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# The most precious resource: time allocation of immigrants in the U.S.

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## Abstract:

This study offers a comprehensive examination of the time-use patterns of immigrants versus native-born populations in the U.S., drawing from the American Time-Use Survey (ATUS) spanning 2003-2019. We analyse differences in the concentration and diversity of time allocation, looking both at participation likelihood and at the time spent in a highly disaggregated set of activities. Our findings underscore pronounced differences between immigrants and native-born, with distinct patterns emerging across genders and influenced by socio-economic attributes. The data reveals a nuanced assimilation trajectory based on the duration of immigrants' residency. Particularly, men immigrants show assimilation in time-use after approximately 20 years, while women immigrants display a staggered alignment, converging notably after two decades. Immigrants also exhibit heightened gender specialization in time-use, which narrows over time but remains pronounced relative to native-born. Second-generation immigrants display time-use patterns similar to long-term first-generation immigrants, aligning closely with the trend of native-born. This study provides valuable insights into the dynamics of time-use, assimilation processes, and gendered divisions, informing socio-economic and integration policies.

**Keywords:** time-use; immigrants assimilation; gender gaps; American Time-Use Survey; second-generation immigrants.

## **1. Introduction**

Time is often cited as our most valuable, and invariably, our most limited resource. Time is one of the few resources with an ex-ante equal endowment: when individuals start their day all have 24 hours to allocate to multiple activities. The final allocation is the result of complex interactions between market and non-market constraints and choices shaped by individual preferences but also by contextual factors. How individuals choose to allocate this precious resource serves as a key to unlocking our understanding of both individual and collective human behavior. The choices made in time allocation have significant social and economic implications, shaping societal norms, driving economic trends, and determining individuals and collective quality of life.

While previous studies have paid considerable effort on understanding these choices for native-born populations and specific sub-groups of the population (Aguar and Hurst 2007, Gimenez-Nadal and Sevilla 2012; Anand and Ben-Shalom 2014, Pepin et al. 2018), the same cannot be said for immigrants – a sub-group of the population with specific characteristics that arguably faces a unique set of challenges, opportunities, and cultural contexts that invariably influence their time allocation decisions. A focus on immigrants' not only offers insights into specific use of time of this important part of the population – for instance time related to their economic contribution or their health and well-being - but also offers a new angle of analysis of their integration into the host society (Hamermesh and Trejo 2013, Ribar 2013). Immigrants often have different household structures and social support networks. Studying their time allocation can reveal how these structures operate in the host country and the gendered pattern of intra-household division of tasks. It is within these contexts that our study finds its motivation.

Drawing from the rich dataset of the American Time-Use Survey (ATUS) spanning the years 2003-2019, we provide a detailed comparison between the time-use of immigrants and that of the native-born US population. This study breaks new ground by taking a disaggregated approach, dividing time-use activities into mutually exclusive categories, allowing us to explore both immigrant-native differences in the probability of engaging in all these activities (extensive margin of time use) and the amount of time devoted to them (intensive margin of time use). Using parametric and non-parametric methods, we provide evidence on the absolute – unconditional – differences as well as the differences in time use that are associated to the immigrant status after controlling for a large set of observable individual and socio-economic characteristics. We explore how these differences play out across genders and delve into the potential assimilation patterns based on the duration of stay in the U.S. By computing measures of concentration and diversity, our study offers a quantifiable insight into how immigrants' time-use patterns compare to those of the native-born population over time.

Our results highlight that immigrants present distinct time-use patterns compared to native-born. The distinct features of time allocation are only partly explained by different socio-economic and location characteristics and suggest that specific constraints and choices are linked to the status of immigrant. Immigrants are more inclined to participate in a lower number of activities (lower extensive margin) and have a higher concentration of the time allocated per activity (higher intensive margin); their time allocation across the set of potential activities is less diverse and often concentrated in more ubiquitous activities (i.e. those with higher average probability of being part of a daily diary of a US resident). Immigrants are more inclined to allocate their time at helping non-household members, religious/spiritual endeavors, eating/drinking, and education. However,

they demonstrate lower participation rates in household-focused tasks, purchases, volunteer work, socializing/leisure activities, and sports.

The overall differences in time allocation between immigrants and native-born, regardless of gender, are due to both the chances of engaging in specific activities and their duration.

Interestingly, the gender dimension accentuates certain discrepancies between immigrants and native-born. For instance, immigrant men participate more in market work and travel than their native-born counterparts, while immigrant women engage less. The immigrant-native discrepancy in sports is significantly negative for men, but not for women.

When accounting for demographic and socio-economic characteristics of individuals, the time use differences between women immigrants and native-born are partly explained by these factors, leading to a reduction in the gap by about one-third. For men, these differences are less affected by demographic and socio-economic factors.

We find striking evidence that gender gaps in time use are more pronounced for immigrants than native-born. Immigrants display more gender specialization in time use than native-born; the differences are only partly explained by observable demographic and socio-economic characteristics.

As time spent in the U.S. increases, we observe an overall path of convergence in time use, an indication of assimilation into the host society. For men immigrants, convergence in time allocation with native-born is slow. It takes around 20 years of residence in the U.S. before a noticeable decrease in the differences in time use between immigrants and natives. Women immigrants, on the other hand, show a slight decrease in time-use deviation between 0-10 years and 11-20 years, and a more pronounced decrease after 20 years of stay.

Our results show that time-use convergence is almost complete for first-generation immigrants who have stayed in the U.S. for over 20 years and second-generation immigrants, both for men and women. Over-time also gender gaps in time use of immigrants tend to converge to those of the native-born population. In fact, gender specialization decreases for immigrants after 20 years of stay, though it remains higher than that of native-born. Notably, second-generation immigrants show a gender specialization rate similar to, or even slightly lower than, native-born.

This paper is organized as follows: Section 2 provides an overview of the related literature in the field, underscoring the gaps our research aims to fill. Section 3 details our data sources and the methodologies employed. Subsequent sections delve deeper into our findings, discussions, and implications.

## **2. Related literature**

There is limited socio-economic and demographic research on the immigrant-native differences in time use. This lack of attention is surprising, as time allocation is crucial for understanding human behavior and choices as how individuals allocate this scarce resource has fundamental implication for social and economic dynamics. A relatively small number of studies have documented significant differences in time use between immigrants and native-born across many daily activities. The underlying theoretical motivations of such differences are mostly related to different: (i) constraints/barriers (e.g. administrative and legal limits for accessing some professions or educational paths, linguistic barriers, limited social connections); (ii) culture and habits; (iii) preferences. The migration literature has analyzed the evolution of time-use differences, by testing the assimilation theory which postulates that the immigrant's time-allocation behavior converges over time with that of native-born (U.S. Bureau of Labor Statistics 2022, Brown and Bean 2006). This is likely to happen because barriers/constraints reduce over

time and preferences and culture of immigrants are increasingly shaped by the culture and norms of the majority/native-born population. Hamermesh and Trejo (2013) theorize that immigrants face both higher fixed costs (e.g. learn the language) and higher returns from time allocated to assimilation activities (e.g. market work, education, purchasing). Consistently with their theoretical hypothesis, they find that immigrants are less likely to undertake assimilation activities, but those who do engage in such activities spend relatively more time than native-born, and that these differences decrease with time the immigrants spend in the U.S. Using ATUS for years 2003-2017, Muchomba and Kaushal (2022) investigate whether assimilation across generations is associated with changes in gender inequality. They add an interesting dimension to time-use assimilation by considering as more assimilating the activities performed outside home and with non-household members (i.e. interactive assimilation). They find that immigrant women among the early generations in the U.S. spend less time in market work, education and shopping whereas the gap disappears for the 2<sup>nd</sup> generation and above. Moreover, they find that in first and 1.5 generation families, husbands engage more in assimilating activities outside home and with non-family members. This latter result reflects a higher degree of gender inequality in immigrants households; which implies that women usually depend on their husbands for their path of assimilation. By measuring the influence of the cultural dimension on assimilation, they also show that women from countries with less gender equal norms spend less time in assimilation activities but these differences disappear across generations. Using the same data, Blau et al. (2020) find that cultural factors influence the allocation of tasks among genders within immigrant's households, and that those coming from more gender equal countries allocate tasks more equally. An interesting study by Vargas (2016) investigates the differences in time-use between Mexican immigrants and native-born over a wide range of activities (market work, household production,

personal care, and leisure activities). He finds that, upon arrival in the U.S., Mexican immigrant men spend more time in paid work and commuting, and less time on household work and caring for household members than comparable native-born. Recently immigrated Mexican women devote the same amount of time to on market work, commuting, purchasing, and leisure compared to native-born women, but more time in housework and eating. Overall, they show that Mexican immigrants have less (discretionary) time to dedicate to their personal well-being compared to native-born and for women, time devoted to these activities even decreases with the duration of the migration spell in the U.S. Other research on the U.S., looks at assimilation in specific time-use activities and of different sub-groups of the population. For example, Coniglio et al. (2021) look at the time spent in formal and informal education, Hwang (2016) looks at housework time, Kofman and Bianchi (2012) investigates time-use of teens by ethnicity, while Vegas (2017) focuses on older immigrant women and their time allocated at childcare. Among papers focusing on other countries, it is worth mentioning Caparrós Ruiz (2017) which looks at time-use assimilation of immigrants in Spain and Chen (2022) who investigates the children's time use across immigrant and native-born households in Australia. For the UK Zaiceva and Zimmermann (2014; 2011) study the assimilation of woman immigrants in terms of housework, religious and childcare activities and whether ethnic minorities do more multitasking than their counterparts. Overall, this literature also shows that the differences among immigrants and native-born are very heterogeneous across time-use activities and across demographic characteristics.

Our paper contributes to the literature by analyzing the features of the overall pattern of time use of immigrants – by gender and years since arrival in the U.S. – and compare it with the native-born population taking explicitly into consideration time-use gaps due to the status of immigrant from those related to a rich set of observable individual and socio-economic characteristics.



Differently from previous studies we provide aggregate measures of time use gaps between immigrants and natives and decompose these measures in order to assess the contributions of differences in the activity mix (extensive margin of time use) from differences in the duration of activities (intensive margin of time use). Our analysis allows to study the main peculiarity of immigrant's time-use – as the much stronger gender specialization over different activities or the speed of assimilation – but also point out activities where immigrant-native gaps are large.

### **3. Data**

Our analysis uses the American Time-Use Survey (ATUS) for the years 2003–2019, conducted by the U.S. Bureau of Labor Statistics (BLS). The ATUS sample is randomly selected among respondents of the Current Population Survey (CPS) survey and is representative of the U.S. population aged 15 years and above.<sup>1</sup> This data is collected through one-day time diaries,<sup>2</sup> in which participants list the time (in minutes) allocated to a detailed set of activities performed in the 24 hours prior to the survey. Time-use surveys are a unique instrument to collect information about how much time individuals devote to daily activities. The time-use diary method is regarded as qualitatively superior in the measurement of daily behavior compared to other survey methods that collect information about the frequency and duration of activities due to: (i) the short recall period which reduces error (Ribar 2015); (ii) the episodic/chronological format that records a continuous sequence of activities (must add up to 24 hours), which aids recall and deter misrepresentation (under- or overestimation) of particular activities (Juster, Ono, and Stafford 2003)<sup>3</sup>; (iii) a higher

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<sup>1</sup> The ATUS data set is publicly available upon registration. We used the American Time-use Survey Extract Builder to extract the data (Hofferth, Flood, and Sobek 2017). <https://www.atusdata.org/atus/>

<sup>2</sup> ATUS allocates 10% of diaries to each day of the week, 25% of diaries to Saturday and 25% of diaries to Sunday. This distribution is based on research showing that on weekends the allocation of time is different as compared to the rest of the working days (Horrigan and Herz 2004).

<sup>3</sup> Overrepresentation may occur principally for activities that are perceived as socially desirable such as child education.

reliability as activities may be performed several times during the day and their duration may be recorded accordingly (Sullivan et al. 2021). Pooling the data from the 2003 through 2019 - and consequently increasing the number of observations - addresses some of the data limitations: (i) it minimizes the noise from random fluctuations in time allocation; (ii) allows to capture time allocated to activities performed rarely (e.g. attending a sport event); and (iii) minimizes the effect of possible time trends in time allocation (Aguilar and Hurst 2007).

The ATUS contains a very detailed set of activities (around 400). Following the Multinational Time Use Survey (MTUS) categorization, we aggregated these activities in 62 categories<sup>4</sup>. The new categories conserve the narrative content of the composing activities and guarantee a sufficient number of observations to conduct the parametric analysis. The categories are described in *Table A1* in the on line appendix 1.

Since the ATUS sample is extracted from the Current Population Survey (CPS), it is possible to exploit the rich set of respondent's demographic characteristics provided by CPS such as gender, nationality, age, marital status, number of children, educational attainment, and other useful household characteristics necessary for the analysis. Moreover, the CPS contains information on the years since migration of the foreign born that allowed us to calculate the years of residence in the U.S. In *Table 1*, we provide summary statistics for the wide range of individual characteristics used in the estimations, by immigration status and gender.

**Table 1 here**

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<sup>4</sup> We do not consider in the analysis seven categories from the MTUS categorization. This is due to the low number of observations for these activities, which does not allow for consistent estimates of the means. For more information of MTUS categorization, see <https://www.timeuse.org/mtus>

The average response rates of the whole set of surveys considered in the analysis is around 52%. Non response is likely unrelated to any specific characteristics of the individuals, as the primary reason for refusal is survey fatigue after completing the CPS survey (U.S. Bureau of Labor Statistics 2022)<sup>5</sup>. However, we also use probability weights to correct for any difference in demographic characteristics related to non-response and over-sampling of some sub-groups of the population such as the immigrants and for over-sampling of weekend days. In our analysis, we focus on working age population in the age range 18-65 years old.<sup>6</sup> After dropping the low-quality observations and observations with missing information,<sup>7</sup> the usable dataset is composed of around 160 thousand observations, among which around 23.5 thousand are immigrants, around 72 thousand are men and around 88 thousand are women.

## **4. Methodology**

### **4.1 Conditional and unconditional analysis**

In the first step of our analysis, we aim to understand differences in time allocation between immigrant and natives, and the extent to which these differences depend on observed demographic characteristics between groups. To do this, for each activity, we first assess the unconditional (weighted)<sup>8</sup> differences in participation probability and, for those who participate, the unconditional (weighted) differences in time allocation between groups. We therefore compare

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<sup>5</sup> Moreover, the interview was conducted in Spanish when the respondent was not comfortable to do it in English. This mitigates the impact of non-response related to the lower English language proficiency of immigrants.

<sup>6</sup> We decide to analyze the adult population excluding children and older people in order to focus on individuals with a relatively more autonomous allocation of time. Children and old individuals time allocation – although interesting - is more likely to be shaped or highly influenced by other family members. In addition, the time allocation decisions on education and retirement have a strong inter-temporal component over the life-cycle (Nadal and Molina 2015). We leave the analysis on these important sub-sample of the US population to future research.

<sup>7</sup> The data quality variable is assessed by the interviewers and indicates whether the data from a particular interview should be used. Non-usable data include those with wrong answers and incorrect recall of activities.

<sup>8</sup> We use population weights available in ATUS (variable wt06).

unconditional differences with estimated (conditional) differences in participation and time allocation that account for the demographic and socio-economic characteristics of individuals.

We use a Probit model to estimate conditional differences in participation probability (extensive margin) between groups. To estimate differences in time allocation intensity (intensive margin), we use a truncated regression model. This method assumes that the decision to participate and the intensity of participation are two separate processes; and that the Tobit model – that is a prominent model to deal with the large number of zeros that time-use data has – yields biased results (Hamermesh and Trejo 2013; Stewart 2013). The specifications of the baseline models are the following:

$$\text{Extensive margin} \quad Act_i(0,1) = \alpha_0 + \beta_0 IMM_i + \varphi'_0 \mathbf{X}_i + \theta_{s,0} + \gamma_{j,0} + \varepsilon_{i,0} \quad (1)$$

$$\text{Intensive margin} \quad Act(\text{minutes})_i = \alpha_1 + \beta_1 IMM_i + \varphi'_1 \mathbf{X}_i + \theta_{s,1} + \gamma_{j,1} + \varepsilon_{i,1} \quad (2)$$

where  $Act_i$  equals 1 if the respondent spent a positive number of minutes (minutes > 0) in activity  $i$ , and 0 otherwise, while  $Act(\text{minutes})_i$  is the logarithm of minutes spent by the respondent in activity  $i$ ;  $IMM_i$  is a dummy that equals 1 if the respondent is an immigrant<sup>9</sup>, and 0 otherwise. The vector  $X_i$  includes the following independent variables: a dummy for gender (*Women*); *age* (in years) and its square, *age2*; a dummy equal to 1 for *married* respondents; a set of dummies equal to 1 if the respondent has children in each of the following age groups: *No children*, *children 0-2 years*, *children 3-5 years*, *children 6-12 years*, *children 13-17 years*; educational attainment dummies (*Less than elementary*, *Elementary*, *Middle*, *Secondary*, *Degree*, *Postgraduate*); and a dummy *weekend* (which includes holidays); and a set of 16 dummies, one for every ranges of

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<sup>9</sup> An immigrant is defined as an individual born outside the US and with both parents being foreign-born.

family income. The vectors  $\theta_{s,0}$  and  $\theta_{s,1}$  refer to state fixed effects while vectors  $\gamma_{j,0}$  and  $\gamma_{j,1}$  refer to year fixed effects. Standard errors are clustered at the state level.

Another important objective of our analysis is to explore the evolution of immigrant's time-use behavior, and analyze the extent to which foreign-born assimilate to the behavior of native-born population. In particular, we examine how the changes in participation and time allocated to activities depend on the time immigrants spent in U.S. and on being a second generation immigrant<sup>10</sup>. To explore this, in Eq. 1 and Eq.2 we include the dummies  $YSM_1, YSM_2, YSM_3$  that equal 1 if the respondent spent less than 10 years ( $YSM_1$ ), between 11 and 20 years ( $YSM_2$ ), and more than 20 years in the US ( $YSM_3$ ), respectively. In the same way, we include a dummy that equals 1 for *second generation* immigrants, and 0 otherwise.

## 4.2 Comparing immigrants and natives time-use distributions

How large are the differences in the overall allocation of time between immigrants and native-born? Are time-use gaps due to the differences in the probability to participate in some activities (i.e. activity mix) or due to differences in their duration? What is the gender dimension of these time-use differences? Do we observe assimilation over time? In the second step of our analysis, using the estimates on immigrants-natives gaps for each activity described in *Section 4.1* above, we answer these questions by comparing the distributions of daily time-use between immigrants and native-born by gender and by time immigrants have spent in the U.S.

Let  $t_{ij}$  be the average time devoted by population  $i$  to activity  $j$  and  $t_i = \sum_j t_{ij}$  the total time (total length of the day). Our distribution of interest is  $(\tau_{ij} = t_{ij}/t_i)_{j=1,\dots,J}$ , where  $J$  is the number of

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<sup>10</sup> A second generation immigrant is defined an individual born in the US and with both parents foreign-born.

activities. To compare the distributions of two sub-populations,  $i = 0,1$ , we use the mean squared deviation (MSD):

$$MSD = \frac{1}{N} \sum (\Delta\tau_j)^2$$

where  $\Delta\tau_j = \tau_{1j} - \tau_{0j}$ . The MSD is non-negative, and takes the value zero when the two distributions are perfectly similar ( $\tau_{1j} = \tau_{0j}$ , for all  $j$ ) and is larger for more dissimilar distributions.

We calculate the MSD in two ways. First, we compute  $\Delta\tau_j$  using unconditional sub-population averages as described in section 4.1 above. Second, we compute  $\Delta\tau_j$  using the estimated differences between sub-populations, conditional on the demographic and socio-economic characteristics of the individuals (as described in section 4.1 above). The latter can be interpreted as ‘residual’ differences in time use between the populations of interest after taking account of observable characteristics. In more detail, let index  $i$  take the values 0 for native-born and 1 for immigrants (or for a specific category of immigrants). For native-born ( $i = 0$ ) we use the original values reported in ATUS. For immigrants ( $i = 1$ ) we estimate conditional durations in minutes using the equality  $t_{ij} = p_{ij}\theta_{ij}$ , where  $p_{ij}$  is the probability of a member of population  $i$  to participate in activity  $j$  and  $\theta_{ij}$  is the average daily duration of activity  $j$  for those who participate in activity  $j$ . Using the results of the extensive margin model (eq. 1), we estimate  $p_{1j}$  as  $p_{1j} = p_{0j} + m_{1j}$  where  $m_{1j}$  is the estimated marginal impact of being in population 1 (i.e. immigrant) on the probability to be involved in activity  $j$  (the coefficient  $\beta_0$  of the model in eq. (1) estimated for activity  $j$ ); and, using the results of the intensive margin model (eq. 2), we estimate  $\theta_{1j}$  as  $\theta_{1j} = \theta_{0j} + \mu_{1j}$  where  $\mu_{1j}$  is the estimated marginal impact of being in population 1 on the

duration of activity  $j$  (the coefficient  $\beta_1$  of the model in eq. (2) estimated for activity  $j$ ). Then, we estimate  $t_{ij}$  as  $t_{ij} = p_{ij}\theta_{ij}$ .

The MSD can be decomposed in four parts.<sup>11</sup> Each part measures the impact of a specific difference in time-use on the MSD. The expression of the decomposition is the following:

$$MSD = IMP_{PART} + IMP_{DUR} + IMP_{CORR} + IMP_{DIFF} \quad (3)$$

where

$$IMP_{PART} = \frac{1}{4N} \left( \frac{1}{t_1} + \frac{1}{t_0} \right)^2 \sum (\bar{\theta}_j \Delta p_j)^2$$

measures the impact on MSD of the differences in participation rates, while

$$IMP_{DUR} = \frac{1}{4N} \left( \frac{1}{t_1} + \frac{1}{t_0} \right)^2 \sum (\bar{p}_j \Delta \theta_j)^2$$

measures the impact of differences in durations for participants, and

$$IMP_{CORR} = \frac{1}{8N} \left( \frac{1}{t_1} + \frac{1}{t_0} \right)^2 \sum \Delta p_j^2 \Delta \theta_j^2$$

measures the impact of the correlation between differences in participation rates and differences in durations. As for the last term:

$$IMP_{DIFF} = \frac{1}{N} \left( \frac{1}{t_1} - \frac{1}{t_0} \right)^2 \sum \bar{t}_j^2 + \frac{1}{2N} \left( \frac{1}{t_1^2} - \frac{1}{t_0^2} \right) \sum (t_{1j}^2 - t_{0j}^2)$$

it measures the impact of the inequality  $t_0 \neq t_1$  – that is the overall duration of the time diaries respectively for natives and immigrants - on our decomposition. This term is zero ( $t_0 = t_1$ ) when

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<sup>11</sup> All steps and algebraic expressions leading to the MSD decomposition are reported in the Online Appendix.

we use unconditional differences. When using the conditional estimates, a discrepancy in overall time budgets emerges; this is generally marginal but should be duly taken into account.

## 5. Results

### 5.1 Do immigrants use their time differently compared to native-born?

In this section, we first present differences in the overall allocation of time by immigrant status and by gender using the MSD decomposition outcomes on the whole set of activities (n. 62). Then, we highlight the specific activities where immigrants differ the most from native-born. *Table 2* displays the results of MSDs of time-use between immigrants and native-born, by gender. The first two columns display the unconditional results – that is differences that do not account for socio-economic features of the two sub-populations – while the last two columns display the conditional results. The first row shows the total MSD while the other rows show its decomposition as described above.

#### **Table 2 here**

Three main results emerge from *Table 2*. First, the immigrant-native differences in time use are larger for men than for women (0.291 and 0.139, respectively, using the conditional MSD). Second, differences in observables socio-economic characteristics do not explain the immigrant-native differential in time use. For men the total MSD becomes even larger when accounting for the observable characteristics, but this increase in the MSD (+0.055) is more than offset by the negative impact of differences in estimated duration of the day (-0.086). For women, differences in time use partly come from differences in demographic and socio-economic characteristics between immigrants and native-born. This is inferred by the decrease of conditional MSD from



0.206 to 0.139. Third, for men, the immigrants-native differential in time use is mainly explained by participation, while for women the differences are mostly explained by duration. Male immigrants allocate their time to a mix of daily activities which is significantly different from male native born even controlling for factors such as age, family composition, educational levels, income, state of residence. For female immigrants, the differences in the type of daily activities in which they engage in an average day is less relevant, divergence in time use mostly depends on duration.

The important difference between men and women leads us to have a closer look at gender specialization in time use separately for immigrants and native-born. Three main results emerge from this analysis that is reported in Table 3. First, immigrants present larger gender differences in time use than native-born as shown by the absolute value of the MSD (1.539 versus 0.577). The gender gap is persistently and significantly higher when controlling for observable characteristics. Second, these differences are largely explained by differences in participation while differences in duration are similar compared to native-born. These results provide evidence of a higher gender specialization of immigrants in daily activities.

**Table 3 here**

Moreover, there is a high positive correlation between participation rate and intensity of participation: when women immigrants have a higher (resp. lower) probability to engage in an activity compared to men, the duration of this activity for those who engage in is longer (resp. shorter) compared to men.

Graph 1 and Graph 2 plot the largest immigrant-native differentials in participation (differential higher than 5%) and duration (differential higher than 15 minutes) by gender, respectively. Each

activity included in either graph is represented by a segment with, at one extremity, the unconditional value (The label of the activity is followed by Unc) and, at the other extremity, the conditional value (The label of the activity is followed by Cond).

### **Graph 1 here**

Looking first at Graph 1, we see that the largest immigrant-native differentials in participation have a clear structure. There are four groups of activities. The first one includes activities linked to home: cooking, cleaning, preparing food, and physical child care. Immigrant women participate more in these activities than native-born women, while immigrant men participate less than native-born men. The second group includes working on the main job and commuting. At odds to the first group, when looking at unconditional values, we find that immigrant men participate more in these activities than native-born men, while immigrant women participate less than native-born women. The third group includes activities mainly linked to leisure: walking with dogs, travelling, reading, going to restaurants and bars, playing games, visiting friends, having adult care. Both men and women immigrants are less involved in these activities than their native-born counterparts. These are activities that are typically labelled in previous studies on time use as assimilating activities (Hamermesh and Trejo 2013; Muchomba and Kaushal 2022) and it is interesting to note that for differences are only partly explained by observable characteristics. The last group includes two activities, relaxing and supervising children. When looking at unconditional values, both men and women immigrants are more involved in these activities than their native-born counterparts. Then, the strong gender specialization of immigrants rests mainly upon activities linked to home and to employment.

Graph 1 also illustrates a strong tendency of conditional immigrant-native differentials in participation to be smaller than unconditional ones. In most cases, the extremity of the segment

corresponding to the conditional values is closer to 0 than the extremity of the segment corresponding to the unconditional one. This observation is coherent with the fact that the socio-demographic characteristics of immigrants contribute to the immigrant-native differentials.

However, for the first two groups, the change in the immigrant-native differential is observed for women only, the change being small for men. This conforms to the decomposition of Table 2, where we found that the conditional impact of differences in participation was lower than the unconditional one for women, not for men. Moreover, the decrease in the impact of participation on gender specialization when we move from unconditional to conditional values comes mainly from immigrant women, who look closer to immigrants once we take account of their socio-demographic structure; while the impact of the socio-demographic structure does not look important for men.

Looking now at Graph 2, the picture displays a much less clear structure. We can however note that most activities are close to the main diagonal, which implies that differences between immigrants and native-born are similar for men and women, and then that, contrary to participation, differences in durations only have a small contribution to the high gender specialization of immigrants compared to native-born, as noted in Table 3.

## Graph 2 here

The activities where participating immigrants spend significantly more time than participating native-born are mainly related to work and to home. As for activities linked to work, using conditional values, immigrant men (women) allocate, on average, 75 minutes (67 minutes) more to a second job, 33 minutes (37 minutes) more to main job, and 7 minutes (8 minutes) more to commuting. Estimations also show that immigrant men spend half an hour more looking for jobs, but the same amount of time working from home as the native-born. Instead, immigrant women spend the same amount of time looking for jobs but 21 minutes more working from home than native-born women. As for activities linked to home, both men and women immigrants involved in cooking, cleaning, laundry, purchases, personal care services devote more time to these activities than similar native-born (using conditional values).

Conversely, the activities where immigrants spend significantly less time than native-born are mainly related to leisure: hobbies, gardening, watching TV, attending sports, listening music, cycling.

Last, confirming the results of Table 2, there is no evidence that conditioning on socio-economic characteristics leads to activity durations of immigrants that are closer to native-born. Globally, the extremities of the segments corresponding to conditional values are not closer to the origin than the extremities of the segments corresponding to unconditional values.

To summarize, differences in time use between immigrants and native-born are mainly driven by three types of activities: activities linked to labor, home and leisure. In the first two groups of activities, the differences between immigrants and native-born mainly come from participation rates, and differences in participation rates strongly differ between men and women: in activities related to labor, there is a higher involvement of men immigrants and a lower involvement of

women immigrants compared to their native-born counterparts. Conversely, in activities related to home, there is a higher involvement of women immigrants and a lower involvement of men immigrants compared to their native-born counterparts. For both types of activities, participating immigrants spend more time than native-born, for both genders. The divergent behavior of activities related to labor and home contributes strongly to the higher gender specialization of immigrants. As for the third group of activities, which are linked to leisure, they are characterized by both a lower participation rate and a lower duration of participants for both genders. Last, the specific sociodemographic characteristics of immigrants significantly contribute to differences in participation rates between immigrants and native-born, while they have no clear impact on differences in activity durations.

## **5.2 Do immigrants assimilate with native-born in terms of time allocation?**

In this section, we explore whether the time allocation of immigrants converges towards that of native-born with years immigrants reside in the U.S. This is regarded by the literature as a measure of assimilation of immigrants with native-born in time expenditures. We also explore whether second-generation immigrants show a more accentuated assimilation pattern compared to first-generation immigrants. For both first and second-generation immigrants we then explore the extent to which assimilation depends on demographic and socio-economic characteristics or on changes in time-use behavior.

As in the previous section, we start with synthetic measures that compare the overall pattern of time use and differences with respect to native-born for four groups of immigrants: first-generation immigrants whose respective durations of stay are 10 years at most, from 11 to 20, and above 20; and second-generation immigrants. This comparison is carried out separately for men and women. Then, we enter more in detail, looking at specific assimilation activities.

Table 4 shows the results of the calculation of MSD of time use between immigrants - classified by years of residence in the U.S. - and native-born, and the MSD of time use between second-generation immigrants and native-born. The MSDs are calculated for men and women, separately. Panel 1 of Table 4 shows the unconditional MSDs, which do not take account of the sociodemographic characteristics of individuals. Panel 2 shows the conditional MSDs, calculated after controlling for the sociodemographic characteristics.

The results provide evidence of convergence in terms of time use, both for men and women. Moreover, long-standing residents of both genders are like second-generation immigrants. However, there are important differences between genders. For men, the total unconditional MSD decreases after 20 years of stay only, while the conditional MSD decreases immediately, between less than 10 years and 10 to 20 years. This divergence suggests that men immigrants converge fairly quickly but incompletely to the distribution of time use of native-born having the same socio-demographic characteristics, but that the specific sociodemographic structure of the immigrant men population still generates important differences at the level of the whole population.

#### **Table 4 here**

The dynamics of time-use differences of women immigrants compared to native ones is quite different. Looking first at unconditional MSDs, we see that differences progressively decrease over time. A closer look at conditional MSDs suggests that the relatively small differences – net of the role of observable socio-economic characteristics – are rather persistent and experience little change with time since migration. This difference suggests that the distribution of time use by women immigrants converges very slowly to the distribution of similar native-born and that the unconditional convergence almost exclusively comes from changes in the sociodemographic structure of the immigrant population when the duration of stay increases.

Last, looking at the decomposition of the conditional total MSD, we see that, for men, the decrease of the MSD is mainly generated by a decrease in the differences in participation, while the impact of differences in durations by participants is fairly stable. For women, the slow convergence in time use is mainly generated by smaller differences in duration; this effect is however counteracted by an increasing impact of correlation: while for recent immigrants a higher probability of participating does not go along with longer durations, for long staying immigrants, they do.

Finally, second-generation immigrants with the same demographic characteristics as native-born allocate time similarly to the native-born (MSD = 0.024 for men, and MSD = 0.028 for women). This result suggests a sustained degree of convergence but not yet full assimilation with native-born in terms of time use. Moreover, second-generation immigrants have much lower conditional MSDs of time use compared to first-generation immigrants residing for more than 20 years in the U.S. This result shows that the assimilation pattern of immigrants born in the U.S. is quite different from that of previous immigrants, and that changes in time-use behavior (due to culture, habits, preferences) may occur across generations.

In Section 4.1, we found that gender specialization was much higher for immigrants than for native-born and that the activities that are at the core of this higher gender specialization are activities linked to labor and house-keeping. How does this higher gender specialization for immigrants evolves with duration of stay? Table 5 helps us answering the question, showing the result of MSD of time use between men and women, by duration of stay in the U.S. and second generation.

**Table 5 here**

We find evidence of a steady but incomplete convergence of gender specialisation, both for unconditional (Panel 1) and conditional analysis (Panel 2). This convergence is almost exclusively driven by convergence in participation rates; differences in duration only have a small effect on convergence. Conversely, second-generation immigrants are similar to native-born, and even show a slightly more similar distribution of time across genders compared to them (0.521 vs. 0.591).

Graphs 3 and 4 show the impact of duration of stay on immigrants-native differentials for probabilities of participation (Graph 3) and time devoted to each activity by participants (Graph 4).

### **Graph 3 here**

On both graphs, each activity is represented by a segment. One extremity of the segment is the conditional value for recent immigrants (less than 10 years of stay; the activity name is followed by <10) while the other extremity is the conditional value for long staying immigrants (more than 20 years of stay; the activity name is followed by >20). For sake of clarity, in each graph, we only include the activities with the largest changes from recent to long staying immigrants: at least a 3% change for differentials in participation rates for one of the genders (Graph 3) and at least a 3 minutes change in durations for one of the genders (Graph 4)<sup>12</sup>.

In the previous section, we were noting that the main source of the higher gender specialisation of immigrants were job related activities, with a higher rate of participation of men immigrant men compared to native-born, and a lower rate of participation of women immigrants compared to native-born; and home related activities, with a lower rate of participation of immigrant men compared to native-born, and a higher rate of participation of women immigrants compared to

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<sup>12</sup> Moreover, for Graph 4, for sake of visibility, we excluded the activity Main Job, which is an outlier.



native-born. Graph 3 shows that these two types of activity contribute both to the convergence of immigrants to native-born and to the lower gender specialisation of long-staying immigrants compared to recent immigrants.

Looking first at job related activities (main job and commuting), duration of stay decreases the immigrants-native differential for men and increases it for women. Then, as men have a higher rate of participation in these activities, the men-women differential for immigrants is narrowed, moving closer to that of native-born. Looking at home-related activities, particularly cooking and cleaning, we see that immigrants-native differentials are smaller, which implies convergence.

In the third quadrant of Graph 3, we mainly find activities linked to leisure. In the previous section, we noted that, for these activities, immigrants of both genders have a lower participation rate than natives, so that these activities contribute to the specificity of time use by immigrants but do not contribute to the higher gender specialisation of immigrants. It is clear from Graph 3 that, for all these activities, the immigrants-natives differential narrows for both genders. Then, these activities also contribute to convergence between immigrants and native-born, but do not contribute to the decrease in the gender gap.

Moving to Graph 4, we see that working on the main job is a clear outlier. Recent men immigrants who are at work devote 74 minutes more to their primary job than comparable native-born men; this is by far the highest conditional immigrants-natives differential, the second one being 17 minutes for sleeping. For women, the conditional immigrants-natives differential is much lower (11 minutes) but still among the highest. Moving from recent immigrants to long-standing immigrants strongly reduces the immigrants-native differential for men (from 74 to 49 minutes) while it largely increases it for women (from 11 to 35 minutes).

#### **Graph 4 here**

As for the other activities, in almost every case, the immigrants-natives differentials are smaller for long-standing immigrants than for recent immigrants. Moreover, this change with duration of stay is usually smaller for men than for women and, for the latter, is particularly important, for cooking, sleeping, caring, being on internet and doing meals.

Then, for men, the small reduction of the contribution of the impact of differences in duration on the MSD observed in Table 4 (from 0.101 to 0.84) when we move from recent to long-duration immigrants is likely to come almost entirely from the change in time spent in the main job. For women, the reduction of the contribution of the impact of differences in duration on the MSD observed in Table 4 when we move from recent to long-duration immigrants is larger (from 0.120 to 0.049). Contrary to men, it cannot be attributed to time spent in the main job, as for women the immigrants-native differential increases with time spend in the U.S. It is more global, coming from a large set of activities, notably activities that are closely linked to gender specialization.

### **6. Conclusive remarks**

Migration studies in social sciences have often focused on the analysis of gaps in market and non-market outcomes – such as employment rate, wages, education, crime, health outcomes etc. - of immigrants vis-à-vis native-born. In this study we focus our attention on how immigrants and native-born in the U.S. allocate their most scarce and precious resource: time. To some extent using this specific angle of observation shifts the analysis from an outcome based approach to exploring the processes that lead to different and complex outcomes. Our study, based on a large sample of immigrants in the U.S., reveals important elements of time allocation processes and enhances our comprehension of immigrant integration but also uncovers the nuanced interplay of

socio-economic and immigrant-specific factors. Our work's novelty stems from its granular approach. Previous studies, albeit insightful, were often siloed in their focus on specific activities. Our research, conversely, offers a broad view, harnessing a comprehensive set of activities, rigorous metrics, and a refined segmentation of the immigrant demographic. The insights of the paper highlight gaps in time use between native-born and immigrants but also specific gender dynamics in the allocation of time of the immigrant population and relative assimilation pathways.

Detailed investigation into specific activities reveals different assimilation patterns across genders and immigrant generations. For instance, for men immigrants, participation in market work, education, and certain sub-activities like work search, work travel, and unspecified activities at the workplace does not show a diminishing difference with native-born, even with increased years of stay. However, second-generation immigrant men generally don't display statistically significant differences from native-born, except in certain areas like second job and civic/volunteer activities.

Women immigrants show a varied assimilation pattern. Newly arrived women immigrants participate around 2 percent less in main job roles than native-born women, while those who have stayed for over 20 years participate about 5 percent more.

Additionally, both men and women immigrants typically allocate more time to certain activities, such as market work and education, than native-born. This is possibly due to perceived higher returns from these activities, especially in aiding their assimilation process. By the second generation, assimilation in the labor market appears almost complete. While our analysis control for observable socio-economic characteristics, the intricacies of cultural nuances, latent biases, or unobserved variables might still influence time-use behaviors. Furthermore, the inherent limitation of cross-sectional data implies that we glean insights into patterns at a particular time point, rather than capturing the dynamism of evolving immigrant behaviors.

The potential for future research in time use with a focus on immigrants is wide. Longitudinal studies could shed light on evolving time-use behaviors across immigrant generations. Moreover, delving deeper into specific sub-populations, such as refugees or specific ethnic groups or countries of origin, could yield nuanced insights about distinct time allocation patterns. Another promising avenue for research is related to contextual factors – such as the presence of localized diasporas or the rural/urban dimension of the host areas – as determinants of time-use of immigrants. The degree of spatial segregation of immigrants might be an important driver of the differences highlighted in this paper. Iceland and Scopilliti (2008) find that immigrants who have resided in the United States for longer periods are generally less segregated than new arrivals. Heterogeneous patterns of segregation for immigrants also emerge based on the intensity of immigration in host areas (Hall 2013). The inclusion in our analysis of the role of geographical concentration of immigrants might deliver new interesting insights into their diverging behaviors in time allocation.

In summation, our exploration underscores the profound significance of understanding time-use behaviors among immigrants. As the US continues its trajectory as a mosaic of diverse populations, such insights not only enrich academic discourse but also inform policy, integration initiatives, and societal cohesion efforts.

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## Tables and figures

**Table 1.** Sample means by immigration status and gender.

VARIABLES	Total		MEN		WOMEN	
	Native- born	Immigrants	Native- born	Immigrants	Native born	Immigrants
	Mean	Mean	Mean	Mean	Mean	Mean
Age (years)	45	43	44	42	46	43
Women	0.52	0.50				
Married	0.51	0.63	0.53	0.64	0.49	0.62
No children	0.76	0.59	0.76	0.59	0.73	0.54
Children 0-2 years	0.07	0.13	0.07	0.12	0.08	0.13
Children 3-5 years	0.07	0.14	0.07	0.13	0.08	0.14
Children 6-12 years	0.13	0.25	0.12	0.23	0.14	0.26
Children 13-17 years	0.10	0.17	0.09	0.15	0.10	0.18
Less than elementary	0.00	0.01	0.00	0.01	0.00	0.01
Elementary	0.00	0.04	0.00	0.04	0.00	0.03
Middle	0.02	0.12	0.02	0.12	0.02	0.11
Secondary	0.69	0.56	0.69	0.55	0.69	0.56
Degree	0.19	0.17	0.19	0.16	0.19	0.17
Post graduate	0.10	0.12	0.10	0.13	0.10	0.11*
Holiday/weekend	0.30	0.30	0.30	0.31*	0.30	0.30*
Observations	135,733	24,447	60,587	11,165	75,146	13,282

*Note:* Our elaboration on ATUS data 2003-2019. Means are assessed using probability weights. All differences between means are significant at 1%, except those with \* ( $p > 0.1$ )

**Table 2.** Conditional and unconditional Mean Square Deviation (MSD) of overall time-use between migrants and native-born, by gender (ATUS 2003-2019).

	<b>Unconditional</b>		<b>Conditional (1)</b>	
	Men	Women	Men	Women
Total MSD	0.237	0.206	0.292	0.139
<b>Decomposition</b>				
Differences in participation ( $IMP_{PART}$ )	0.127	0.076	0.161	0.035
Differences in duration ( $IMP_{DUR}$ ),	0.087	0.086	0.089	0.085
Correlation between ( $IMP_{CORR}$ ),	0.023	0.044	0.128	0.033
Differences in total day duration ( $IMP_{DIFF}$ )			-0.086	-0.015

*Note:* (1) Conditional MSD are computed using estimates from eqs. (1) and (2) thus controlling for age, marital status, number of children by age groups, educational level, family income, time of interview (weekend or weekday), US State of residence.

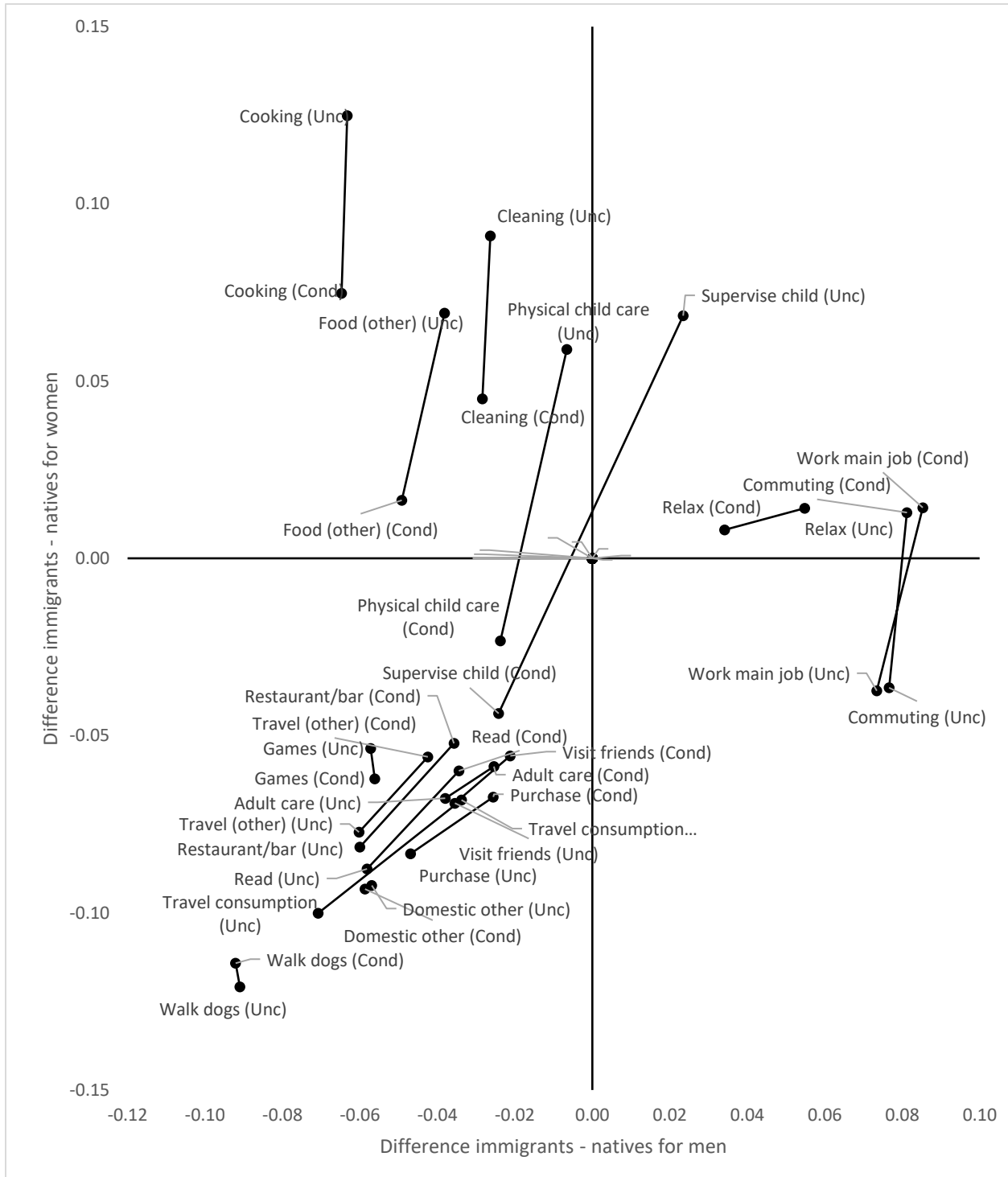


**Table 3.** Conditional and unconditional Mean Square Deviation (MSD) of overall time-use between men and women by immigration status (1). (ATUS 2003-2019).

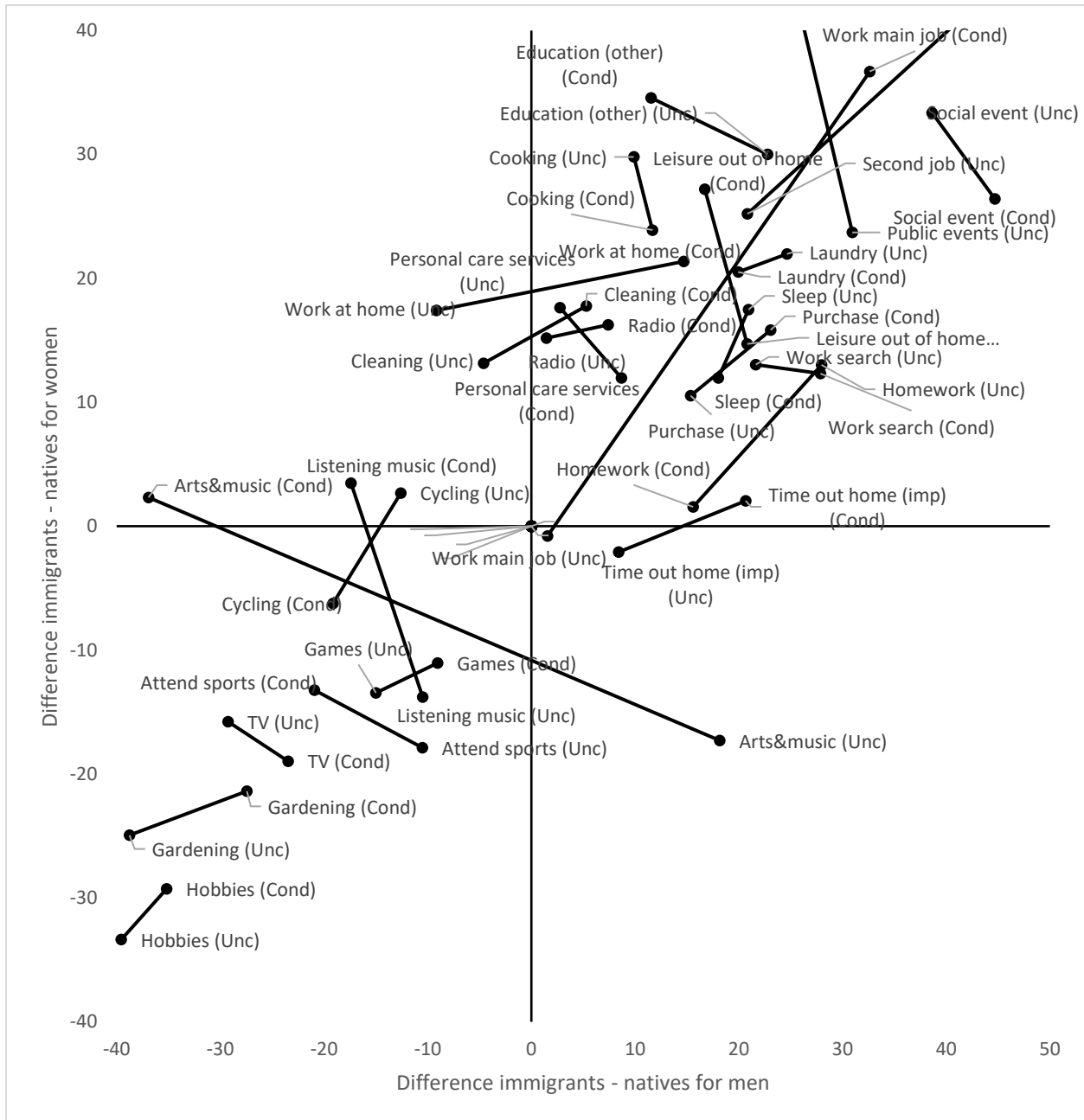
	Native-born	Immigrants	
		Unconditional	Conditional (2)
Total MSD	0.577	1.539	1.078
<b>Decomposition</b>			
Differences in participation ( $IMP_{PART}$ )	0.249	0.964	0.696
Differences in duration ( $IMP_{DUR}$ ),	0.119	0.096	0.087
Correlation between ( $IMP_{CORR}$ ),	0.209	0.479	0.354
Differences in total day duration ( $IMP_{DIFF}$ )			-0.059

*Note:* (1) As the unconditional and conditional distributions are the same for native-born, the MSD and its decomposition do not change; (2) Conditional MSD are computed using estimates from eqs. (1) and (2) thus controlling for age, marital status, number of children by age groups, educational level, family income, time of interview (weekend or weekday), US State of residence.

**Graph 1.** Largest Immigrant-native difference in participation by gender



**Graph 2.** Largest Immigrant-Native differences in activity durations by gender



**Table 4.** Conditional and unconditional Mean Square Deviation (MSD) of overall time-use between immigrants, second generation and native-born, by duration of stay and by gender. (ATUS 2003-2019)..

<b>PANEL 1. Unconditional</b>	<b>Men</b>				<b>Women</b>			
	<b>&lt;10</b>	<b>11-20</b>	<b>&gt;20</b>	<b>Second-g</b>	<b>&lt;10</b>	<b>11-20</b>	<b>&gt;20</b>	<b>Second-g</b>
Total MSD	0.321	0.320	0.164	0.164	0.397	0.288	0.112	0.094
<b>Decomposition</b>								
(1) Differences in participation	0.153	0.185	0.086	0.046	0.198	0.094	0.037	0.035
(2) Differences in duration	0.134	0.122	0.054	0.073	0.137	0.121	0.049	0.049
Correlation between (1) & (2)	0.034	0.013	0.024	0.045	0.063	0.074	0.026	0.011
<b>PANEL 2. Conditional</b>	<b>Men</b>				<b>Women</b>			
	<b>&lt;10</b>	<b>11-20</b>	<b>&gt;20</b>	<b>Second-g</b>	<b>&lt;10</b>	<b>11-20</b>	<b>&gt;20</b>	<b>Second-g</b>
Total MSD	0.425	0.229	0.195	0.024	0.166	0.158	0.136	0.028
<b>Decomposition</b>								
(1) Differences in participation	0.265	0.142	0.074	0.006	0.057	0.040	0.050	0.006
(2) Differences in duration	0.101	0.085	0.084	0.018	0.120	0.094	0.049	0.015
Correlation between (1) & (2)	0.174	0.073	0.091	-0.00	0.004	0.035	0.053	0.007
Differences in total day duration	-0.11	-0.07	-0.05	0.003	-0.01	-0.01	-0.02	0.000

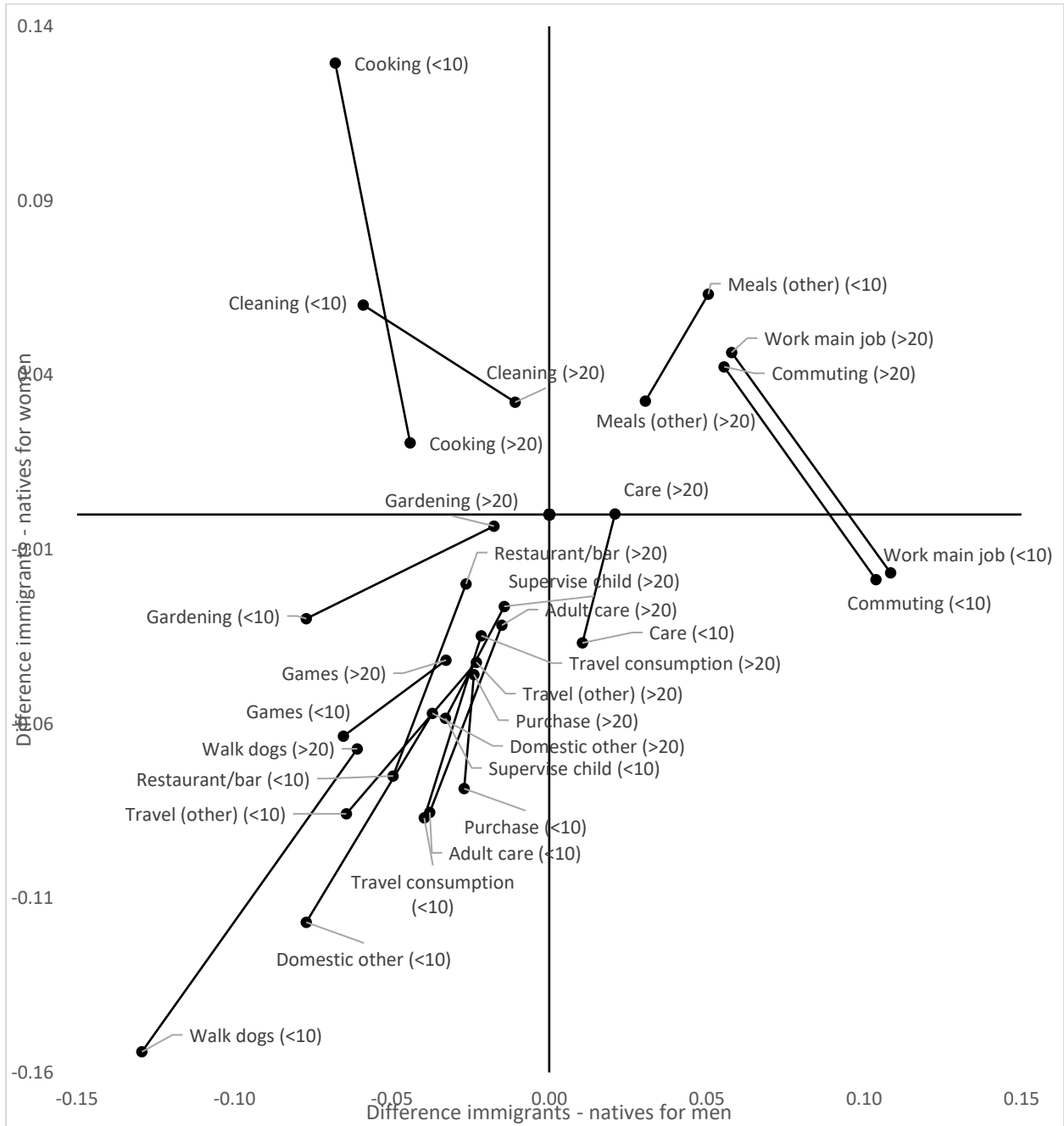
*Note:* Conditional MSD are computed using estimates from eqs. (1) and (2) thus controlling for age, marital status, number of children by age groups, educational level, family income, time of interview (weekend or weekday), US State of residence. Three categories for duration of stay are included: less than 10 years (<10), between 11 and 20 years (11-20), over 20 years (>20). Second-g. are defined as individuals born in the U.S with both parents born abroad.

**Table 5.** Conditional and unconditional Mean Square Deviation (MSD) of overall time-use between men and women, by duration of stay and by immigration status (ATUS 2003-2019).

<b>PANEL 1. Unconditional</b>					
	<b>Native-born</b>	<b>&lt;10</b>	<b>11-20</b>	<b>&gt;20</b>	<b>Second-g</b>
Total MSD	0.591	1.892	1.746	1.084	0.418
<b>Decomposition</b>					
(1) Differences in participation	0.255	1.304	1.115	0.565	0.172
(2) Differences in duration	0.121	0.089	0.104	0.109	0.103
Correlation between (1) & (2)	0.214	0.5	0.526	0.411	0.142
<b>PANEL 2. Conditional</b>					
	<b>Native-born</b>	<b>&lt;10</b>	<b>11-20</b>	<b>&gt;20</b>	<b>Second-g</b>
Total MSD	0.591	1.517	1.025	0.715	0.521
<b>Decomposition</b>					
(1) Differences in participation	0.255	1.177	0.674	0.349	0.239
(2) Differences in duration	0.121	0.068	0.088	0.099	0.102
Correlation between (1) & (2)	0.214	0.361	0.322	0.292	0.185
Differences in total day duration	0.000	-0.089	-0.058	-0.024	-0.005

*Note:* Conditional MSD are computed using estimates from eqs. (1) and (2) thus controlling for age, marital status, number of children by age groups, educational level, family income, time of interview (weekend or weekday), US State of residence. Three categories for duration of stay are included: less than 10 years (<10), between 11 and 20 years (11-20), over 20 years (>20). Second-g. are defined as individuals born in the U.S with both parents born abroad.

**Graph 3.** Largest impacts of duration of stay on immigrant-native differences in participation by gender (conditional values)



**Graph 4.** Largest impacts of duration of stay on immigrant-native differences in activity durations by gender (conditional values)

