}^{P,M}$.

Computing $\Delta\bar{u}_{il}^{N,M} = \bar{u}_{il}^{N,M}$ - $\bar{u}_{i3}^{N,M}$

[35] Our baseline specification abstracts away from issues related to differences in, e.g., the amount of time that is needed to find a first job (search time), across locations. Examining available expected search time data in the BPS we find small differences across the three location categories - on average the expected search time for the first job is roughly 2.3 months in the respondents' hometowns and 2.4 months in their job-search-states and somewhere-else. In addition, adding search time as a regressor in our estimation (Section 5.2.1) does not change our conclusions in any substantively important way.

[36] This is due to survey length constraints. The BPS does contain individuals' perceived unconditional probabilities of choosing each type of job. Comparing these probabilities to the fractions of students who actually work in each of these types of jobs, we find that students somewhat overestimate the probability of working in a job that utilizes a college degree (Non-Degree: perceived = 0.178, actual = 0.393, Any-Degree: perceived = 0.311, actual = 0.256, My-Degree: perceived = 0.510, actual = 0.350). Given this overestimation, we also consider an alternative approach that utilizes this belief information in the computation of P_{ij}^{l}. The estimation of the model yields results that are similar to those obtained under the Rational Expectations assumption described below.

Our measure of the (subjective) expected (at time t) non-pecuniary benefits for location l, $\bar{u}_{il}^{N,M}$, consists of two components: the non-job-related non-pecuniary utility given location choice l and the job-related non-pecuniary utility given location choice l. With respect to the former, we assume that student i derives non-pecuniary utility α_{il}^L from living in location l, where α_{il}^L is an individual-specific permanent preference that is non-random from student i's perspective.[37] With respect to the latter, we assume that student i derives non-pecuniary utility α_{ij}^J from having a type j job. Differences in this utility across job types can lead to differences in job-related non-pecuniary utility across locations if the type of jobs available tends to vary with location. Specifically, with α_{ij}^J also being assumed to be permanent and non-random, the conditional expectation of job-related non-pecuniary utility for location l is given by the weighted average of α_{ij}^J, where, as before, the weight for location l is the probability that a person obtains a job of type j in that location, P_{ij}^l: $\sum_{j=1}^3 P_{ij}^l \alpha_{ij}^J$.

Then, for $l = 1, 2$,

$$\bar{u}_{il}^{N,M} = \alpha_{il}^L + \sum_{j=1}^{3} P_{ij}^l \alpha_{ij}^J. \tag{6}$$

Taking the difference between $\bar{u}_{il}^{N,M}$ and $\bar{u}_{i3}^{N,M}$, we can express the non-pecuniary premium $\Delta\bar{u}_{il}^{N,M}$ as the sum of non-job-related location preference and job-related location preference:

$$\begin{aligned}
\Delta\bar{u}_{il}^{N,M} &\equiv \bar{u}_{il}^{N,M} - \bar{u}_{i3}^{N,M} \\
&= (\alpha_{il}^L - \alpha_{i3}^L) + \sum_{j=1}^{3} P_{ij}^l \alpha_{ij}^J - \sum_{j=1}^{3} P_{ij}^3 \alpha_{ij}^J + \alpha_{i1}^J - \alpha_{i1}^J \\
&= \underbrace{(\alpha_{il}^L - \alpha_{i3}^L)}_{\text{Non-Job-Related Location Preference}} + \underbrace{[\sum_{j=1}^{3} P_{ij}^l \underbrace{(\alpha_{ij}^J - \alpha_{i1}^J)}_{\text{Job-Type Preference}} - \sum_{j=1}^{3} P_{ij}^3 \underbrace{(\alpha_{ij}^J - \alpha_{i1}^J)}_{\text{Job-Type Preference}}]}_{\text{Job-Related Location Preference}},
\end{aligned} \tag{7}$$

where $\alpha_{il}^L - \alpha_{i3}^L$ is the non-job-related location preference described in Table 2 (obtained using Survey Question 3) and $\alpha_{ij}^J - \alpha_{i1}^J$ is the job-type preference described in Table 3 (obtained using Survey Question 4).

[37]Our analysis remains valid even in the case where α_{il}^L is random and our measure is viewed as the conditional expectation of this preference at the time of survey completion.

5.1.2 Measures of Premiums

Table 5 shows descriptive statistics for the 322 students for whom we have valid measures of both the reported perceived location probabilities, $\tilde{P}_{il}$, and the pecuniary and non-pecuniary premiums, $\Delta\bar{u}_{il}^{P,M}$ and $\Delta\bar{u}_{il}^{N,M}$. Comparing Columns 1 and 2 to Columns 3 and 4 of Panel A provides two types of suggestive evidence that non-pecuniary premiums may be important. First, there is evidence that these premiums play a larger role than pecuniary premiums in determining average overall premiums. For example, while students, on average, perceive that the Home-Area is associated with a negative pecuniary premium ($\Delta\bar{u}_{i1}^{P,M}$), the magnitude of this negative pecuniary premium, \$1,490, is much smaller than the magnitude of the positive non-pecuniary premium that is associated with their Home-Area ($\Delta\bar{u}_{i1}^{N,M}$), \$6,400. Similarly, for the Job-Search-State, students, on average, perceive a substantial positive non-pecuniary premium ($\Delta\bar{u}_{i2}^{N,M}$) of \$13,060 per year and a negligible pecuniary premium ($\Delta\bar{u}_{i2}^{P,M}$). Second, there is evidence that non-pecuniary premiums play a larger role than pecuniary premiums in creating large deviations for some individuals from the average overall premiums that exist in particular locations; the standard deviations of the non-pecuniary premiums associated with Home-Area and Job-Search-State (\$15,820 and \$18,100, respectively) are substantially larger than the standard deviations of pecuniary premiums associated with Home-Area and Job-Search-State (\$3,570 and \$2,890, respectively).

Table 5: Descriptive Statistics for Reported Perceived Location Probabilities and Premiums

Sample Size = 322	**Panel A**						**Panel B**		
	$\Delta\bar{u}_{i1}^{P,M}$	$\Delta\bar{u}_{i2}^{P,M}$	$\Delta\bar{u}_{i1}^{N,M}$	$\Delta\bar{u}_{i2}^{N,M}$	$\Delta\bar{u}_{i1}^{M}$	$\Delta\bar{u}_{i2}^{M}$	$\tilde{P}_{i1}$	$\tilde{P}_{i2}$	$\tilde{P}_{i3}$
Mean	-1.49	0.02	6.40	13.06	4.91	13.09	0.3349	0.4125	0.2526
Standard Deviation	3.57	2.89	15.82	18.10	15.82	18.30	0.2736	0.2426	0.2229
Median	-0.73	0.21	5.38	10.01	4.15	9.88	0.3000	0.4000	0.2000
Interquartile Range	3.18	2.68	16.99	14.74	18.09	14.91	0.3950	0.2500	0.2960

Notes: The unit of premiums ($\Delta\bar{u}_{il}^{P,M}$, $\Delta\bar{u}_{il}^{N,M}$, and $\Delta\bar{u}_{il}^{M}$) is \$1,000. Location 1 = Home-Area; Location 2 = Job-Search-State; Location 3 = Somewhere-Else.

Panel B shows the perceived location probabilities. On average, the perceived probability of moving back to one's Home-Area, 0.335, is close to the actual fraction of students living in their Home-Area (defined as the home metropolitan area), 0.340. Students underestimate the probability of moving to the Somewhere-Else category (average perceived probability = 0.253, actual fraction = 0.390). We discuss issues related to this finding in Section 5.3.2.

While we formally estimate the model and study the role of these pecuniary and non-pecuniary premiums in detail in Section 5.2, here we provide some simple descriptive evidence about the relative importance of these two types of premiums in determining perceived location probabilities. For each student we can characterize the location that the person perceives as being most likely (from responses to the perceived location probability question), the location that has the highest pecuniary premium, and the location that has the highest non-pecuniary premium. Supporting the importance of non-pecuniary premiums, we find that, for about 75% of the students, the location that has the highest non-pecuniary premium is the location that the student perceives as being most likely.[38] In contrast, this fraction is roughly 40% for pecuniary premiums.[39]

5.2 Estimation

5.2.1 β and Marginal Effects of Location Premiums

From a conceptual standpoint, our survey questions allow us to capture all the pecuniary and non-pecuniary premiums of relevance for each location. Given this objective of our survey efforts, we begin by considering an empirical specification consistent with the situation where both pecuniary and non-pecuniary premiums are fully measured, but note in advance that in Section 5.2.2 we develop a specification test that provides evidence in support of this specification. The model of relevance is described by Equation (4). For asymptotic efficiency, we estimate the model using the iterated Generalized Method of Moments.[40]

The estimate of β is 0.062, and a test of the null that β is equal to zero is overwhelmingly rejected, with a t-statistic of 12.6. In terms of model fit, the correlations between reported perceived location probabilities and model-predicted perceived location probabilities are between 0.4 and 0.5, the average absolute differences between reported perceived location probabilities and model-predicted perceived location probabilities are between 0.16 and 0.18, and the reported most likely location coincides with model-predicted most likely

[38] There are some cases where there are multiple locations that have the highest pecuniary/non-pecuniary premium or are perceived to be most likely. In these cases, we check whether the two sets of locations overlap with each other.

[39] We note that uncovering a strong relationship between perceived outcomes and non-pecuniary premiums requires, not only that non-pecuniary premiums are important, but also that our novel survey questions are successful in capturing information about the non-pecuniary aspects of locations. As such, our results here provide further evidence about the quality of our non-pecuniary measures.

[40] Our model implies that the reported perceived location probabilities should be strictly greater than zero. In practice, we set $\tilde{P}_{il} = 0.01$ if student i reports a zero perceived probability for location l. Our results are robust to slight changes (e.g., setting $\tilde{P}_{il} = 0.001$) in this adjustment.

location for three quarters of students.[41]

Since the objects of interest are location probabilities, instead of the log-odds-ratios that appear in Equation (4), we begin by computing the marginal effect of increasing the premium associated with the Home-Area by \$1,000 using the estimated value of β. We find that this leads to a 0.92 percentage point increase in the average reported perceived probability of living in the Home-Area. Repeating this exercise for the Job-Search-State, we find that a \$1,000 increase in the overall Job-Search-State premium leads to a 1.14 percentage point increase in the average reported perceived probability of living in the Job-Search-State. Finally, we find that the marginal effect of increasing the benefits associated with Somewhere-Else by \$1,000 is 0.87 percentage points. Thus, location probabilities are heavily influenced by location-specific premiums.

To illustrate the importance of our non-pecuniary measures in the estimation of β and the marginal effects, we re-estimated Equation (4) after removing non-pecuniary premiums and adding intercept terms and other regressors (gender, race, high school GPA, and college GPA) to capture the expected value of the now unmeasured non-pecuniary premiums conditional on these regressors. In this case, the estimated value of β is -0.0030, which has the opposite sign as (and is much smaller in magnitude than) our baseline estimate obtained with non-pecuniary premiums in the regression (0.062). In addition, in this case a test of the null that utility does not depend on wage income ($\beta = 0$) has a large p-value of 0.89. These findings highlight the relevance of omitted variable bias when relevant non-pecuniary benefits are not fully measured, as discussed in Section 2.

5.2.2 A Formal Test of the Quality of Our Non-pecuniary Measures

As discussed in Section 2, there are two restrictions imposed in our baseline specification, Equation (4). First, because our baseline specification corresponds to a conceptual model in which both pecuniary and non-pecuniary premiums are fully measured for each location, the conditional expectations of the log-odds-ratios are the same as β times the sum of our pecuniary and non-pecuniary premium measures (i.e., the equations do not contain constants). Second, because both pecuniary and non-pecuniary premiums are characterized in

[41] The residual in our model can represent either unmeasured pecuniary or non-pecuniary premiums or measurement error in reported probabilities. Hence, one reason for differences between reported and model-predicted perceived location probabilities is the presence of this type of measurement error. Gong, Stinebrickner, and Stinebrickner (2022) finds that this explanation is very relevant - the variance of the measurement error is similar in magnitude to the variance of true perceived probabilities. Measurement error in reported probabilities will lead to a reduction in the correlations reported above.

dollar equivalents in the baseline conceptual model, the coefficients associated with the pecuniary and non-pecuniary premium measures are identical. Whether these two restrictions from an appealing conceptual model hold in practice depends on the quality of our premium measures. With respect to the first restriction, if respondents tend to systematically leave out certain components when reporting pecuniary or non-pecuniary benefits, the expectation of the overall unmeasured premium $\Delta\bar{u}_{il}^{U} \equiv \Delta\bar{u}_{il}^{P,U} + \Delta\bar{u}_{il}^{N,U}$ will be generally non-zero, in which case a constant would be needed in the conditional expectation of $log(\frac{\tilde{P}_{il}}{\tilde{P}_{i3}})$. The validity of the second restriction may also be influenced by unmeasured premiums. If measured pecuniary and/or non-pecuniary premiums are correlated with unmeasured pecuniary and/or non-pecuniary premiums, the coefficients on $\Delta\bar{u}_{il}^{P,M}$ and $\Delta\bar{u}_{il}^{N,M}$ may pick up some of the effect of unmeasured premiums. Then, if the correlation between $\Delta\bar{u}_{il}^{U}$ and $\Delta\bar{u}_{il}^{P,M}$ is different from the correlation between $\Delta\bar{u}_{il}^{U}$ and $\Delta\bar{u}_{il}^{N,M}$, unmeasured premiums may cause the two coefficients to differ. In addition, differences in the coefficients $\Delta\bar{u}_{il}^{P,M}$ and $\Delta\bar{u}_{il}^{N,M}$ can arise in a very direct way if students do not fully internalize the instruction to report non-pecuniary benefits in dollar equivalents.

A specification test for the baseline model can be formed by applying the standard Lagrange Multiplier (LM) test to examine the validity of these two restrictions. We find that neither the null hypothesis that there is no constant term in the conditional expectation of $log(\frac{\tilde{P}_{il}}{\tilde{P}_{i3}})$ nor the null that the coefficients on $\Delta\bar{u}_{il}^{P,M}$ and $\Delta\bar{u}_{il}^{N,M}$ are identical can be rejected at traditional significance levels, with p-values of 0.30 and 0.43, respectively. Testing these two null hypothesis jointly, we obtain a p-value of 0.27. Alternatively, we can first re-estimate the unrestricted specification that has a constant term and potentially different coefficients on $\Delta\bar{u}_{il}^{P,M}$ and $\Delta\bar{u}_{il}^{N,M}$, then use the Wald test to determine whether the constant is zero and whether the two coefficients are the same. We find that neither the constant in the Home-Area equation ($l = 1$) nor the constant in the Job-Search-State equation ($l = 2$) are significant at a 10% level, with the smallest of the two p-values being 0.1428. The p-value for the test of equal coefficients is 0.208. The detailed regression and testing results are shown in Appendix D. Thus, both LM and Wald tests provide reassurances for our baseline specification and further evidence on the quality of our survey measures of non-pecuniary (and pecuniary) premiums.

Importantly, the above specification test does not rule out the possibility of independently-distributed unmeasured premiums that have expectations of zero. In other words, students may randomly leave out certain components when reporting their perceived pecuniary and non-pecuniary benefits associated with each location. Then, if these left-out components tend to average out across people, this type of mismeasurement will not be detected by our specification test. Because this type of unmeasured benefit is likely to be present in practice, it is important to consider how it will influence our results. Importantly, because these unmeasured benefits are independent of measured premiums, they do not influence the consistency of our estimator of β. However, whether this type of mismeasurement is present will have implications for our interpretation of the residual term in the regression, which, in turn, will affect the interpretation of the actual well-being/welfare inequality measure that we compute in Section 6. When this type of mismeasurement is not present, we can accurately measure the overall well-being/welfare for each person and directly compute the inequality in the overall well-being/welfare measure. However, if this type of mismeasurement is present, we should view the well-being/welfare inequality measure computed based on measured pecuniary and non-pecuniary benefits as a type of lower bound. We return to a discussion of this issue in Section 6.

5.3 Counterfactual Analysis

5.3.1 Importance of Pecuniary and Non-pecuniary Premiums

The descriptive statistics reported in Table 5 show that, on average, non-pecuniary premiums, $\Delta\bar{u}_{il}^{N,M}$, are substantially larger than pecuniary premiums, $\Delta\bar{u}_{il}^{P,M}$. To quantify the full importance of pecuniary and non-pecuniary premiums, we conduct counterfactual experiments based on the estimated baseline model (Equation 4) to examine how average reported perceived location probabilities change when we remove certain components of the overall premium. Specifically, for each of the counterfactual experiments, we compute perceived location probabilities for each student i using the following equation:

$$log(\frac{\tilde{P}_{il}}{\tilde{P}_{i3}}) = \hat{\beta}\widetilde{\Delta\bar{u}}_{il}^{M} + \hat{\xi}_{il},\, l = 1, 2, \tag{8}$$

where $\hat{\beta} = 0.062$ is the estimated slope parameter, $\hat{\xi}_{il}$ is the residual term from the regression, and $\widetilde{\Delta\bar{u}}_{il}^{M}$ represents the overall premium in the counterfactual scenario.

The average reported perceived probabilities for the baseline model are shown in Row 1 of Table 6. The results in Row 2 correspond to a counterfactual experiment in which all of the non-pecuniary premiums are removed, so that the perceived location probabilities are deter-

Table 6: Results for Counterfactual Experiments (Average Reported Location Probabilities)

Sample Size = 322	$\tilde{P}_{i1}$	$\tilde{P}_{i2}$	$\tilde{P}_{i3}$
Baseline (1)	0.3349	0.4125	0.2526
Pecuniary Premiums Only (2)	0.3322	0.3236	0.3442
(2) - (1)	-0.0026	-0.0889	0.0915
	(0.0071)	(0.0110)	(0.0112)
Non-pecuniary Premiums Only (3)	0.3472	0.4029	0.2499
(3) - (1)	0.0123	-0.0096	-0.0027
	(0.0023)	(0.0022)	(0.0012)
No Home Attachment (4)	0.2759	0.4583	0.2658
(4) - (1)	-0.0590	0.0458	0.0132
	(0.0089)	(0.0072)	(0.0033)

Notes: Location 1 = Home-Area; Location 2 = Job-Search-State; Location 3 = Somewhere-Else. Bootstrapped standard errors of the differences are in the parenthesis.

mined only by pecuniary premiums, i.e., $\widetilde{\Delta\bar{u}_{il}}^M = \Delta\bar{u}_{il}^{P,M}$ for $l = 1, 2$. In this case, the average reported perceived probabilities are almost equal across the three location alternatives. The results in Row 3 correspond to an experiment in which perceived location probabilities are determined by only non-pecuniary premiums, i.e., $\widetilde{\Delta\bar{u}_{il}}^M = \Delta\bar{u}_{il}^{N,M}$ for $l = 1, 2$. In this case, the average reported perceived probabilities are very close to the baseline reported perceived probabilities. Thus, the first three rows of Table 6 show that non-pecuniary premiums play the dominant role in determining average perceived location probabilities.

5.3.2 Policy: Home Attachment, Mobility, and Wages

When many individuals come from the types of home areas that tend to offer limited economic opportunities, it is natural to wonder whether substantial wage gains can be achieved using policies that try to induce students to move away from home. To examine this issue, the results in Row 4 of Table 6 correspond to a counterfactual in which the incentive to move away from home comes from removing the home attachment utility for each student, i.e., $\widetilde{\Delta\bar{u}_{i1}}^M = \Delta\bar{u}_{i1}^M - (\alpha_{i1}^L - \alpha_{i3}^L)$ and $\widetilde{\Delta\bar{u}_{il}}^M = \Delta\bar{u}_{i2}^M$. We find that home attachment (i.e., non-job-related location preferences) does indeed have a substantial influence on location decisions; the removal leads to a reduction of $5.90 = 33.49 - 27.59$ percentage points in the average perceived probability for the Home-Area. However, the vast majority of this reduction ($4.58 = 45.83 - 41.25$ percentage points) is absorbed by the average perceived location probability for the Job-Search-State, which Section 4.1 shows often has strong similarities to the Home-Area and is very often the state in which one's Home-Area is located.

Thus, inducing someone to leave their Home-Area through removing home attachment is not sufficient to induce workers to move to our broadest category (Somewhere-Else), where high-skilled job opportunities are mostly likely to be available.

Considering that the Job-Search-State is often the home state or an adjacent state, one might wonder whether eliminating home attachment would also remove part of the non-pecuniary benefits of the Job-Search-State. To investigate the relevance of this possibility, we examine how our results change if, in addition to removing Home-Area attachment, we also remove the full home-attachment amount from the non-pecuniary benefits of the Job-Search-State whenever the Job-Search-State is the home state. This adjustment provides a type of bound on our results since it would only be justified by a very conservative assumption - that whatever non-pecuniary benefits a person receives from living in their hometown are also fully received as long as they are living in their home state. We find that the perceived probability of living in Home-Area, Job-Search-State, and Somewhere-Else become 0.3043, 0.4084, and 0.2873, respectively. Comparing these results to our baseline probability (Row 1 of Table 6), we find that while removing home attachment from both Home-Area and Job-Search-State (when Home-Area is in Job-Search-State) can indeed result in an increase in the probability that Somewhere-Else is chosen, the magnitude of this increase is small.

As a result, it makes sense to consider what would happen to wages under a scenario in which there exists a direct incentive to move specifically to the Somewhere-Else location category.[42] Section 5.2.1 showed that this type of incentive can be successful - a $1,000 increase in the premium associated with living in Somewhere-Else, which could be implemented through a cash grant, was shown to lead to a 0.87 percentage point increase in the average reported perceived probability of living Somewhere-Else rather than in one's Home-Area or Job-Search-State. At first glance, this seems quite promising for increasing wage earnings; Section 4.1 indicates that students often come from small Home-Areas with average incomes lower than the national average, and Job-Search-States (which often encompass or are close to the Home-Area) also often have low average income. However, whether this cash incentive results in higher wage earnings depends critically on what locations individuals tend to consider within the broad Somewhere-Else category. Our descriptive statistics in Section

[42] As evidence of the policy interest in influencing worker location decisions, there are several cities (e.g., Tulsa, Oklahoma and Lincoln, Kansas) and states (e.g., Vermont and Alaska) in the US and many more worldwide (e.g., Chile and Saskatchewan, Canada) that provide some form of moving incentives to new residents. In addition, there have been discussions about policies that may lead to more efficient labor allocation across cities and achieve high productivity, such as relaxing housing regulation that reduces housing cost in more productive cities (Hsieh and Moretti, 2019).

5.1.2 indicate that individuals seemingly often do not tend to consider the types of locations within the Somewhere-Else category that policymakers might envision - those where their skills might be most productive. Indeed, on average, students only expect to gain $1,490 more per year by moving from their Home-Area to Somewhere-Else and do not expect to gain any additional earnings by moving from their Job-Search-State to Somewhere-Else. As a result, even though the incentive creates movement to the Somewhere-Else category, we find that it does not produce a substantial change in average expected wage earnings.

The finding that students do not expect to have substantially higher earnings in the Somewhere-Else category is consistent with our general conclusion that location decisions are largely driven by non-pecuniary factors, since this suggests that a graduate thinking about the Somewhere-Else category might have an emphasis on finding geographic areas that are as similar as possible in non-pecuniary respects to their Home-Area or Job-Search-State. Considering specific non-pecuniary factors, our previous findings suggest that graduates may wish to remain relatively close to home due to the sizable utility that is received from partners, family, and friends, perhaps precluding the consideration of certain especially lucrative locations. While our in-school surveys do not obtain information about what locations a person is considering within the Somewhere-Else category, our post-college data allow us to look at what types of locations individuals actually choose to live ("Work County") within the Somewhere-Else category (for those who choose the Somewhere-Else category). Comparing the second row of Table 7 to the third and fourth rows, we find that these locations are bigger and wealthier than their hometowns, but still substantially smaller and also poorer than the national average.

Evidence that students are not ending up in the highest paying locations suggests that their perception that wage earnings do not vary substantially across location categories is largely accurate. To provide further evidence, for each location category, we compute average realized earnings for individuals who chose that location category for their first post-college job. We find little variation in this average earnings across locations ($25,850 for Home-Area, $22,500 for Job-Search-State, and $22,420 for Somewhere-Else).[43]

Generally, our results represent a cautionary tale. From the standpoint of improving economic trajectories, it may not be sufficient to induce individuals to leave specific places where they tend to have limited economic opportunities. One option might be to provide incentives to move to very specific locations where strong job opportunities exist. However,

[43] Of course, this does not represent a formal test of Rational Expectations because individuals may select into different locations based on realizations of unobserved shocks.

Table 7: Economic Characteristics of Home County and Work County

	Population		Family Income ($)		Per Capita Income ($)	
	Mean	Median	Mean	Median	Mean	Median
Work County	350861	120307	45505	45951	19470	19526
Home County	190605	70872	41907	41383	18091	17382
Work County: Somewhere-Else	529191	210528	47853	47689	20338	20384
All US Counties	1043853	404119	51264	49182	21586	20868

Note: The means and medians are population-weighted.

given that few people seem to currently choose these types of locations, it may not be possible to induce substantial movement without large financial incentives.

6 Non-pecuniary Benefits and Welfare Inequality

Our analysis above suggests the importance of non-pecuniary benefits in determining location decisions and welfare. We illustrate how our new non-pecuniary measures (along with post-college data on earnings, location, and job type) can be used to compare a standard measure of earnings inequality to a broader measure that also takes into account non-pecuniary factors.

6.1 Measuring Inequality in Overall Welfare

Consistent with the approach we take to measuring pecuniary benefits in Section 2, we focus on the inequality in initial earnings and the overall welfare associated with the first job that a student obtained after graduation (typically Year 2005 for cohort 2000 and Year 2006 for cohort 2001).[44] Let w_i, $L_i = 1, 2, 3$, and $J_i = 1, 2, 3$ represent the annual earnings, location, and job type of $i's$ first post-college job. Her overall welfare b_i is then given by:

$$b_i = w_i + \sum_{l=1}^{3} \mathbb{1}(L_i = l)\alpha_{il}^{L} + \sum_{j=1}^{3} \mathbb{1}(J_i = j)\alpha_{ij}^{J}, \tag{9}$$

where α_{il}^{L} and α_{ij}^{J} are the non-pecuniary utility student i derives from living in location l and having a type j job, respectively. We measure the inequality in annual earnings, w_i, and

[44] Alternatively, we have also computed and compared the inequality in the average earnings and the average overall welfare over the first four post-college years (Year 2005-2008 for cohort 2000 and Year 2006-2009 for cohort 2001). The results are very similar to what we find for first post-college jobs.

overall welfare, b_i, by their respective cross-sectional standard deviations and the coefficients of variations.

As described in Section 4, w_i, L_i, and J_i are directly available from the post-college portion of the BPS. Information relevant for α_{il}^L and α_{il}^J has been discussed and used for our analysis throughout this section. A fundamental difficulty related to measuring absolute utility levels is always present in some form when one attempts to conduct cross-individual welfare/utility comparisons.[45] In our context, we only observe the difference between the utility associated with two locations, $\alpha_{il_1}^L - \alpha_{il_2}^L$, for any pair of l_1 and l_2, and the difference between the utility associated with two types of jobs, $\alpha_{ij_1}^J - \alpha_{ij_2}^J$, for any pair of j_1 and j_2. The absolute utility associated with a location, α_{il}^L, and the absolute utility associated with a job type, α_{ij}^J, are unknown to us.

The discussion above suggests that, generally speaking, some type of normalization is necessary to characterize the inequality in absolute welfare/utility. However, if we measure net utility as the overall welfare student i obtains relative to a reference situation where she lived in a certain location and had a certain type of job (and obtained zero wage earnings), we can characterize the inequality in this net utility without imposing any additional assumptions. Here, we choose the combination of living Somewhere-Else and having a Non-Degree job as the reference group. Overall net welfare b_i can then be obtained using the following equation.

$$\begin{aligned} b_i =& w_i + \sum_{l=1}^{3} \mathbb{1}(L_i = l)(\alpha_{il}^L - \alpha_{i3}^L) + \sum_{j=1}^{3} \mathbb{1}(J_i = j)(\alpha_{ij}^J - \alpha_{i1}^J) \\ \equiv& w_i + \alpha_i, \end{aligned} \tag{10}$$

where $\alpha_i \equiv \sum_{l=1}^{3} \mathbb{1}(L_i = l)(\alpha_{il}^L - \alpha_{i3}^L) + \sum_{j=1}^{3} \mathbb{1}(J_i = j)(\alpha_{ij}^J - \alpha_{i1}^J)$ represents the non-pecuniary component of overall net welfare.

This choice of the reference group is motivated by the empirical finding that the large majority of students consider Somewhere-Else to be the least preferred location (74%) and Non-Degree jobs to be the least preferred job type (78%).[46] Then, roughly speaking, our net inequality measure has a useful interpretation as the cross-sectional inequality in welfare

[45] For example, in the macroeconomic literature, to compute absolute utility levels and welfare inequality, researchers typically assume economic agents derive utility from certain consumption goods and amenities according to a known functional form (see e.g., Diamond, 2016).

[46] We show in Appendix E that our results for welfare inequality are robust to the choice of the reference group.

relative to one's worst case scenario. If the utility received from the worst case scenario tends to be similar across people, then the measure has the further interpretation as the cross-sectional inequality in absolute welfare.

6.2 Results

Non-pecuniary preferences $\alpha^L_{il} - \alpha^L_{i3}$ and $\alpha^J_{ij} - \alpha^J_{i1}$ are available for all students in our main in-school sample (322 students). We restrict our analysis to the subset of 277 students who also have valid measures of w_i, L_i, and J_i. Table 8 provides descriptive statistics for realized pecuniary benefits w_i, non-pecuniary benefits α_i, and overall welfare b_i. The average annual earnings associated with the first post-college job is \$23,600. The average non-pecuniary benefits (relative to the benefits from living Somewhere-Else with a Non-Degree job) is \$13,290 per year. Summing up these two components, we obtain a sample average of annual overall welfare of \$36,900.

Table 8: Descriptive Statistics: Overall Net Welfare

Sample Size = 277	w_i	α_i	b_i
Mean	23.60	13.29	36.90
Standard Deviation	13.49	19.89	25.63
Coefficient of Variation	0.57	1.50	0.69
Median	22.26	10.00	33.80
Interquartile Range	14.38	20.00	29.29

Notes: The unit of all entries are \$1,000. w_i, α_i, and b_i represent the pecuniary benefits, net non-pecuniary benefits, and overall net welfare respectively.

One potential measure of inequality is the standard deviation of an object of interest across individuals. The results associated with this measure are reported in the second row. Considering first earnings inequality, we find that the sample standard deviation of pecuniary benefits w_i is \$13,490. The difference between welfare inequality and earnings inequality will be increasing in the amount of dispersion that is present in non-pecuniary benefits, α_i, and the correlation between α_i and w_i. With respect to the former, we find that the sample standard deviation of α_i, \$19,890, is even larger than the standard deviation of w_i. With respect to the latter, driven by the fact that higher paying jobs tend to be My-Degree and Any-Degree jobs (which, on average, provide higher non-pecuniary benefits), we find a positive correlation of 0.1477 between α_i and w_i.[47] As a result, the overall welfare, which incorpo-

[47] Consistent with our findings in Section 5.1.2 about location-specific earnings expectations, we do not find

rates both realized non-pecuniary benefits and annual earnings, has a standard deviation of \$25,630, which is almost double the standard deviation of realized annual earnings. Another commonly used measure of inequality is the coefficient of variation - the mean divided by the standard deviation - which we report in the third row. With this measure, the overall inequality in welfare increases by 21% (from .57 to .69) when we take into account non-pecuniary benefits. Contributing to a literature interested in quantifying welfare inequality (e.g., Diamond, 2016; Moretti, 2013), our results from the two potential inequality measures reinforce the importance of taking into account non-pecuniary considerations when thinking about inequality.

As discussed in Section 5.2.2, while we have found strong evidence supporting the quality of our non-pecuniary measures, it is important to be cognizant of the possibility that there might exist some mean-zero unmeasured non-pecuniary benefits that are independent from measured (pecuniary and non-pecuniary) benefits. However, if this is the case, our results remain useful because our computed standard deviation of b_i represents an informative lower bound. The true value of overall welfare b_i is equal to the sum of our measure of b_i (Equation 10) and a mean-zero, independently-distributed unmeasured component. As a result, the inequality (as measured by the standard deviation or the coefficient of variation) in actual overall welfare is even larger than the substantial inequality in measured overall welfare reported above, strengthening our conclusions about the importance of non-pecuniary considerations.

However, we stress that there are reasons that it is probably still best to view our analysis of inequality as illustrative. As one example, throughout our analysis in this section we have assumed that α^L_{il} and α^J_{ij} are individual-specific permanent preferences that are non-random. While this assumption does not affect the interpretation of our results in any of the previous sections, relaxing it would have an effect on the interpretation of the results in Table 8, partly because these preferences were not elicited in the post-college period. We note that if the innovations in preferences (between the time of belief-elicitation and the first year after graduation) are strongly negatively correlated with realized earnings, then it is possible that the true welfare inequality is smaller than earnings inequality. However, considering the positive correlation between pecuniary and non-pecuniary outcomes that we found above,

much difference in average realized annual earnings across location alternatives. As a result, the correlation between non-job-related preferences for realized location choices, $\sum_{l=1}^{3} \mathbb{1}(L_i = l)(\alpha^L_{il} - \alpha^L_{i3})$ and w_i is very small, and the overall correlation is primarily determined by preferences for realized job types, $\sum_{j=1}^{3} \mathbb{1}(J_i = j)(\alpha^J_{ij} - \alpha^J_{i1})$.

this seems unlikely to be the case.

7 Conclusion

Our paper makes a methodological contribution by introducing novel survey questions, which are meant to directly elicit, in dollar equivalents, the full non-pecuniary benefits associated with a particular location. To provide evidence about the quality of our non-pecuniary measures, we first show that the elicited non-pecuniary preferences are related in a statistically significant way to intuitively relevant characteristics of a location. We then develop a novel specification test to provide more formal evidence.

Our results indicate that, largely because students tend to be strongly attached to areas close to their hometowns, differences in non-pecuniary benefits across locations tend to be bigger than differences in pecuniary benefits across locations. As a result, non-pecuniary benefits play the primary role in determining the location decisions in our sample of college graduates. Indeed, counterfactual experiments show that, when the influence of non-pecuniary preferences is removed, our model is no longer able to predict the differences in average perceived location probabilities that exist across locations in the data. The presence of substantial non-pecuniary benefits has direct implications for issues related to inequality. We find that measures of inequality that take into account non-pecuniary benefits are larger than inequality measures based on only earnings.

Interestingly, although non-pecuniary preferences often push people to live close to their hometowns, we find that students do not perceive that this home attachment causes large losses in wage earnings. The reason is that individuals do not believe that there are large wage differences between areas close to their hometowns and our broadest location category - Somewhere-Else. Our ability to uncover this pattern in perceived wages across locations is possible because our survey questions allow respondents to directly report the counterfactual earnings expectations associated with the Somewhere-Else category (as well as other location categories), thereby allowing them to take into account whatever locales are relevant for them within the Somewhere-Else category. From a methodological standpoint, our approach is relevant for thinking about issues that arise during the specification of location choice sets in the migration literature. In standard data, the set of location categories that a person considers is not observed, so a researcher must make assumptions about not only what these categories are, but also what locations a person considers within these categories. It is natural to characterize an agent's job opportunities using the average wages within a location category or using the maximum wages within the category. In our context, the Somewhere-Else category, as a whole, offers higher average wages than Home-Areas and Job-Search-States and also includes specific locations with very high-paying job opportunities (such as the urban areas of New York and Los Angeles). Thus, our findings suggest that these types of assumptions would be problematic in our context, and could lead to a substantial overstatement of the wage benefits that would result from inducing individuals to move away from small home areas to broader geographic areas.

Our findings related to wages have specific implications for policy. They show very directly that sometimes it may not be sufficient to induce people to move out of their hometown and surrounding areas; even if individuals are willing to leave their home areas, where opportunities may be limited, they may tend to choose locations that offer similar wage opportunities. One possible reason that students often do not believe that they would take advantage of the most lucrative job opportunities in our broad Somewhere-Else location category is that they might have preferences for living in locations within the Somewhere-Else category that share similarities with their home areas.[48] However, we cannot rule out a second possible reason - that information frictions may exist about job opportunities in big cities or other lucrative locales. A useful direction for future research would be to investigate the relative importance of these possibilities.

[48] In terms of implications for Appalachia, this would suggest that the well-recognized pull of the region may be stronger than what might be anticipated based on non-pecuniary preferences for individuals' home areas alone. Some informal evidence in support of this potential explanation comes from a finding that, for 71 percent of the students, the Job-Search-State, which tends to be the location alternative that is associated with the highest non-pecuniary benefits, is either the student's home state or a bordering state. Not only are bordering states likely to be similar in non-pecuniary ways, but evidence that they are not being chosen primarily for pecuniary reasons comes from the fact that they tend to be quite poor.

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Appendices

A Survey Questions

A.1 Graduation Year Survey

Question 1. What do you consider to be your HOMETOWN? Note: If you don't have a place that you would consider your hometown, consider the last place you lived.
home town=City/Town____________ County____________ State____________
For this entire survey, your **HOMEAREA** means your home town and the nearby surrounding area
Circle any of the following that currently live in your HOMEAREA.
Parents Brother/Sisters Other Family Boyfriend/girlfriend/spouse Friends I don't know anyone

Question 2. If you were to search for a job, in which of the following areas would you be most likely to search? Circle one.
A. Somewhere in my home state outside of my HOMEAREA

In this case, your JOB-SEARCH-STATE is my home state. Write it on the next line

JOB-SEARCH-STATE=____________

B. In some other specific state other than my home state

In this case, your JOB-SEARCH-STATE is the specific state that you prefer.

Write the name of that state here

JOB-SEARCH-STATE=____________

Circle any of the following that currently live in your JOB-SEARCH-STATE.
Parents Brother/Sisters Other Family Boyfriend/girlfriend/spouse Friends I don't know anyone

Question 3. It is possible that how happy you will be will be depend on where you live. How happy you will be may depend on how much you like the features of a particular location and also where you have family/friends in that location. If you were **offered identical jobs** in your HOMEAREA, your JOB-SEARCH-STATE, and SOMEWHERE-ELSE, **where would you choose to live? Circle ONE** (Note: For this entire survey, if your JOB-SEARCH-STATE contains your hometown then you should think about how happy you will be living in the part of your home state that is outside of your HOMEAREA)

HOMEAREA JOB-SEARCH-STATE SOMEWHERE-ELSE

If HOMEAREA, skip to 3.1. If JOB-SEARCH-STATE, skip to 3.2., if SOMEWHERE-ELSE, skip to 3.3.

3.1 IF you circled HOMEAREA

You have indicated that you would prefer to live in your HOMEAREA if you had the exact same job opportunity in each of the three locations. Therefore, in order to be convinced to live in your JOB-SEARCH-STATE or SOMEWHERE-ELSE, you would have to receive a job offer which paid more money than the job offer in your HOMEAREA.

If the job in your HOMEAREA paid $30,000, how much would you have to be paid by the job in your JOB-SEARCH-STATE in order to convince you to choose to live in the JOB-SEARCH-STATE instead?____________
Note: should be more than $30,000.

If the job in your HOMEAREA paid $30,000, how much would you have to be paid by the job SOME-WHERE-ELSE in order to convince you to choose to live in SOMEWHERE-ELSE instead?____________
Note: should be more than $30,000.

3.2 IF you circled JOB-SEARCH-STATE

You have indicated that you would rather live in your JOB-SEARCH-STATE if you had the exact same job opportunity in each of the three locations. Therefore, in order to be convinced to live in your HOMEAREA or SOMEWHERE-ELSE, you would have to receive a job offer which paid more money than the job offer in your JOB-SEARCH-STATE.

If the job in your JOB-SEARCH-STATE paid $30,000, how much would you have to be paid by the job in your HOMEAREA in order to convince you to choose to live in the your HOMEAREA instead?____________
Note: should be more than $30,000.

If the job in your JOB-SEARCH-STATE paid $30,000, how much would you have to be paid by the job SOMEWHERE-ELSE in order to convince you to choose to live in SOMEWHERE-ELSE instead?____________
Note: should be more than $30,000.

3.3 IF you circled SOMEWHERE-ELSE

You have indicated that you would prefer to live SOMEWHERE-ELSE if you had the exact same job opportunity in each of the three locations. Therefore, in order to be convinced to live in your HOMEAREA or JOB-SEARCH-STATE, you would have to receive a job offer which paid more money than the job offer SOMEWHERE-ELSE.

If your job SOMEWHERE-ELSE paid $30,000, how much would you have to be paid by the job in your HOMEAREA in order to convince you to choose to live in the your HOMEAREA instead?____________
Note: should be more than $30,000.

If the job SOMEWHERE-ELSE paid $30,000, how much would you have to be paid by the job JOB-SEARCH-STATE in order to convince you to choose to live in your JOB-SEARCH-STATE instead?____________
Note: should be more than $30,000.

Question 4. It is possible that how happy you will be in your job will depend on what type of job you have since different types of jobs require different types of work. Suppose you were offered the **same pay** to work in a NO-DEGREE job, a DEGREE-ANYAREA job, and a DEGREE-MYAREA job. Which would you choose? Circle one
NO-DEGREE-NEEDED DEGREE-ANYAREA DEGREE-MYAREA

If NO-DEGREE-NEEDED, skip to 4.1. If DEGREE-ANYAREA, skip to 4.2, if DEGREE-MYAREA, skip to 4.3.

4.1 If you circled NO-DEGREE-NEEDED

You have indicated that you would enjoy working in a NO-DEGREE-NEEDED job more than in either a DEGREE-ANYAREA job or a DEGREE-MYAREA job if all the jobs had the same pay. Therefore, in order to be convinced to choose a DEGREE-ANYAREA job or a DEGREE-MYAREA job, you would have to receive a job offer which paid more money than the job offer in your NO-DEGREE-NEEDED job.

If the NO-DEGREE-NEEDED job paid $30,000, how much would you have to be paid by the DEGREE-ANYAREA job to convince you to choose the DEGREE-ANYAREA job instead?____________Note: should be more than $30,000.

If the NO-DEGREE-NEEDED job paid $30,000, how much would you have to be paid by the DEGREE-MYAREA job to convince you to choose the DEGREE-MYAREA job instead?____________Note: should be more than $30,000.

4.2 If you circled DEGREE-ANYAREA

You have indicated that you would enjoy working in a DEGREE-ANYAREA job more than in either a NO-DEGREE-NEEDED job or a DEGREE-MYAREA job if all the jobs had the same pay. Therefore, in order to be convinced to choose a NO-DEGREE-NEEDED job or a DEGREE-MYAREA job, you would have to receive a job offer which paid more money than the job offer in your DEGREE-ANYAREA job.

If the DEGREE-ANYAREA job paid $30,000, how much would you have to be paid by the NO-DEGREE-NEEDED job to convince you to choose the NO-DEGREE-NEEDED job instead?____________Note: should be more than $30,000.

If the DEGREE-ANYAREA job paid $30,000, how much would you have to be paid by the DEGREE-MYAREA job to convince you to choose the DEGREE-MYAREA job instead?____________ Note: should be more than $30,000.

4.3 If you circled DEGREE-MYAREA

You have indicated that you would enjoy working in a DEGREE-MYAREA job more than in either a NO-DEGREE-NEEDED job or a DEGREE-ANYAREA job if all the jobs had the same pay. Therefore, in order to be convinced to choose a NO-DEGREE-NEEDED job or a DEGREE-ANYAREA job, you would have to receive a job offer which paid more money than the job offer in your DEGREE-MYAREA job.

If the DEGREE-MYAREA job paid $30,000, how much would you have to be paid by the NO-DEGREE-NEEDED job to convince you to choose the NO-DEGREE-NEEDED job instead?____________Note: should be more than $30,000.

If the DEGREE-MYAREA job paid $30,000, how much would you have to be paid by the DEGREE-ANYAREA job to convince you to choose the DEGREE-ANYAREA job instead?____________ Note: should be more than $30,000.

Question 5. This question asks about what would happen if you search for particular types of jobs in particular locations.

Question 5.1. Suppose during the school year that you search seriously for a **NO-DEGREE** job.

If you were to get an offer for a job of this type, how much would you expect the job to pay?

$____________per year

Question 5.2. Suppose during the school year that you search seriously for a **DEGREE-ANYAREA** job in your **HOMEAREA**.

If you were to get an offer for a job of this type, how much would you expect the job to pay?

$____________per year

Question 5.3. Suppose during the school year that you search seriously for a **DEGREE-MYAREA** job in your **HOMEAREA**.

If you were to get an offer for a job of this type, how much would you expect the job to pay?

$____________per year

Question 5.4. Suppose during the school year that you search seriously for a **DEGREE-ANYAREA** job in your **JOB-SEARCH-STATE** (remember, if the JOB-SEARCH-STATE is the home state, it doesn't include HOMEAREA).

If you were to get an offer for a job of this type, how much would you expect the job to pay?

$____________per year

Question 5.5. Suppose during the school year that you search seriously for a **DEGREE-MYAREA** job in your **JOB-SEARCH-STATE** (remember, if the JOB-SEARCH-STATE is the home state, it doesn't include HOMEAREA).

If you were to get an offer for a job of this type, how much would you expect the job to pay?

$____________per year

Question 5.6. Suppose during the school year that you search seriously for a **DEGREE-ANYAREA** job in a place **SOMEWHERE-ELSE** (not in your HOMEAREA and not in your JOB-SEARCH-STATE).

If you were to get an offer for a job of this type, how much would you expect the job to pay?

$____________per year

Question 5.7. Suppose during the school year that you search seriously for a **DEGREE-MYAREA** job in a place **SOMEWHERE-ELSE** (not in your HOMEAREA and not in your JOB-SEARCH-STATE).

If you were to get an offer for a job of this type, how much would you expect the job to pay?

$____________per year

Question 6. Please tell us the percent chance that you will move to each of the following locations after graduating from Berea. **For this entire survey, SOMEWHERE-ELSE includes all possible places that you might live outside your HOMEAREA and your JOB-SEARCH-STATE.**

Location	Percent Chance
HOMEAREA	____________
JOB-SEARCH-STATE	____________
SOMEWHERE-ELSE	____________

Note: The 3 numbers should add to 100 and each should be between 0 and 100. Write 0 if there is no chance you will live in a particular location. Write 100 if you know for sure you will live in a particular location.

A.2 Post-College Survey

BPS collects job-related information for up to two jobs. We combine wage earnings from the two jobs to compute total earnings and characterize the type of a student's job using the degree required for the main job (JOB 1) in our analysis.

Question 7. Describe your current job(s)

How many jobs do you currently have? ____________

Note: In all of this question, if you have more than one job, please refer to the job in which you earn the most money per week as JOB1 and the job in which you earn the second most money per week as JOB2. If you have only one job, answer the question associated with JOB1 and write "NOT APPLICABLE" or "NA" in each of the blanks associated with JOB2.

What type of degree is needed for your jobs? **NOTE *: NO-DEGREE-NEEDED means** the job does not require a 4-year college degree. **DEGREE-ANYAREA means** the job requires a 4-year college degree of any type. **DEGREE-MYAREA means** the job requires a college degree specifically in your area of study. Circle ONE

1. JOB1 Circle one: NO-DEGREE-NEEDED DEGREE-ANYAREA DEGREE-MYAREA
2. JOB2 Circle one: NO-DEGREE-NEEDED DEGREE-ANYAREA DEGREE-MYAREA

How many hours do you typically work **each week** in your job(s)? Hours JOB1 ___**(a)**___ Hours JOB2 ___**(a)**___

Approximately how much do you earn in your job(s)? **NOTE**** Please indicate both a dollar amount and whether this amount is your pay per hour, per day, per week, per month, per year etc. For example, if you earn $8.5 an hour, please write <u>$8.5 per hour.</u> If you earn $30,000 per year, please write <u>$30,000 per year.</u>
Earning JOB1 $___**(b)**___per___**(c)**___ Earning JOB2 $___**(b)**___per___**(c)**___

We use the numbers in **(a)**, **(b)**, and **(c)** to compute your yearly earnings. The formula you should use depends on whether you reported your earnings per Year, per MONTH, per WEEK, per HOUR etc. in **(c)**.

If per <u>YEAR</u>, then your YEARLY EARNINGS is the $ amount from **(b)**: b
If per <u>MONTH</u>, then your YEARLY EARNINGS is the $ amount from **(b)** multiplied by 12: $b \times 12$
If per <u>TWO WEEKS</u>, then your YEARLY EARNINGS is the $ amount from **(b)** multiplied by 26: $b \times 26$
If per <u>WEEK</u>, then your YEARLY EARNINGS is the $ amount from **(b)** multiplied by 52: $b \times 52$
If per <u>HOUR</u>, then your YEARLY EARNINGS is the $ amount from **(b)** multiplied by 52 and then multiplied by the HOURS number in **(a)**: $b \times 52 \times a$

B More Statistics for Home Counties

Figure A1 displays the sample distribution of the average family income in students' home counties in the year 2000. As a comparison, the dashed line displays the county-level population-weighted family income distribution of the whole country. The figures shows that the majority of Berea students are from relatively low income counties.

Figure A2 displays the sample distribution of college share of employed workers in students' home counties in 2000. As a comparison, the dashed line displays county-level population-weighted college share distribution of the whole nation. The distribution for BPS is more skewed to the left, indicating that a considerable fraction of the students are from counties that have relatively low share of college graduates.

Figure A1: Distribution of Family Income in Home County

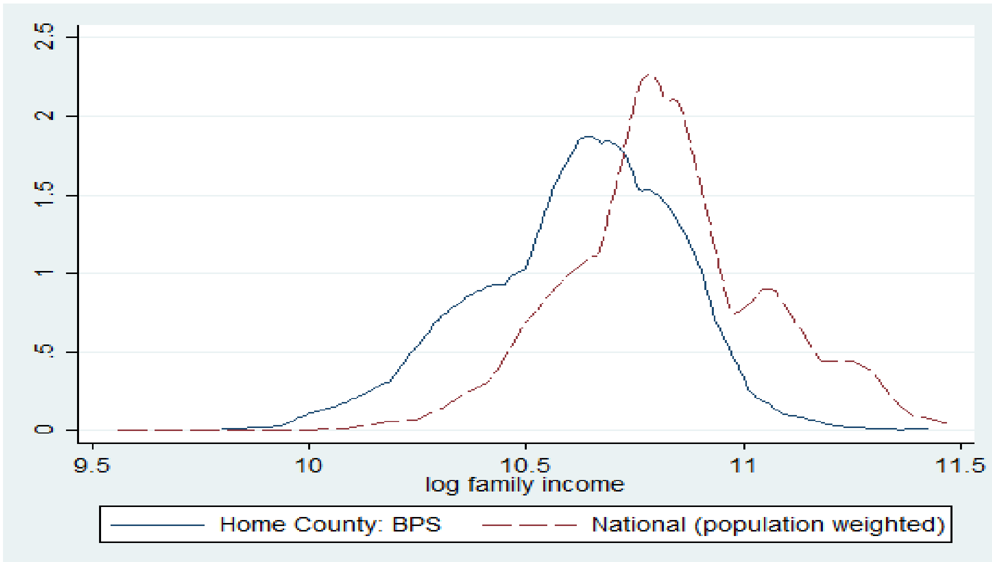
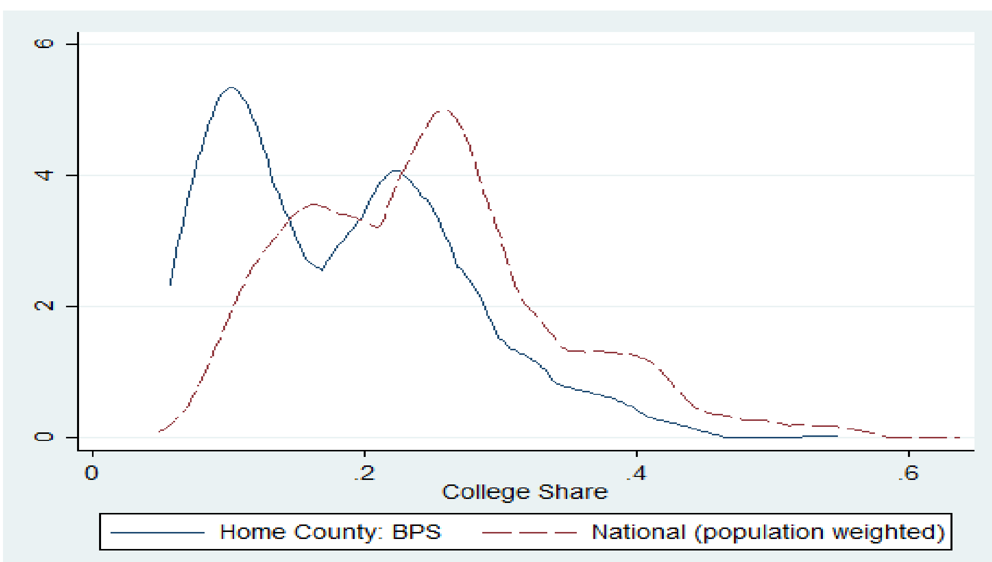


Figure A2: Distribution of College Share in Home County



We find strong positive correlations among the population, average family income, and college share of students' home counties. The correlation between population and average income is 0.487 while the correlation between population and college share is 0.503.

C Multiplicatively Separable Utility Function

The interpretation of our key survey questions (Questions 3 and 4) in Sections 2 and 3.2 is based on an assumption that pecuniary and non-pecuniary benefits are additively separable in the utility function, i.e., $\bar{u}_{il} = \bar{u}_{il}^P + \bar{u}_{il}^N$. While our specification test provides supporting evidence for this natural interpretation, it is nonetheless worthwhile to investigate the robustness of our main conclusions to alternative interpretations/assumptions. In this section, we consider a multiplicatively separable specification where the utility associated with a given location and job type combination can be obtained by multiplying the combination-specific expected earnings, μ_{ijl}, with a combination-specific multiplier λ_{ijl} that modifies the expected earnings to take into account non-pecuniary considerations. The expected utility associated with location l, $\bar{u}_{il}$, is then given by:

$$\bar{u}_{il} = \sum_{j=1}^{3} P_{ij}^l \lambda_{ijl} \mu_{ijl}, \tag{A1}$$

where, as before, P_{ij}^l is student i's perceived probability of obtaining a type j job conditional on living in location l.

We have described how to construct P_{ij}^l and μ_{ijl} for each student above. To construct λ_{ijl}, we first assume that $\lambda_{ijl} = \lambda_{il}^L \lambda_{ij}^J$, where λ_{il}^L is the non-pecuniary multiplier associated with location l and λ_{ij}^J is the non-pecuniary multiplier associated with job type j. Normalizing $\lambda_{i3}^L = 1$ (Somewhere-Else), we can construct λ_{i1}^L (Home-Area) and λ_{i2}^L (Job-Search-State) using the location preference question (Survey Question 3). Following our discussion above, this question effectively tells us that, for any job type j, student i is indifferent between a job that pays m_{i1}^L in the Home-Area (utility = $\lambda_{i1}^L \lambda_{ij}^J m_{i1}^L$), a job that pays m_{i2}^L in the Job-search-State (utility = $\lambda_{i2}^L \lambda_{ij}^J m_{i2}^L$), and a job that pays m_{i3}^L in the Somewhere-Else area (utility = $\lambda_{i3}^L \lambda_{ij}^J m_{i3}^L$). This implies that $\lambda_{i1}^L \lambda_{ij}^J m_{i1}^L = \lambda_{i2}^L \lambda_{ij}^J m_{i2}^L = \lambda_{i3}^L \lambda_{ij}^J m_{i3}^L$. Solving these equations, we have $\lambda_{i1}^L = \frac{m_{i3}^L}{m_{i1}^L}$ and $\lambda_{i2}^L = \frac{m_{i3}^L}{m_{i2}^L}$.[49] Similarly, we can construct λ_{i2}^J (Any-Degree) and λ_{i3}^J

[49] As a concrete example, consider a student who prefers a job that pays \$30,000 in the Home-Area, and it requires a job that pays \$31,000 to convince the student to move to the Job-Search-State and a job that pays \$32,000 to convince the student to move to the Somewhere-Else area. In this case, we have $m_{i1}^L = 30,000$,

(My-Degree) using the job type preference question (Survey Question 4) once we normalize $\lambda^J_{i1} = 1$ (Non-Degree). Table A1 below reports the descriptive statistics of relevant variables.

Table A1: Non-Pecuniary Multipliers

Sample Size: 323	Mean	Standard Deviation	25th Perc.	Median	75th Perc.
λ^L_{i1} (Home-Area)	1.216	0.438	1	1.143	1.429
λ^L_{i2} (Job-Search-State)	1.369	0.561	1.071	1.250	1.500
λ^J_{i2} (Any-Degree)	1.096	0.216	1	1	1.167
λ^J_{i3} (My-Degree)	1.448	0.463	1.167	1.333	1.667

Notes: This table reports the non-pecuniary multiplier of various locations and job types. We exclude observations for which the multiplier is higher than the 99th percentile or lower than the 1st percentile of the cross-sectional distribution of the multiplier.

For each student i, we combine information about P^l_{ij}, μ_{ijl}, λ^L_{il}, and λ^J_{ij} to compute $\bar{u}_{il}$ for $l = 1, 2, 3$. The key estimation equations for this alternative specification become:

$$log(\frac{\tilde{P}_{il}}{\tilde{P}_{i3}}) = \beta(\bar{u}_{il} - \bar{u}_{i3}) + \xi_{il},\ l = 1, 2. \tag{A2}$$

Similar to before, we estimate the key equation using the Generalized Method of Moments. The estimate of β is 0.049 with a t-statistic of 8.9.

Note that, similar to the baseline regression equation (Equation 4), these alternative regression equations also do not have intercept terms. It means we can examine the validity of the alternative specification by testing whether the intercept terms are zeros. We find that this no-intercept assumption is rejected at a 5% level (p-value = 0.0142), providing evidence against the alternative specification. Nonetheless, it might be useful to examine the robustness of our main conclusions that 1) non-pecuniary considerations are more important for location decisions, and 2) welfare inequality is greater than earnings inequality, to this alternative specification.

To examine the robustness of the first main conclusion, we conduct two counterfactual experiments. In the first counterfactual, we let $\lambda_{ijl} = 1$ for all student i, job type j, and location l. This equalizes the non-pecuniary multipliers across locations so that all cross-location differences in average perceived location probabilities are driven by pecuniary factors. In the second counterfactual, we let μ_{ijl} be the unconditional earnings expectation, $\sum_{l=1}^{3} \tilde{P}_{il} \sum_{j=1}^{3} P^l_{ij}\mu_{ijl}$, for all i, j, and l. This equalizes the earnings across locations so that

$m^L_{i2} = 31,000$, and $m^L_{i3} = 32,000$. It implies that $\lambda^L_{i1} = \frac{32,000}{30,000} = 1.07$ and $\lambda^L_{i2} = \frac{32,000}{31,000} = 1.03$.

all cross-location differences in average perceived location probabilities are driven by non-pecuniary factors. Table A2 reports the results. As was the case with the baseline results, we find that the average reported perceived probabilities are almost equal across the three location alternatives in the first counterfactual (Row 2) and similar to the baseline reported perceived probabilities (Row 1) in the second counterfactual (Row 3). Thus, our first main conclusion continues to hold under this alternative specification.

Table A2: Multiplicative Separable Specification - Results for Counterfactual Experiments

Sample Size = 323	$\tilde{P}_{i1}$	$\tilde{P}_{i2}$	$\tilde{P}_{i3}$
Baseline	0.3392	0.4103	0.2505
Pecuniary Premiums Only	0.3366	0.3370	0.3264
Non-pecuniary Premiums Only	0.3565	0.3930	0.2505

Notes: This table reports the average Reported location probabilities for both the baseline and the counterfactuals based on the multiplicative separable specification. Location 1 = Home-Area; Location 2 = Job-Search-State; Location 3 = Somewhere-Else.

With respect to 2), the overall welfare b_i under this alternative specification is given by:

$$b_i = [\sum_{l=1}^{3} \mathbb{1}(L_i = l)\lambda_{il}^{L})][\sum_{j=1}^{3} \mathbb{1}(J_i = j)\lambda_{ij}^{J}]w_i, \tag{A3}$$

where, as before, w_i, $L_i = 1, 2, 3$, and $J_i = 1, 2, 3$ are student i's post-college earnings, location, and job type, respectively. We find that the cross-sectional mean and standard deviation of b_i are 38.02 and 37.00, respectively. The coefficient of variation of b_i is then given by $\frac{37.00}{38.02} = 0.97$, which is much larger than the coefficient of variation of w_i which we computed in Section 6.2 (0.57). Hence, our conclusion that welfare inequality is larger than traditionally measured earnings inequality remains.

D Alternative Specification

We consider an alternative, unrestricted specification of the log-odds-ratio where 1) there is a constant term in the conditional expectation of the log-odds-ratio and 2) the coefficients on pecuniary and non-pecuniary premiums, $\Delta\bar{u}_{il}^{P,M}$ and $\Delta\bar{u}_{il}^{N,M}$ are potentially different.

$$log(\frac{\tilde{P}_{il}}{\tilde{P}_{i3}}) = \alpha_l + \beta_P \Delta\bar{u}_{il}^{P,M} + \beta_N \Delta\bar{u}_{il}^{N,M} + \xi_{il},\ l = 1, 2. \tag{A4}$$

We again apply iterative GMM to estimate α_1, α_2, β_P, and β_N, using the same ten moment conditions described in Section 2. As shown in Table A3, neither α_1 nor α_2 are significantly different from zero at a 10% level. We then apply the standard Wald test to examine the null hypothesis that $\beta_P = \beta_N$. We find that the p-value associated with this test is 0.208. Furthermore, we find that the p-value associated with the Wald test of the joint null that $\alpha_1 = \alpha_2 = 0$ and $\beta_P = \beta_N$ is 0.207. These testing results provide supporting evidence that we have measured the full non-pecuniary premiums in dollar equivalents.

Table A3: Estimation Results (Alternative Specification)

Sample Size = 322	α_1	α_2	β_P	β_N
Estimate	-0.0347	0.1528	0.0296	0.0560
Standard Error	0.1137	0.1043	0.0210	0.0060
p-value	0.7601	0.1429	0.1591	$< 10^{-4}$

Note: α_l is the constant term in the conditional expectation of the log-odds-ratio, $log(\frac{\tilde{P}_{il}}{\tilde{P}_{i3}})$. β_P and β_N represent the effects of pecuniary and non-pecuniary premiums on the log-odds-ratio, respectively.

As a robustness check, we also conduct counterfactual experiments based on the estimated alternative specification to examine how average reported perceived location probabilities change when we remove certain components of the overall premium. Specifically, for each of the three counterfactual experiments considered in Section 5.3.1, we compute perceived location probabilities for each student i using the following equation:

$$log(\frac{\tilde{P}_{il}}{\tilde{P}_{i3}}) = \hat{\alpha}_l + \hat{\beta}_P \widetilde{\Delta\bar{u}}_{il}^{P,M} + \hat{\beta}_N \widetilde{\Delta\bar{u}}_{il}^{N,M} + \hat{\xi}_{il},\ l = 1, 2, \tag{A5}$$

where $\hat{\alpha}_1$, $\hat{\alpha}_2$, $\hat{\beta}_P$, and $\hat{\beta}_N$ are the estimated parameters shown in Table A3, $\hat{\xi}_{il}$ is the residual term from the regression, and $\widetilde{\Delta\bar{u}}_{il}^{P,M}$ and $\widetilde{\Delta\bar{u}}_{il}^{N,M}$ represent the pecuniary and non-pecuniary premiums in the counterfactual scenario.

Table A4: Average Reported Location Probabilities in Counterfactual Experiments (Alternative Specification)

Sample Size = 322	$\tilde{P}_{i1}$	$\tilde{P}_{i2}$	$\tilde{P}_{i3}$
Pecuniary Premiums Only	0.3215	0.3377	0.3408
Non-pecuniary Premiums Only	0.3379	0.4451	0.2170
No Home Attachment	0.2454	0.5228	0.2318

Notes: Location 1 = Home-Area; Location 2 = Job-Search-State; Location 3 = Somewhere-Else.

The average reported perceived probabilities for the three counterfactual experiments are shown in Table A4. The results are qualitatively similar to what we find in Table 6 using the baseline specification (Equation 4). Hence, our conclusion that non-pecuniary premiums play the dominant role in determining average perceived location probabilities is robust to the alternative specification (Equation A4).

E Alternative Reference Situation

As discussed in Section 6.1, some type of normalization is necessary to characterize the inequality in absolute welfare/utility. Specifically, we need to assume that there exist l^* and j^* such that all individuals receive the same utility in a situation where they live in location l^* and have type j^* jobs. In Section 6.1, we let $l^* = 3$ (Somewhere-Else) and $j^* = 1$ (Non-Degree). Here, we redo the analysis for all nine possible combinations of l^* and j^*. Table A5 reports our welfare inequality measure, the standard deviation of overall welfare b_i, for all combinations of l^* and j^*. We find that, regardless of the reference situation, this standard deviation is always between \$22,000 and \$26,000, suggesting that our results for welfare inequality are robust to the choice of reference situation.

Table A5: Standard Deviation of b_i for Alternative Reference Situations

Sample Size = 277	Non-Degree	Any-Degree	My-Degree
Home-Area	23.85	22.90	23.80
Job-Search-State	22.37	23.12	23.86
Somewhere-Else	25.63	25.77	23.86

Note: This table reports the standard deviation of b_i for all possible reference situations. For example, the first row of the first column shows that the standard deviation of b_i is \$23,850 if we assume that all individuals receive the same utility in a situation where they live in the Home-Area and have Non-Degree jobs.

F Descriptive Statistics for the Post-College Locations

In this appendix, we provide descriptive statistics about the Job-Search-State and the states where the students moved to after graduation (post-college state). Data come from Census 2000.

Table A6: Summary Statistics for Job Search State

Number of students with valid Job search state response	313
Post-college state = Job search state	148
Post-college state = Job search state = Home state	115
Job search state = Home state	170
Job search state $\neq$ Home state	143
Job search state adjacent to home state	55
Characteristics of Job search state	
Per capita income of Job search state <= national	261
Avg income of Job search state <= national	262
Avg income of college graduates <= national	248
College share of employed workers <=national	259

Table A7: Summary Statistics for Actual Post-college Residential State

	Number of Students	Share
Number of Students with info about Home State and Job State	540	
Statistics on Home State		
Per capita income of Home State <= national	494	0.91
Avg income in Home State <= national	494	0.91
Avg income of college graduates in Home State <= national	485	0.90
College share of Home State <=national	495	0.92
Statistics on Post-college state		
Per capita income of Post-college state <= national	471	0.87
Avg wage income of Post-college state <= national	471	0.87
Avg wage income of college graduates in Post-college state <= national	456	0.84
College share of Post-college state <=national	476	0.88

Figure A3: Distribution of Population: Home County and Work County

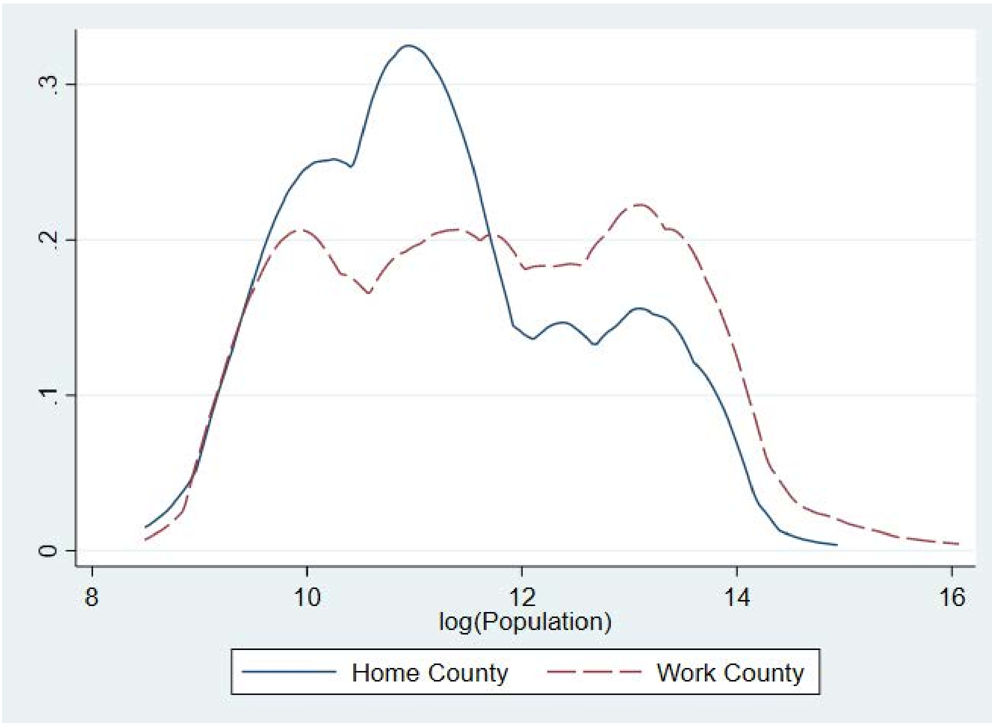
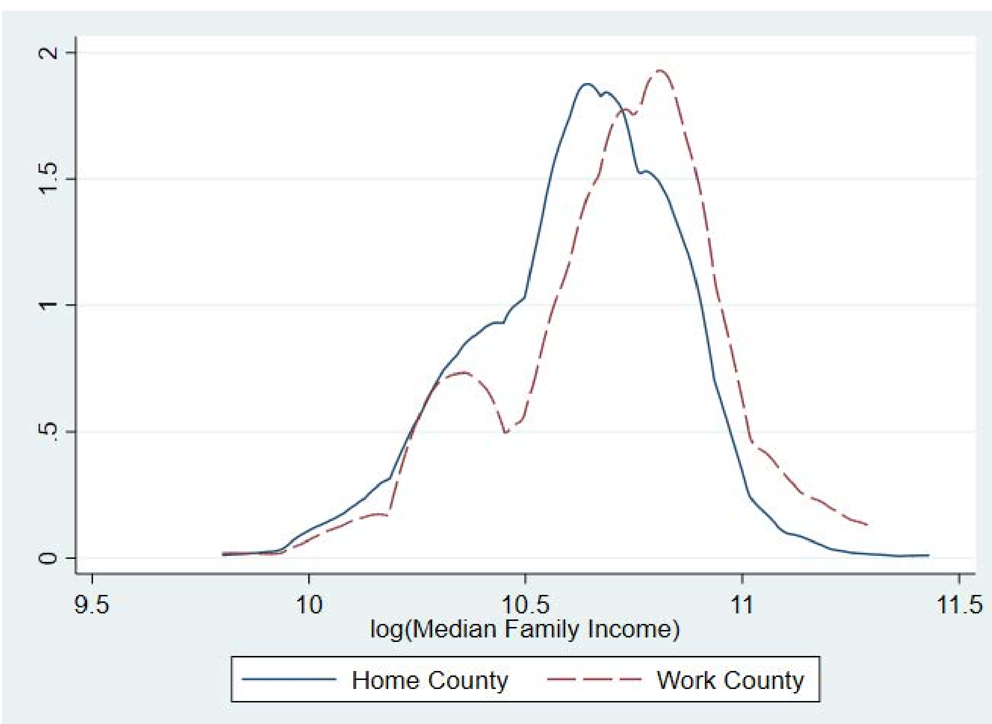


Figure A4: Distribution of Median Family Income: Home County and Work County



G Descriptive Statistics on Housing Costs: Home State, Job-Search-State, and Post-college Residential State

In this appendix, we provide descriptive statistics on housing costs for home states, job-search-states and post-college residential states. Data come from Census 2000.

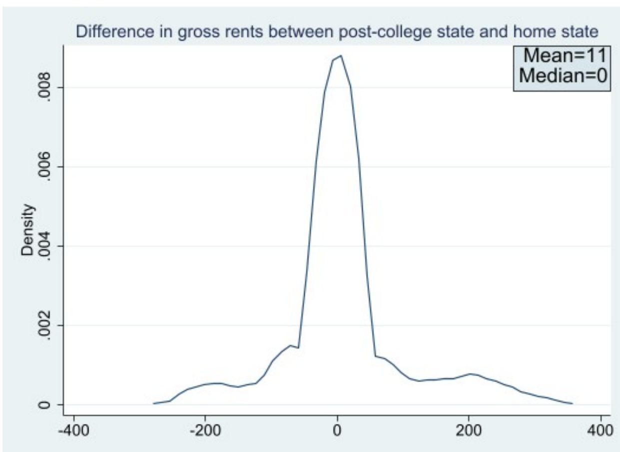
As we can see from Table A8, most students in our sample are from, tend to look for jobs in, and eventually move to states where housing expenses are low. For instance, 87% of the students come from a state where the median gross rent is below the national median gross rent. Almost all the students (97%) come from a state where the median house value is below the national median. In terms of post-college locations, more than 80% (90%) of the students choose to live in a state where the median rent (home value) is lower than the national median. We find similar patterns for job-search-states. Among the 313 students with valid job-search-state responses, more than 70% of them tend to search for jobs in a state with housing cost below the national median.

Table A8: Housing Costs: Home State, Job-Search-State, and Post-college Residential State

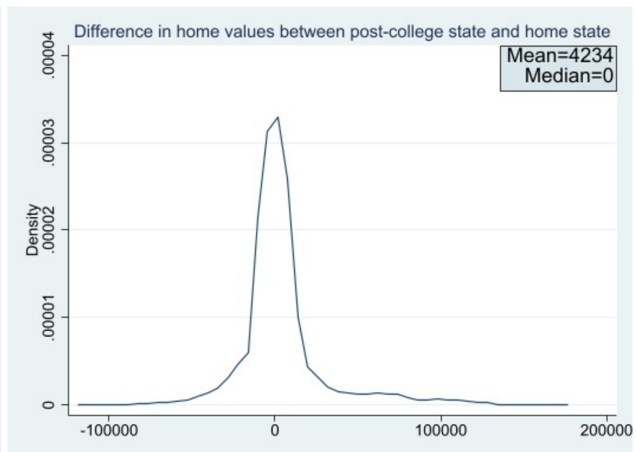
	Number of Students	Share
Number of Students with info about Home State and Post-College State	540	
Statistics on Home State		
Median gross rent of home state <= National median	472	0.87
Median home value of home state <= National median	525	0.97
Statistics on Post-College State		
Median gross rent of post-college state <= National median	445	0.82
Median home value of post-college state <= National median	494	0.91
Statistics on Job Search State		
Number of students with valid Job-Search-State response	313	
Median gross rent of job search state <= National median	229	0.73
Median home value of job search state <= National median	273	0.87

In the context of our location choice model, it is the difference rather than the absolute level of housing costs that matters for location decisions. Therefore, we compare the differences in rents and home values between post-college residential states and home states as well as these housing cost differences between Job-Search-States and Home States. Figure A5 plots the distributions of these differences. As we can see from the top panel, the differences in gross rents between post-college residential states and home states are small, with a mean of 11 dollars per month and a median of 0 dollars per month. The differences in home values between post-college residential states and home states are quite marginal as well, with a mean of 4,234 dollars and a median of 0 dollars. As a comparison, the national median gross rent is 602 dollars per month and the national median home value is 119,600 dollars in the year 2000. The bottom panel shows that the differences in gross rents and home values between job-search-states and home states are also small.

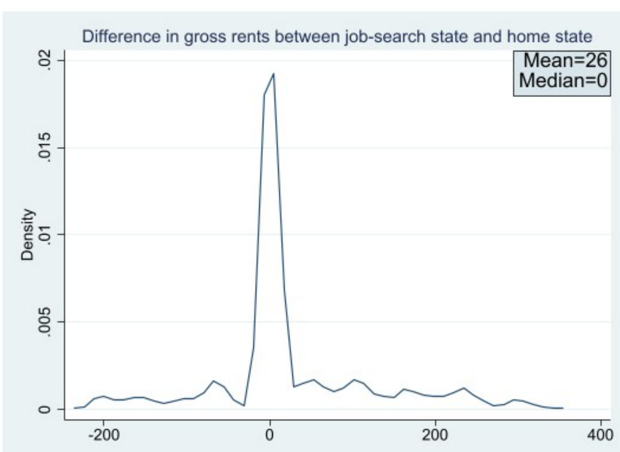
To sum up, as students tend to look for jobs in and move to states that are similar in housing costs compared to their hometown, differences in housing costs are not strongly associated with the value of locations, and are unlikely to have sizable impact on location decisions.



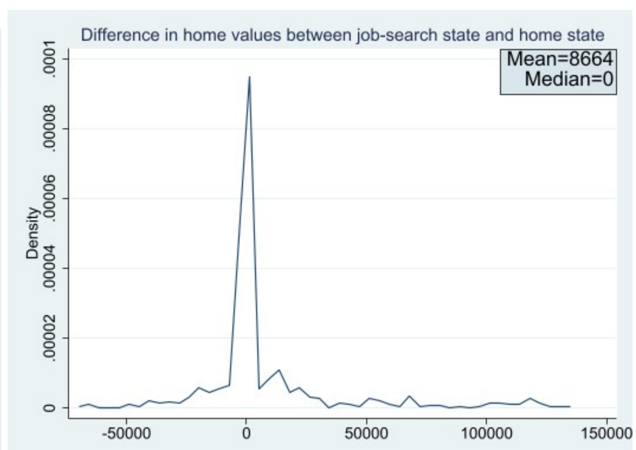
(a) Rent Difference: Post-College State and Home State



(b) Home Value Difference: Post-College State and Home State



(c) Rent: Job Search State and Home State



(d) Home Value Difference: Post-College State and Home State

Figure A5: Difference in Housing Costs compared to Home State