Time Use and the Geography of Economic Opportunity

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Abstract

Recent work suggests that the area of the United States in which a child is raised has a substantial effect on their income in adulthood. We measure differences in time use between areas which are better or worse at producing incomes in adulthood. The main differences are that, in areas which produce higher incomes, people spend more time at work, and adults spend more time with children. The data does not support some theories of what makes communities effective at producing human capital: People do not spend more time on educational activities, or on community events and institutions, in areas which increase incomes by more.

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1 Introduction

Chetty and Hendren (2018a) measure the effects of the community in which a child is raised on their incomes in adulthood, and find them to be substantial. This confirms the long-standing hypothesis that growing up in a good community has a substantial impact on a child's life course (e.g., Benabou 1993, Katz et al. 2001).[1]

However, it is not known exactly *why* communities differ in their effects on the adult incomes of children raised there. A natural first step towards this is to characterize what is different between these communities. Chetty and Hendren (2018b) document that communities which increase the incomes of children who were raised there have higher standardized test scores, lower levels of segregation, and greater social capital – potentially pointing to explanations relating to the school system and social interactions. Subsequent research along these lines suggests that places which generate growth in test score performances are not better at producing incomes (Rothstein 2019, Mookerjee and Slichter 2020), and that effects on income are more correlated with historical than contemporary segregation (Andrews et al. 2017).

We contribute to the question of what makes some places increase incomes in adulthood more than others by characterizing how time use differs between these places. Differences in time use are potentially informative in this regard for two reasons. First, time use is a marker for community characteristics such as cultural values about the importance of children, work, and education. Second, the allocation of time is per se an important input into child development (e.g., Sayer et al. 2004a, Kofman and Bianchi 2012, Caetano et al. 2019).[2]

We use the American Time Use Survey, which provides information on how much time is spent by individuals on different activities. We observe the *quantity* of time spent but not the *quality*, as is common in the literature; however, we present a simple theoretical model in Section 2 demonstrating why one would expect differences in quality of time inputs to be reflected in the amount of time spent on each activity. For example, in communities with a comparative advantage in producing human capital through time use on social activities, we would expect to see more time spent on social activities.

We examine time use separately for three subgroups within our sample. These subgroups are adults who have at least one child in the household, and are therefore likely to be caregivers to children; adults with no children in the household, who are therefore unlikely to be primary caregivers to children; and young adults (ages 15-23), to capture how the people being raised in a community spend their time.

Our first empirical finding is that adults spend more time with children in com-

[1] Other recent work such as Chetty et al. (2016) and Fletcher and Han (2019) also provide quantitative support for the importance of the community where a child is raised.

[2] Prior literature has considered that parental time spent on children might play a role in the intergenerational transmission of income inequalities, at the individual (rather than community) level (e.g., Hill and Stafford 1980, Kalil et al. 2012).

munities which have more positive effects on income in adulthood. (For the rest of the paper, we refer to communities which have a more positive effect on incomes in adulthood as "higher-effect" communities.) This is consistent with both the views that such communities are more child-centric in the sense of placing a greater utility weight on children's outcomes, and that time spent with family is a key time input for children's cognitive development (Caetano et al. 2019).[3]

Second, we find that individuals spend more time at work in higher-effect communities. This finding is sensitive to controls for adults but not for the young adults cohort. This finding is consistent with the theory that communities vary in their cultural emphasis on work, and that children learn how much to emphasize their careers from observing adults (Huang et al. 2001). It is also potentially consistent with the possibility that higher-effect communities are increasing children's incomes in adulthood by placing them into healthier labor markets, rather than by increasing their human capital.

Also notable are some correlations that we fail to find. First, we examine time spent on adult care as a placebo category, and do not find that respondents in higher-effect communities are any more likely to allocate time towards taking care of adult household members. This suggests that additional time on caregiving is specific to children, and not necessarily indicative of generalized values about the importance of helping others. Second, while Chetty and Hendren (2018b) find evidence that higher-effect communities might have greater social capital and stronger social networks, we find no correlation between a community's effect on incomes and time spent on social or community-building activities such as attending social gatherings, participating in community or religious organizations or events, or attending sports or entertainment events. Third, despite the higher average test scores in such communities (Chetty and Hendren 2018b), we do not find evidence that more time is spent by young adults on educational activities in higher-effect communities.

The rest of the paper proceeds as follows. Section 2 builds a simple theoretical model to motivate the analysis. Section 3 describes the data. Section 4 gives the results. Section 5 concludes.

2 Theoretical Model

To guide our interpretation of the empirical results, we develop the following simple model of time allocation.

Suppose that families have m ways to spend their time, and choose a vector of time allocations to activities $(t_1, ..., t_m)$ to maximize human capital production y subject to a time constraint $t_1 + ... + t_m = 1$ and the constraint imposed by the human capital production function $y \leq f(t_1, ..., t_m)$. Assume that f is differentiable and the technology set is convex.

[3]Prior papers also find that more educated parents spend more time with children (Sayer et al. 2004b, Guryan et al. 2008).

Let $t^* = (t_1^*, ..., t_m^*)$ be the human capital-maximizing time use. By the Envelope Theorem, the marginal product $MP_k := \frac{\partial f}{\partial t_k}$ evaluated at t^* is equal for all activities t_k.

Suppose that, for some activity k, we altered the technology of human capital production to increase MP_k at all time allocation bundles. Because the technology set is convex, every activity has a diminishing marginal product. Therefore, the new optimal input bundle t' would have a greater time use on activity k than t^* does.

This suggests that improvements in the quality of an activity are likely to result in an increase in the quantity of time spent on that activity. However, there are three caveats to this claim.

First, if one were to change the production function in a way that increases the marginal product of activity k only at levels of $t_k < t_k^*$, then this change to the production function would make activity k more productive without increasing time expenditure on activity k. Therefore, not all differences in activity quality will show up in quantities.

Second, time use reflects *comparative* advantages in quality, not *absolute* advantages. If one were to change the production function by multiplying all marginal products by the same scalar (e.g. by changing f to $f' = .9 * f$), then one would not alter the optimal time allocation.

Third, this model assumes that families are maximizing children's human capital production. In practice, time use is also motivated by competing interests such as consumption value, institutional constraints, and social norms. To the extent that these competing motivations vary across communities, we would expect to see time use vary across communities in a way that reflects underlying values.

We can incorporate this final consideration into our framework, as follows. Suppose that, instead of maximizing human capital production, families choose a time allocation to maximize a utility function $U = \alpha f(t_1, ..., t_m) + (1 - \alpha)c(t_1, ..., t_m)$, where the function c reflects the value that families derive from other considerations such as consumption. Let $\tilde{t}$ be the time allocation that a family would select with $\alpha = 0$, i.e. considering only this consumption value.

In communities where α is greater, time use will be more closely aligned with t^*; and, where α is smaller, time use will be more closely aligned with $\tilde{t}$. That is, time use reflects the extent of prioritizing children's human capital accumulation. Furthermore, time use differences across places might reflect differences in c: e.g., in particularly religious communities, we would expect to see people spend more time in church, regardless of its value to human capital accumulation.

Summing up, time use likely reflects a combination of (i) comparative advantages in human capital production, (ii) differences in the priority placed on child development, and (iii) differences in values related to the consumption value of activities.

3 Data and Methods

We obtain our measures of time use from the American Time Use Survey (ATUS). The ATUS is a Bureau of Labor Statistics Survey, conducted by the U.S. Census Bureau, on a nationally representative sample of people aged 15 and older from households that recently completed the Current Population Survey. One person from each household is randomly chosen to answer a series of questions on their time use for one day: what activities they engaged in and for how long, the location, who they were accompanied by, etc. We use survey years from 2003 to 2018.

We categorize respondents into three mutually exclusive subgroups. The first is "young adults," composed of all respondents ages 15-23, and intended to capture the time use of people who are being raised in the community. We would ideally match the age bracket used by Chetty and Hendren (2018b), who define where a child is raised by where they lived between ages 9 through 23. However, we are limited to start at age 15 because ATUS does not collect information on the time use of children under 15.

For the sample of young adults, we focus on categories of time use which might influence the respondent's own human capital accumulation, as follows: (i) *education*, which includes time spent on classes, homework, and education-related travel, (ii) *work*, encompassing time spent actually working as well as searching, traveling, and other work-related actions (note that results are unchanged if we define work to exclusively mean time spent actually working), (iii) *watching television* as part of leisure time, such as watching sports on TV, (iv) *sports*, including participating in sports, exercising, or recreational outdoor activities, (v) *social activities* which are organized and formal, consisting of religious, social and civic actions, social services, related travel, and volunteering, and (vi) *socializing* informally, which includes time spent visiting or communicating with family, friends, and neighbors.

Our other two subgroups are adults with children in the household, and adults without children in the household. We define an adult to be a respondent age 24 or older, and adults with children are adults who report at least one person under the age of 18 residing in their household.

Among adults, our key categories of time use are (i) *child care*, which includes time spent on educational, health-related, and other activities with household children as well as time spent with non-household children, (ii) *adult care*, which includes time spent caring for household and non-household adults and helping non-household adults, (iii) *work*, encompassing time spent actually working as well as searching, traveling, and other work-related actions, and (iv) *social activities*, consisting of religious, social, and civic actions, social services, related travel, and volunteering. The goal of these measures is (a) to capture inputs directly given from caregivers to children, and (b) to proxy for attitudes, values, and behaviors common among the people children interact with.

The survey also provides standard socio-economic and demographic information for all members of each household. Table 1 provides an overview of our sample

from ATUS. Two variables are of particular importance for our analysis: (i) family income, which allows us to create an indicator for whether households are high or low income, and (ii) the number of children in the household, which lets us separately explore time allocation for adults with and without children in the household (which we treat as a proxy for whether they could be potential caregivers). Our definition of high and low income roughly corresponds to the median of income in the data for each year: on average, households are denoted as high income if they earn $60,000 and above, which corresponds to about 52% of our sample.[4]

We combine this data with Chetty and Hendren's (2018b) estimates of counties' effects on the adult incomes of children raised there. Chetty and Hendren construct estimates of community quality separately for children from families at the 25^{th} (low) and the 75^{th} (high) percentiles of income. They use cohorts born between 1980 and 1988, which partially overlaps with our data; our results are robust to restricting the sample to the overlapping cohorts.

For simplicity, we convert their estimates of county exposure effects into units of standard deviations above or below the average. To perform this conversion, we use their estimate of the true standard deviation of county effects, which is 0.517 for the 25^{th} and 0.321 for the 75^{th} percentile, in units of percent effect on income per year of exposure.[5] Their estimates are designed to be forecast-unbiased in the presence of estimation error, which necessitates shrinkage;[6] therefore, the standard deviation of their estimates is smaller than these estimates of the standard deviation of county quality. Specifically, Chetty and Hendren's estimates are constructed using a convex combination of two estimates: (i) estimates using children who move between counties at different ages, and (ii) average outcomes for children who spend their entire childhood in one county ("permanent residents"). Chetty and Hendren argue that (i) is approximately unbiased but has high variance due to sampling error, while (ii) has low variance but is biased. In practice, most of the variation in their combined estimates comes from (ii) rather than (i).

For each income category, high and low, we assign the individuals in that category the corresponding standard deviation measure of how effective their county of residence is for children in that income group (derived from Chetty and Hendren's (2018b) estimates).[7] We then measure the difference in average time spent on each activity category between more and less effective communities by regressing time use on the measure of county quality, as follows:

$$t_{ic} = \beta_0 + \beta_1 Q_{ic} + u_{ic},$$

where t_{ic} is the time in minutes spent on an activity by individual i residing in

[4]We are not able to divide at exactly the median because income is binned in the data.

[5]The mean of their measure is 0 by construction.

[6]See their paper for more details

[7]For consistency with Chetty and Hendren, who give estimated effects at the 25^{th} and 75^{th} percentiles of the income distribution, we match our below-median income individuals to their 25^{th} percentile estimates and our above-median income individuals to their 75^{th} percentile estimates.

Table 1: Descriptive statistics

	Adults		Young Adults
	Hhd child	No hhd child	
Age	40.77	56.63	18.54
	(9.77)	(15.96)	(2.61)
Male	0.41	0.45	0.49
	(0.50)	(0.49)	(0.50)
White	0.80	0.77	0.76
	(0.42)	(0.40)	(0.42)
College grad	0.42	0.36	0.04
	(0.49)	(0.48)	(0.19)
Employed	0.72	0.53	0.35
	(0.45)	(0.50)	(0.47)
Observations	31,889	42,832	7,847

Notes: The table provides descriptive statistics for our sample.

county c, and Q_{ic} is the standard deviation measure of how effective county c is for children belonging to individual i's income category (high or low). A positive estimated $\widehat{\beta_1}$ indicates that communities which are more successful for the human capital development of children invest more time in that particular activity, and the magnitude is the number of additional minutes that people in a community with a 1 standard deviation above-average effect on income spend on that activity relative to people in the average community.

Because Q is estimated by Chetty and Hendren, it is important to consider how measurement error in their estimates might affect our results. Our ideal regression is

$$t_{ic} = \alpha_0 + \alpha_1 Q^*_{ic} + v_{ic},$$

where Q^*_{ic} is the true exposure effect as opposed to Chetty and Hendren's estimate, and $E(v_{ic}|Q^*_{ic}) = 0$. Let $\epsilon_{ic} := Q_{ic} - Q^*_{ic}$ be the measurement error in the estimate of Q^*.

We have

$$\begin{aligned} E(t_{ic}|Q_{ic}) &= E(\alpha_0 + \alpha_1 Q^*_{ic} + v_{ic}|Q_{ic}) \\ &= \alpha_0 + \alpha_1 E(Q^*_{ic}|Q_{ic}) + E(v_{ic}|Q_{ic}) \\ &= \alpha_0 + \alpha_1 Q_{ic} + E(v_{ic}|Q_{ic}), \end{aligned}$$

where the last equality holds because Chetty and Hendren's measure is designed to be forecast-unbiased. It follows that our regression estimand β_1 is equal to the ideal estimand α_1 if $E(v_{ic}|Q_{ic}) = 0$. While $E(v_{ic}|Q^*_{ic}) = 0$, it can still be the case that $E(v_{ic}|Q_{ic}) \neq 0$ if $E(v_{ic}|\epsilon_{ic}) \neq 0$. That is, our estimates might be biased due to measurement error if the errors in Chetty and Hendren's estimates are correlated

with time usage in the same community. As discussed above, the main source of potential error in Chetty and Hendren's estimates is that permanent residents of different communities are systematically different. Therefore, to assess whether our estimates are likely to be sensitive to measurement error, we estimate specifications using individual-level controls.

In particular, in order to rule out that these differences are simply driven by differences in socio-economic and demographic characteristics, we estimate a specification controlling for individuals' age, gender, race, education, and income bracket. Comparing individuals across communities who are identical in these respects eliminates the possibility that the differential time use patterns are accounted for purely by selection along these dimensions (e.g., richer or college educated people being both more likely to live in higher-effect communities as well as more likely to spend time on work). With limited exceptions, our results turn out not to be sensitive to these controls.

4 Results

Table 2 reports the results for adults with children in the household, and Table 3 for adults without. Comparing these results can suggest whether the value of growing up in a higher-effect county stems from caregivers themselves engaging in more beneficial activities rather than the general time use pattern of the community. For each sample, we report both the results from an uncontrolled specification (Panel A) and a specification including the controls described above (Panel B).

The first set of results is for time allocated towards childcare activities.

Households in higher-effect communities spend significantly more time with children overall. Each standard deviation increase in community effect on incomes is associated with an additional 2-4 minutes per day of childcare by respondents in households with children, off of a baseline of 82 minutes per day. This is driven by additional time specifically with children from the same household, who absorb the overwhelming majority of childcare time (80 minutes per day) among such households.[8] Households without children also spend more time caring for children, though the amounts of time involved are small – half a minute per day per standard deviation, off of a baseline of 6 minutes per day.

We also examine time spent on taking care of adults, in the spirit of a placebo test, to see whether the larger amount of time on child care reflects a general tendency to spend time caring for others as opposed to a specific orientation to children. We find no pattern of higher time spent on adult care in higher-effect communities.

The third time use category we study is work. Our results mostly suggest that adult respondents spend more time on work in higher-effect communities, though these results are sensitive to the inclusion of controls.

[8]Results are robust to controlling for the number of children in the household.

Table 2: Results for Adults with Children in Household

	Childcare		Adult Care	Work	Soc. Act.
	Hhd	Non-hhd			
			Panel (A): No Controls		
Q	3.43***	0.03	0.04	5.97***	0.69
	(0.85)	(0.14)	(0.10)	(2.07)	(0.56)
Baseline	79.99	1.53	1.41	207.29	23.45
Observations	31,889	31,889	31,889	31,889	31,889
			Panel (B): With Controls		
Q	1.97**	0.13	0.06	2.29	0.81
	(0.81)	(0.14)	(0.10)	(2.03)	(0.56)
Baseline	79.99	1.53	1.41	207.29	23.45
Observations	31,889	31,889	31,889	31,889	31,889

Notes: The table provides results from regressions of time spent on different activity categories by individuals aged 24 and above who have at least one child under the age of 18 residing in their household, on the effectiveness of their community at increasing incomes in adulthood. *, **, and *** denote significance at 10%, 5%, and 1% respectively.

Table 3: Results for Adults with No Children in Household

	Childcare		Adult Care	Work	Soc. Act.
	Hhd	Non-hhd			
			Panel (A): No Controls		
Q	–	0.53**	−0.18	−2.32	−0.86*
		(0.25)	(0.14)	(1.67)	(0.52)
Baseline		5.94	2.02	160.80	26.24
Observations		42,832	42,832	42,832	42,832
			Panel (B): With Controls		
Q	–	0.43*	−0.22	2.80*	−0.52
		(0.25)	(0.14)	(1.56)	(0.52)
Baseline		5.94	2.02	160.80	26.24
Observations		42,832	42,832	42,832	42,832

Notes: The table provides results from regressions of time spent on different activity categories by individuals aged 24 and above who have no children residing in their household, on the effectiveness of their community at increasing incomes in adulthood. *, **, and *** denote significance at 10%, 5%, and 1% respectively.

Table 4: Results for Young Adults

	Educ	Work	Watch TV	Sports	Soc. Act.	Socialize
			Panel (A): No Controls			
Q	−0.66	8.37***	−1.09	−0.22	1.49	−0.91
	(3.17)	(3.12)	(2.27)	(1.26)	(1.73)	(1.11)
Baseline	123.50	106.44	144.03	36.70	60.17	19.90
Observations	7,847	7,847	7,847	7,847	7,847	7,847
			Panel (B): With Controls			
Q	−0.81	8.00***	0.04	−0.88	0.89	−0.55
	(3.06)	(2.94)	(2.28)	(1.23)	(1.73)	(1.11)
Baseline	123.50	106.44	144.03	36.70	60.17	19.90
Observations	7,847	7,847	7,847	7,847	7,847	7,847

Notes: The table provides results from regressions of time spent on different activity categories by individuals aged between 15 and 23, on the effectiveness of their community at increasing incomes in adulthood. *, **, and *** denote significance at 10%, 5%, and 1% respectively.

The last category which we explore for adults is social, civic, and religious activities, where we find zero differences between higher-effect and lower-effect communities.

Finally, we examine time spent by young adults, i.e. individuals aged between 15 and 23. The results are reported in Table 4.

We find no difference in time spent on education between high- and low-effect communities. (In fact, our point estimate is negative, i.e., time spent on education is lower in high-effect communities.)

The most salient difference in time usage among young adults is on work, with young adults from a one standard deviation better community spending on average eight additional minutes per day working, from a baseline of 106 minutes.

Similar to older adults, we do not find any differences in social and community activities. This is true for both structured social events and informal socializing. We also do not find differences in time spent watching TV.

5 Conclusion

We find that time use is correlated with communities' effects on incomes in adulthood. In particular, individuals living in higher-effect areas tend to spend more time at work, and adults in those communities spend more time on childcare activities. This is consistent with the views that high-effect communities are distinguished by a greater cultural emphasis on work, or on children's welfare. It is also consistent with the views that high-effect communities induce higher earnings in adulthood directly

as a result of additional time spent with children, or as a result of stronger labor market conditions.

However, we also fail to find some correlations which would have been expected under other theories of why some communities have greater effects on income in adulthood. In particular, we do not find any correlation with time spent on educational activities, inconsistent with differences in cultural values about education, and inconsistent with differences in the production of human capital directly caused by time expenditure on education. Additionally, we do not find that people of any age spend additional time on social or community activities in high-effect communities, which is not consistent with the view that high-effect communities are primarily distinguished by stronger social ties and greater social capital.

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