The Occupational Attainment of Natives and Immigrants: A Cross-Cohort Analysis

Hugh Cassidy*

December 15, 2014

Abstract

This paper investigates the occupational characteristics of natives and immigrants in the United States. Occupations are characterized by a vector of task usages (analytical, interactive, and manual) that describe the activities performed on the job. Immigrants on average perform fewer analytical and interactive tasks and more manual tasks than natives, and the task usage gaps have widened significantly in recent years. These gaps remain (but shrink) when comparing natives and immigrants in the same education group. Lower English language proficiency and living in a larger language enclave increase the task usage gaps. While immigrants' task usages tend to assimilate to natives' with time since migration, newer immigrant cohorts have experienced significantly slower occupational assimilation than earlier cohorts. These results have potentially important implications for recent findings of slower economic assimilation of recent cohorts.

Keywords: Tasks, Immigration, Assimilation.

JEL Classification: F22, J24, J62.

*Kansas State University. E-mail: hughcassidy@ksu.edu.

1 Introduction

The economic performance of immigrants is an important area of interest to economists. Early research by Chiswick (1978) suggests that immigrants assimilated quickly to natives in wages. However, later work by Borjas (1985) calls into question this result, and argues instead that immigrant quality has been in decline, generating the spurious relationship between time since migration and the native/immigrant wage gap. More recently, Borjas (2015) argues that not only has initial labor market performance of immigrants declined with newer cohorts, but that the economic assimilation rates of recent cohorts is also markedly slower than past cohorts.

A potentially important dimension of both the initial economic success and the assimilation process is the occupational attainment of immigrants. In this paper, I compare the occupational composition of natives and immigrants in the United States over the past several decades. I investigate how natives and immigrants compare over time in terms of occupations performed, as well as how the differences in occupational characteristics of immigrants vary with time since migration. I use occupational characteristics from the O*NET to derive analytical, interactive, and manual task usage levels for each occupation. This approach allows for a succinct and interpretable analysis of a large number of occupations. Past work such as Green (1999) has relied instead on a small number of occupations to investigate occupational assimilation, which ignores the large variation of characteristics within broad occupational groups. I then merge these occupational task usages with Census data from 1970 to 2010.

I find that immigrants perform fewer analytical and interactive tasks, and more manual tasks, than natives. These gaps have risen significantly over time, with the gaps in mean task usage between natives and immigrants in 2010 more than doubling between 1970 and 2000 for all three tasks considered. Compared to natives in the same education group, these gaps are smaller but are still significant. This result holds across both time periods and cohorts. However, this immigrant/native task gap narrows with time since migration as immigrants

assimilate occupationally to natives. These results are consistent with results from recent work by Imai, Stacey, and Warman (2014) and Lessem and Sanders (2014), both of which use longitudinal data sets and find that immigrants converge to their pre-migration task usage with years since migration.

While occupational assimilation occurs overall, the rate of assimilation has slowed for more recent immigrant cohorts. This finding corresponds with results from Borjas (2015) that newer immigrant cohorts are assimilating to natives in terms of wages at a slower rate. Declining occupational assimilation rates would have important effects on overall economic assimilation of immigrants. If, for example, newer immigrant cohorts are less occupationally mobile than past cohorts, they may be stuck in occupations where they are poorly matched, leading to slower wage growth and thus slower assimilation.

Borjas (2015) points to a slowdown in English language proficiency accumulation as a potentially important factor in the slowdown in wage assimilation by newer cohorts. I find that higher English language proficiency does diminish the task gaps, with more fluent English speakers performing more analytical and interactive tasks and fewer manual tasks. Incorporating language proficiency helps to explain a sizeable portion of the overall occupational assimilation, which is evidence that improved language proficiency is an important channel through which immigrants assimilate into the economy.

In addition to language proficiency, Borjas (2015) argues that an increase in the effective size of conational groups in the U.S. can help to explain the slowdown in assimilation of recent cohorts. I investigate this idea by controlling for size of an individual's ethnic and language enclave, as measured by the fraction of the individual's county that originate from the same country and the fraction that speak the same (non-English) language. I find that living in a larger language enclave implies lowers analytical and interactive task usage, and increases manual task usage. These results are consistent with either immigrants living in larger language enclaves at the expense of better occupational matches, with self-selection by immigrants based on enclave, or with enclave size providing additional information regarding

language ability not fully captured by the language proficiency variable.

This paper is organized as follows. In Section 2, I discuss the existing literature. In Section 3, I describe both the O*NET and Census data used in the analysis. I also describe the procedure for calculating the task usages. I begin the main analysis in Section 4, where I compare the task usages of natives versus immigrants across years. The central results of the paper regarding occupational assimilation are shown in Section 5. I then extend the analysis to include language and enclave size in Section 6. I conclude the paper in Section 7.

2 Existing Literature

This study is closest methodologically to Peri and Sparber (2009), which also combines several Census decennial samples with O*NET task usage variables. The focus of that paper is the effect of immigration on task specialization of natives. They find that since low-educated immigrant have a comparative advantage in manual over communication tasks due to lower English language ability, natives respond to immigration by substituting toward communication tasks. As a result, immigration has little to no impact of native wages. They do not focus on immigrant assimilation, either overall or occupationally. They do, however, provide some evidence of the task assimilation process in Figure 2 of the paper. This figure shows the relative communication to manual task usage of recent immigrants (less than ten years in the U.S.), old immigrants (more than ten years in the U.S.), and natives. This figure demonstrates a larger gap between the initial task usage ratio of natives versus immigrants for more recent years, as well a smaller gap for old immigrants, which demonstrates assimilation. In my paper, I explore in much more detail the occupational assimilation process, though their empirical findings are consistent with what I show here. In addition, I consider a longer sample by including the 2010 three-year American Community Survey (ACS).

Adserà and Ferrer (2014) investigate whether female immigrants in Canada behave as secondary workers, by merging O*NET occupational characteristics (strength and analyt-

ical) with Canadian Census data. They find that these immigrants use fewer analytical tasks, and more strength tasks, than comparable native women. They find little evidence of assimilation in task usages overall, but university-educated women exhibit some analytical task assimilation and significant physical task assimilation.

In terms of economic content, my paper is closely related to Borjas (2015), which investigates the economic assimilation of immigrants across cohorts. Borjas (2015) finds that newer cohorts have not only lower entry wages than older cohorts, but also exhibit slower assimilation rates with time since migration. While that paper does control for within- versus across-occupation wage growth, it does not discuss the occupational assimilation process of immigrants.

One of the few papers that explicitly examines occupational assimilation is Green (1999), which considers Canada during the 1980s. Green aggregates occupations into a small number of groups, and investigates how the proportion of immigrants in those occupations compares to natives across cohorts and with time since migration. He finds that immigrants tend to work in more skilled occupations than natives, but that this relationship has declined with newer cohorts. My study is similar to Green (1999), with the major innovation being the characterization of occupations by task usages instead of aggregating occupations into a small number. The task approach allows the results to be more succinct and interpretable, while maintaining the significant variation in occupational characteristics contained with a highly aggregated group. Goldman, Sweetman, and Warman (2011), using the Longitudinal Survey of Immigrants to Canada (LSIC), finds that immigrants tend to move to higher skilled occupations following migration, with the proportion of males in high skilled occupations increasing from 41.2% six months after migration to 60.5% four years after migration. Their definition of occupational skill, however, is uni-dimensional and does not incorporate the occupation's characteristics.

Finally, two papers that explicitly examine the relationship between immigrant task usage and years since migration are Imai, Stacey, and Warman (2014), which also uses

the LSIC, and Lessem and Sanders (2014), which uses the New Immigrant Survey (NIS). Both of these papers utilize a unique feature of the data sets, which is an immigrant's pre-migration occupation. This information is used to assign pre-migration task usage, which is then compared to the immigrant's current occupation in the destination country (Canada and the U.S., respectively) to calculate the immigrant's "task gap". Both studies find that immigrants tend to perform lower cognitive tasks and more manual tasks than they did prior to migration, but that this gap shrinks with time since migration.[1] These changes in task usage over time support the idea that immigrants assimilation occupationally, and that this assimilation involves increased use of cognitive tasks, and decreased use of manual tasks. Both of these studies use data that follows immigrants during the 2000s. Thus, while they provide insights into the assimilation process of immigrants, they do so for only a brief period of time. My study, on the other hand, compares the assimilation rates across a number of immigrant cohorts over several decades.

3 Data

3.1 U.S. Census

Worker data is taken from the U.S. Census Integrated Public Use Microdata Series (Ruggels et al. 2010).[2] For years 1970-2000, I use the decennial Census, while for 2010 I use the three-year pooled ACS which covers years 2008-2010. I include in my sample only men, ages 25-64, who are employed and have a valid occupational code assigned to them and who are not in the military. Immigrants are defined as those who are either non-citizens or naturalized citizens. For immigrants, I require that they have arrived to the U.S. age 18 or later. To facilitate comparison across the years, I use the Census 1990 occupation code

[1] Lessem and Sanders (2014) use only cognitive and manual tasks, while Imai, Stacey, and Warman (2014) use interpersonal, analytical, fine motor, visual, and physical strength.

[2] Data is available for download at: https://usa.ipums.org/usa/.

(*occ1990*) that is available in each of these surveys.[3]

Summary statistics of the native and immigrant samples by year are shown in Table 1. The age difference between natives and immigrants alternates from positive to negative across the different years, but both show a notable uptick in the 2010 sample. Presumably, this reflects the disproportionate unemployment rate of younger workers during the Great Recession. For both immigrants and natives, the average number of years of education has been steadily increasing. However, the overall increase has been larger for natives, who from 1970 to 2010 show an increase of 2.4 years of school on average, while immigrants show only a 1.4 year increase. Thus, the education gap between natives and immigrants has expanded in the past several decades in my sample.

3.2 O*NET

While the U.S. Census contains occupational information about both natives and immigrants, no additional details are included with regards to what type of activities are performed on the job. Previous studies of immigrants, including Green (1999) and Cohen-Goldner and Eckstein (2010) have used broad occupational classifications. However, this method ignores the fact that a substantial amount of variation exists within these broad classifications in terms of activities performed on the job. Instead, I turn to occupational task usage to characterize jobs. As the Census includes no task information, however, another data set is needed to assign task usages on the job.

For this purpose, I use the U.S. Department of Labor's O*NET.[4] This data set contains information regarding a large number of characteristics required to perform an occupation. Examples include mathematical reasoning, oral comprehension, and finger dexterity. In this paper, as in Peri and Sparber (2009), I focus on the abilities survey component of the

[3]While this code is constructed for comparability, there are a number of occupations that are not used after a given year, typically 2000. In those cases, I recode those occupations so that they are not used in any year, where I use the closest occupation as an alternative. These comprise a very small fraction of the population. Details are available upon request.

[4]This data is available for download at: http://www.onetonline.org/.

O*NET.

To facilitate the analysis, I reduce the large vector of occupational characteristics into a smaller vector of three tasks: analytical, interactive, and manual. Each characteristic is rescaled to represent the percentile of the sample in 2010 whose occupation requires lower levels of that characteristic. After this rescaling takes place, the characteristics are grouped into the task bundles, where these groupings are shown in Table 2. I take the mean over the characteristics to arrive at the final analytical, interactive, and manual tasks. Additional description of this procedure, as well as the occupational mapping performed, are available in Appendix A. Thus, task usages are by construction between zero and one.

The result of this procedure is that each occupation is assigned a vector of tasks describing the job. Table 3 provides several sample occupations and their corresponding task vectors. Physicists and astronomers have the highest analytical task usage of any occupation, at 0.96, while psychologists use the highest interactive tasks, with a value of 0.99, and finally structural metal workers utilize the most manual tasks at 0.96. Note that due to these tasks being formed by taking the mean across multiple occupational characteristics, the highest task usage occupation does not necessarily have a rank of one. The fourth occupation listed is construction inspectors, which demonstrates a mix of multiple task usages. Correlation coefficients between the tasks for the full sample are shown in Table 4. As expected, analytical and interactive tasks show a strong positive correlation, while manual tasks are strongly negatively associated with analytical and interactive tasks.

4 Task Usages: Native vs Immigrants

In this section, I compare the analytical, interactive, and manual task usages of immigrants to natives across the Census years. The first set of results, in Table 5, shows the mean task usages of immigrants and natives, as well as the difference in the means, for each survey

year.[5] Several results are worth noting. First, immigrants across all years use, on average, lower analytical and interactive tasks, and higher manual tasks, than natives. The second noteworthy finding is that, for all three tasks, the gap between immigrants and natives has widened over time. For example, in 1970, the analytical task usage gap between natives and immigrants was 0.029, while in 2000 the gap was double this value, and in 2010 the gap increased further to 0.086. Similar patterns are present for the interactive and manual tasks.

What can explain this large divergence between natives and immigrants in tasks performed? As noted above, while the average number of years of schooling has increased for both natives and immigrants, the increase has been more significant (2.4 years) for natives than for immigrants (1.4 years). As education is strongly related to occupational task usage,[6] this change may help to explain at least part of this pattern. This explanation is investigated by dividing the samples into five education categories.[7] For each education group in each survey year, I calculate the average native task usages in that group. Then, for each immigrant, I calculate the difference between their task usages and the average task usages of natives in their education group. I then take the weighted average of these differences across all immigrants.

The results from this procedure are shown in Table 6. First, note that the task usage gaps persist even when controlling for education. In fact, in 1970, controlling for education increases the gap between natives and immigrants. Between 1970 and 2000, these gaps have remained largely unchanged, except for a decline in the manual task usage gap. Between 2000 and 2010, however, there was a substantial increase in all three task usage gaps. Due primarily to this large increase in the 2000s, between 1970 and 2010, the task usage gaps between natives and immigrants within education group expanded.

Borjas (2015) also notes that the period between 2000 and 2010 was characterized by

[5]These summary statistics are weighted, where the weights are adjusted by the number of weeks each respondent has worked in the previous year.

[6]Analytical and interactive task usages increase significantly with years of education for both natives and immigrants, while manual task usage declines. Details available upon request.

[7]Education groups are divided by years of education, with: less than 6 years, 6 years, 6-9 years, 10 years, and more than 10 years of education.

significantly slower economic assimilation of immigrants. Those results are consistent with these findings, where I capture the occupational assimilation dimension of this process. One possible explanation for these observations may be that the Great Recession is influencing the results. Conceivably, if the recession disproportionately affected immigrants, then it may help to explain the large divergence observed during the 2000s. To address this question, I turn to the 2005-2007 three-year ACS Census survey (henceforth referred to as the 2007 sample). The years covered pre-date the onset of the recessionary period. I recreate Tables 5 and 6, where column (5) in each now shows the 2007 sample. All other columns are unaltered.

These results are shown in Tables 7 and 8. As shown in column (5) of each table, the task gap is largest during the 2007 survey. In the period between 2007 and 2010, there was convergence in task usage between natives and immigrants both overall (Table 7) and within age-education groups (Table 8). Thus, it appears that the rapid divergence of task usage between natives and immigrants during the 2000s was not the result of the Great Recession. Furthermore, considering only the 2000 and the 2010 survey period masks the convergence that occurred between 2007 and 2010, and so actually understates the amount of change that occurred in the 2000s.

5 Occupational Assimilation

The preceding section investigates task usages of immigrants versus natives across several Census survey periods, but does not discuss the question of occupational assimilation. In this section, I further partition the samples into immigrant cohorts, based on their year of arrival into the United States. I then investigate how the task usages of cohorts vary with years since migration, and whether the rate of change in cohorts since their time of migration varies across cohorts. This analysis is motivated partly by the results in Borjas (2015), which provides evidence that newer immigrant cohorts are not only performing more

poorly shortly after arrival to the U.S., but are assimilating more slowly than previous cohorts. Since occupational assimilation may be an important dimension in the economic assimilation process, it is natural to examine how the rate of occupational assimilation may have changed across cohorts.

I consider only immigrants who arrived in the U.S. after 1950. My first cohort group arrived between 1950-1959. The other cohorts are divided into five-year periods, starting with 1960-64 onward. This gives me a total of 11 cohorts. For ease of exposition, I start by considering only the 1965-69, 1975-79, 1985-89, 1995-1999, and 2005-2009 cohorts. I use only these groups as they allow me to look at task usage shortly following migration, since they arrived within five years of a Census survey. For this analysis, I focus on the task usage gaps between immigrants and the average native task usage in the same education group in a given year. For each of the three tasks, I compare the mean task usage gap shortly after migration (0-5 years), 10-15 years after migration, and 20-25 years after migration for the five cohorts mentioned above. These results are shown in columns (2) to (6) of Table 9, and I include the average across the five cohorts considered in column (1).

Examining column (1), which includes all cohorts, we can see that both analytical and interactive tasks exhibit convergence overall, while the pattern for manual task usage is less clear. Shortly after migration, immigrant analytical task usage is 0.064 below the task usage of their comparable native. This gap shrinks to 0.049 below natives 10-15 years after migration, and further shrinks to 0.032 below natives 20-15 years after migration. These values for the interactive task gaps are 0.086, 0.074, and 0.050 below natives, respectively. The manual task usage gap initially expands from 0.022 to 0.028 above natives, then shrinks to 0.019 above natives. These patterns demonstrate that immigrants undergo occupational assimilation of immigrants with time since migration. In addition, they are consistent with Imai, Stacey, and Warman (2014) and Lessem and Sanders (2014) that both show immigrant task usage converging to pre-migration task usages with years since migration.

Examining individual cohorts, several interesting findings become apparent. First, the

analytical task usage gap of new arrivals grew significantly between the 1965-69 and 1985-89 cohorts, from -0.047 to -0.070. As analytical task usage is positively related to earnings, this result is consistent with Borjas (2015) which found that the 1985-1989 immigrant cohort had an especially high initial wage gap with natives. The analytical task gap shrunk between the 1985-89 and 1995-99 cohort, but expanded again between the 1995-99 and 2005-09 cohorts. Again, these results echo Borjas (2015), which found the same pattern in initial wage gaps. Interactive and manual tasks, on the other hand, show little trend by cohort in initial gap, with the exception of a large increase in the gap between the 1995-99 and 2005-09 cohorts.

Turning to the patterns in assimilation rates, I find more evidence corresponding to the results in Borjas (2015), that assimilation rates have declined for more recent immigrant cohorts. For all three tasks, we see that both the 1965-69 and the 1975-79 cohorts exhibit large convergence over 20-25 years since migration. The 1985-89 cohort, on the other hand, shows convergence in the first 10-15 years since migration, but little change in the subsequent decade. The 1995-99 cohort actually diverges from natives in all three tasks in the first 10-15 years since migration. In summary, I find that more recent cohorts exhibit slower overall occupational assimilation to the average task usage of natives in the same education group.

These results are driven primarily by events in the 2000s, which is where the task usage divergence takes place. As I investigate above, a potential cause for these findings may be the Great Recession, which may have disproportionately impacted immigrants compared to natives. I address this concern in the same manner as Tables 7 and 8, where I replace the 2010 survey period with the three-year, 2005-2007 ACS Census survey (which I continue to refer to as the 2007 survey). I replicate Table 9, though due to the change in years, I adjust the cohorts used in the analysis. Instead of the 2005-09 cohort, I use the 2000-04 cohort, but leave the other cohorts the same. In addition, for the 1985-89 cohort, the third year range is no longer 20-25 years since migration but 15-20 years, while for the 1995-99 cohort, 10-15 years since migration is now 5-10 years. These results, shown in Table 10, echo those shown in Tables 7 and 8. Occupational divergence was actually greater between 2000 and

2007 than between 2000 and 2010. This is evident by comparing Tables 9 and 10, columns (4)-(6). For all three tasks, the gap between natives and immigrants is larger when 2007 is used instead of 2010. This implies that some degree of convergence actually took place for the 1985-89 and 1995-99 cohorts during the Great Recession.

Adserà and Ferrer (2014) find that task usage assimilation of female immigrants to Canada varies significantly by education level, with university-educated women showing greater assimilation than other female immigrants. I investigate the role of education on assimilation by partitioning the sample into low- and high-educated workers, where high-educated are defined as those with more than a high-school diploma, and replicating Table 9 for each group. The results are shown in Table 11 (low-educated) and Table 12 (high-educated).

The patterns found in the full sample hold in each of the subsamples: first, immigrants have lower analytical and interactive task usages and higher manual task usages than natives with the same education group; second, these gaps have expanded for newer cohorts; third, the gaps tend to shrink with time since migration; and finally, the rate of task usage assimilation has slowed for more recent cohorts. The gaps in analytical and interactive tasks are significantly larger for low-educated immigrants than high-educated immigrants. This result is consistent with higher-educated immigrants having better English language proficiency, which Imai, Stacey, and Warman (2014) find to be a significant determinant in the task usage gap of immigrants. Overall, this analysis demonstrates that the qualitative results found in the full sample do not vary greatly by education group.

The preceding results demonstrate: first, the presence of occupational assimilation, as measured by occupational task usage of immigrants compared to natives in their education group, for analytical and interactive tasks; and second, that the rate of occupational assimilation has slowed for more recent cohorts, with a notable slowdown during the 2000s. These results are based on summary statistics only, and do not control for other characteristics beyond education. To investigate the role that other immigrant characteristics may have

played on occupational assimilation, and to test whether the slowdown in occupational assimilation is statistically significant, I perform a series of regressions where the dependent variable is task usage. I include both natives and immigrants in the estimations. To begin, I include observations from the primary sample, which consists of the decennial surveys from 1970 to 2000, and the 2010 survey based on the ACS.

The results from these regressions are shown in Table 13. The dependent variable is analytical in columns (1)-(2), interactive in columns (3)-(4), and manual in columns (5)-(6). The primary independent variables of interest are the years since migration and the years since migration interacted with immigrant cohort. Note that I divide the years since migration as well as the interactions between years since migration and the cohorts by ten to make the results clearer. Thus, these values in fact represent decades since migration. I show only variables related to years since migration, though all specifications include controls for survey year, cohort. I also include age, age squared, age cubed, and years education, all interacted with immigrant. I omit the 1965-99 cohort as the reference group for the years since migration and cohort interaction. I aggregate the final two cohorts into a single, 2000-2009 cohort. Columns (2), (4), and (6) add state of residence dummy variables interacted with survey year.

The previous results suggested that the task usage gap between natives and immigrants declines with years since migration, but that this rate of decline has slowed for more recent cohorts. The results from Table 13 support these claims. While controlling for state of residence interacted with year mitigates the effect of years since migration, qualitatively the results are unchanged. Thus, I focus my discussion on the full models shown in columns (2), (4), and (6). First, note that the years since migration coefficient is positive for analytical and interactive task usages, and negative for manual task usage, and is statistically significant in all models. Since immigrants on average start with lower analytical and interactive task usages and higher manual task usage than natives, these results imply that the gap closes with time since migration. Second, the effect of years since migration varies substantially by

cohort. Consider, for example, the interaction between the 1995-99 cohort and years since migration for analytical tasks in column (2), which has a value of -0.035 and is statistically significant at the 0.1% level. This result says that the change in analytical task usage after an additional ten years since migration for the 1995-99 cohort is 0.039 less than the change for the 1965-69 cohort. Given this value, and considering that the coefficient on years since migration (divided by ten) is 0.021, years since migration actually has a negative effect on analytical task usage for this cohort.[8] In fact, as we move away from the 1965-69 cohort, the impact of years since migration declines with each successive cohort for all three tasks, with the except of the newest cohort, 2000-09, where the coefficient is only marginally significant for the interactive task specification.

Thus, the regression results support the summary statistics that a slowdown in occupational assimilation, across all three occupation task usages, has occurred for more recent immigrant cohorts. In the following section, I investigate potential causes of this phenomenon.

6 Explaining the Slowdown in Occupational Assimilation

Borjas (2015) provides two (related) explanations for the apparent slowdown in immigrant assimilation for more recent cohorts. First, fewer immigrants are becoming proficient in English in the years following arrival to the U.S. Since language proficiency is known to be strongly linked to economic success of immigrants,[9] a failure to become proficient can help explain poor wage growth. Second, belonging to a large national origin or language group may reduce an immigrant's incentive to acquire English proficiency, as they have a large "audience" to communicate with. Thus, a growth in the size of an immigrant's conational or language group in the U.S. may slow assimilation rates. In fact, Borjas (2015) estimates

[8] Though not shown, I verified that the negative effect of years since migration on the 1995-99 cohort is, in fact, statistically significant.

[9] See Chiswick and Miller (2010), among many others.

that approximately a third of the slowdown in economic assimilation of more recent cohorts can be attributed to an increase in the size of conational groups.

I investigate both of these explanations by extending the regression model described above. First, I include a control for the respondent's proficiency of speaking English, which takes values *only English*, *very well*, *well*, and *not well/does not speak English*. As language proficiency information is unavailable in the 1970 Census, I omit that survey from the estimations. I include two measures for the size of an immigrant's enclave.[10] I calculate the fraction of individuals in the same county originating from the same source country as the respondent, as well as the fraction who speak the same language, in the current survey year. These variables are denoted country share and language share, respectively. The mean fraction of conationals equals 0.023 for immigrants, while the mean fraction of language speakers equals 0.024 for non-English speakers. I set the share of conational to zero for natives, and I set the share of language speakers to zero for those who report speaking English at home.

Results from these estimations are shown in Table 14. As before, the independent variables are analytical, interactive, and manual task usages. Columns (1), (4), and (7) repeat the main analysis from the previous table. Since the 1970 survey is no longer included, I repeat the estimation for comparison. All of the results from the full sample regressions continue to hold when the 1970 Census is omitted. Columns (2), (5), and (8) add the language proficiency controls, where the omitted category is *not well/does not speak English*. As expected, higher English language proficiency is positively related to analytical and interactive task usage, and negatively related to manual task usage. Furthermore, controlling for language proficiency reduces (in absolute value) the coefficients on all of the years since migration variables. For example, the years since migration (divided by ten) coefficient for the interactive task estimation declines from 0.023 to 0.018 with the inclusion of language proficiency. These results are consistent with an improvement in language proficiency be-

[10]Here, I differ from Borjas (2015), whose results considered the effective size of a national group, and whose regression specification included as an observation unit an immigrant cohort, defined by age at arrival, source country, and year of arrival.

ing an important channel through which immigrants assimilate. As language is measured fairly coarsely, i.e. only four categories are included, these results likely underestimate the importance of improved language proficiency on occupational assimilation.[11]

The effects of ethnic and language enclaves are shown in columns (3), (6), and (9). Having a larger share of county residents from the same source country decreases interactive task usage, but has no statistically significant effect on analytical and manual tasks. Having a larger share of the county that speaks the same language reduces analytical and interactive task usages, and increases manual task usage. Thus, for all three tasks, a larger language enclave increases the task gap between natives and immigrants. These results are consistent with Borjas (2015), even though the measurement approach and estimation method differ significantly. A one standard deviation increase in the fraction of county residents from your home country, which equals 0.10, is associated with a 0.023 decrease in analytical task usage, a 0.019 decrease in interactive task usage, and a 0.028 increase in manual task usage. Controlling for enclave sizes actually increases (in absolute terms) the effect of years since migration on task usage for all three tasks.

Three explanations for the relationship between langauge enclave size and task usage are possible: first, that large language enclaves affect immigrant job search behavior, making them either slower to search or that the job search method used in enclaves disproportionately favors lower analytical and interactive, and higher manual task occupations; second, immigrants who would have otherwise worked in lower analytical and interactive, and higher manual occupations, self-select into language enclaves; and third, the size of the enclave provides a noisy measure of language ability not fully captured by the coarse language ability measure, with those living in larger language enclaves having lower language ability. This

[11]The effects of language proficiency on wages have two sources of bias. First, as language proficiency is partly a choice of immigrants, there is a risk of unobserved heterogeneity between overall skill and language ability causing an upward-bias in the estimates. Second, measurement error would likely cause a downward-bias. Bleakley and Chin (2004) and Dustmann and Van Soest (2002) both find that the downward measurement error bias is much larger than the upward unobserved heterogeneity bias, implying that OLS wage regressions which control for language ability likely understate the importance of language ability. While this study focuses on occupational attainment as measured by task usages, the close link between tasks and wages imply that a similar result is possible here.

study does not differentiate between these explanations, which is left to future work.

7 Conclusion

In this paper, I compare native and immigrant occupational attainment, where occupations are characterized by the tasks performed. Immigrants on average perform fewer analytical and interactive tasks and more manual tasks than natives, and this gap has grown significantly in the past few decades. Even within education groups, the gap remains, and saw a large expansion between 2000 and 2010.

Immigrant cohorts tend to assimilate occupationally to natives with time since migration, as measured by a decline in the gaps between immigrants and natives in the same education group for all three tasks considered. However, newer immigrant cohorts have shown significantly slower occupational assimilation rates compared to previous cohorts. Controlling for English language proficiency can explain some of the observed relationship between time since migration and task usage, implying that improvement in proficiency may be an important dimension of the occupational assimilation process.

These results are consistent with recent work by Borjas (2015), which argues that newer immigrant cohorts have both higher initial wage gaps compared to natives than past cohorts, but also show significantly slowler wage growth with time since migration. Since a potentially important component of overall economic assimilation is assimilation in occupation performed, I believe that this paper adds an important element to the debate regarding the economic performance of immigrants in the U.S.

Table 1: Summary Statistics by Year, Native versus Immigrant

	(1) 1970 mean/sd	(2) 1980 mean/sd	(3) 1990 mean/sd	(4) 2000 mean/sd	(5) 2010 mean/sd
Age (Natives)	42.7	40.5	40.5	42.1	43.6
	10.9	10.3	10.3	10.0	10.8
Years of Education (Natives)	11.4	13.4	13.4	13.6	13.8
	3.6	2.7	2.7	2.5	2.5
Age (Immigrants)	40.8	41.1	41.1	41.6	43.1
	9.7	10.1	10.1	9.9	10.1
Years of Education (Immigrants)	10.8	11.8	11.8	12.2	12.2
	4.9	4.9	4.9	4.7	4.6
Observations	711575	2397064	2397064	2632533	1690573

Source: 1970, 1980, 1990, 2000, and 2010 IPUMS Census.

Table 2: Task Bundle Definitions

Task Bundle	O*NET Variables
Analytical	Fluency of Ideas, Originality, Problem Sensitivity, Deductive Reasoning, Inductive Reasoning, Information Ordering, Category Flexibility, Mathematical Reasoning, Number Facility, Memorization, Speed of Closure, Flexibility of Closure
Interactive	Oral Comprehension, Written Comprehension, Oral Expression, Written Expression
Manual	Arm-Hand Steadiness, Manual Dexterity, Finger Dexterity, Control Precision, Multilimb Coordination, Response Orientation, Rate Control, Reaction Time, Wrist-Finger Speed, Speed of Limb Movement, Static Strength, Explosive Strength, Dynamic Strength, Trunk Strength, Stamina, Extent Flexibility, Dynamic Flexibility, Gross Body Coordination, Gross Body Equilibrium

Table 3: Sample Occupational Task Usages

Occupation	Analytical	Interactive	Manual
Physicists and Astronomers	0.96	0.87	0.059
Psychologists	0.91	0.99	0.06
Structural Metal Workers	0.22	0.12	0.96
Construction Inspectors	0.57	0.65	0.40

Table 4: Task Usage Correlations

	Analytical	Interactive	Manual
Analytical	1		
Interactive	0.798***	1	
Manual	-0.588***	-0.799***	1

Source: 1970, 1980, 1990, 2000, and 2010 IPUMS Census.
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 5: Task Usage by Year, Overall

	(1) 1970 Mean	(2) 1980 Mean	(3) 1990 Mean	(4) 2000 Mean	(5) 2010 Mean
Analytical					
Natives	0.462	0.491	0.495	0.501	0.504
Immigrants	0.433	0.449	0.439	0.443	0.418
Difference	0.029	0.042	0.056	0.058	0.086
Interactive					
Natives	0.459	0.487	0.489	0.499	0.508
Immigrants	0.404	0.424	0.418	0.419	0.394
Difference	0.055	0.064	0.071	0.080	0.114
Manual					
Natives	0.522	0.499	0.492	0.484	0.474
Immigrants	0.537	0.522	0.524	0.518	0.541
Difference	-0.015	-0.023	-0.032	-0.034	-0.067
Observations	711575	2043175	2397064	2632533	1690573

Source: 1970, 1980, 1990, 2000, and 2010 IPUMS Census.

Table 6: Mean Immigrant Task Difference by Year, Within Education Group

	(1) 1970 mean	(2) 1980 mean	(3) 1990 mean	(4) 2000 mean	(5) 2010 mean
Analytical	-0.038	-0.035	-0.038	-0.041	-0.059
Interactive	-0.067	-0.056	-0.051	-0.061	-0.081
Manual	0.023	0.014	0.011	0.015	0.036
Observations	21403	108808	177214	252449	192733

Source: 1970, 1980, 1990, 2000, and 2010 IPUMS Census.

Table 7: Task Usage by Year, Overall, Including 2007

	(1) 1970 Mean	(2) 1980 Mean	(3) 1990 Mean	(4) 2000 Mean	(5) 2007 Mean	(6) 2010 Mean
Analytical						
Natives	0.462	0.491	0.495	0.501	0.501	0.504
Immigrants	0.433	0.449	0.439	0.443	0.409	0.418
Difference	0.029	0.042	0.056	0.058	0.092	0.086
Interactive						
Natives	0.459	0.487	0.489	0.499	0.503	0.508
Immigrants	0.404	0.424	0.418	0.419	0.382	0.394
Difference	0.055	0.064	0.071	0.080	0.121	0.114
Manual						
Natives	0.522	0.499	0.492	0.484	0.479	0.474
Immigrants	0.537	0.522	0.524	0.518	0.555	0.541
Difference	-0.015	-0.023	-0.032	-0.034	-0.076	-0.067
Observations	711575	2043175	2397064	2632533	1699028	1690573

Source: 1970, 1980, 1990, 2000, 2007, and 2010 IPUMS Census.

Table 8: Mean Immigrant Task Difference by Year, Within Education Group, Including 2007

	(1) 1970 mean	(2) 1980 mean	(3) 1990 mean	(4) 2000 mean	(5) 2007 mean	(6) 2010 mean
Analytical	-0.038	-0.035	-0.038	-0.041	-0.063	-0.059
Interactive	-0.067	-0.056	-0.051	-0.061	-0.085	-0.081
Manual	0.023	0.014	0.011	0.015	0.042	0.036
Observations	21403	108808	177214	252449	182023	192733

Source: 1970, 1980, 1990, 2000, 2007, and 2010 IPUMS Census.

Table 9: Task Usage Gaps Between Immigrants and Natives in Same Education Group, by Cohort and Time Since Migration

	(1) All mean	(2) 65 mean	(3) 75 mean	(4) 85 mean	(5) 95 mean	(6) 05 mean
Analytical						
0-5 years	-0.064	-0.047	-0.058	-0.070	-0.058	-0.074
10-15 years	-0.049	-0.028	-0.033	-0.045	-0.060	.
20-25 years	-0.032	-0.005	-0.021	-0.045	.	.
Interactive						
0-5 years	-0.086	-0.078	-0.081	-0.081	-0.085	-0.099
10-15 years	-0.074	-0.056	-0.052	-0.064	-0.091	.
20-25 years	-0.050	-0.021	-0.037	-0.063	.	.
Manual						
0-5 years	0.022	0.025	0.026	0.025	0.017	0.025
10-15 years	0.028	0.015	0.012	0.021	0.041	.
20-25 years	0.019	-0.002	0.006	0.031	.	.
Observations	365838	43836	85444	106022	88979	18058

Source: 1970, 1980, 1990, 2000, and 2010 IPUMS Census.

Table 10: Task Usage Gaps Between Immigrants and Natives in Same Education Group, by Cohort and Time Since Migration, 2007

	(1) All mean	(2) 65 mean	(3) 75 mean	(4) 85 mean	(5) 95 mean	(6) 00 mean
Analytical						
0-5 years	-0.072	-0.047	-0.058	-0.070	-0.058	-0.088
10-15 years	-0.053	-0.028	-0.033	-0.045	-0.071	.
20-25 years	-0.035	-0.005	-0.021	-0.051	.	.
Interactive						
0-5 years	-0.095	-0.078	-0.081	-0.081	-0.085	-0.112
10-15 years	-0.078	-0.056	-0.052	-0.064	-0.103	.
20-25 years	-0.052	-0.021	-0.037	-0.070	.	.
Manual						
0-5 years	0.038	0.025	0.026	0.025	0.017	0.062
10-15 years	0.032	0.015	0.012	0.021	0.051	.
20-25 years	0.021	-0.002	0.006	0.035	.	.
Observations	376863	43836	85444	112273	96819	38491

Source: 1970, 1980, 1990, 2000, 2007, and 2010 IPUMS Census.

Table 11: Task Usage Gaps Between Immigrants and Natives in Same Education Group, by Cohort and Time Since Migration, Low Education

	(1) All mean	(2) 65 mean	(3) 75 mean	(4) 85 mean	(5) 95 mean	(6) 05 mean
Analytical						
0-5 years	-0.080	-0.067	-0.071	-0.074	-0.078	-0.102
10-15 years	-0.060	-0.047	-0.043	-0.050	-0.073	.
20-25 years	-0.040	-0.018	-0.031	-0.047	.	.
Interactive						
0-5 years	-0.081	-0.084	-0.077	-0.069	-0.075	-0.102
10-15 years	-0.065	-0.059	-0.043	-0.050	-0.081	.
20-25 years	-0.041	-0.016	-0.030	-0.051	.	.
Manual						
0-5 years	0.020	0.021	0.006	0.002	0.021	0.042
10-15 years	0.024	0.009	-0.002	0.007	0.044	.
20-25 years	0.008	-0.012	-0.006	0.018	.	.
Observations	196358	25048	45680	58659	46032	7656

Source: 1970, 1980, 1990, 2000, and 2010 IPUMS Census.

Table 12: Task Usage Gaps Between Immigrants and Natives in Same Education Group, by Cohort and Time Since Migration, High Education

	(1) All mean	(2) 65 mean	(3) 75 mean	(4) 85 mean	(5) 95 mean	(6) 05 mean
Analytical						
0-5 years	-0.046	-0.014	-0.044	-0.066	-0.037	-0.049
10-15 years	-0.035	-0.001	-0.023	-0.039	-0.044	.
20-25 years	-0.024	0.008	-0.011	-0.042	.	.
Interactive						
0-5 years	-0.093	-0.068	-0.087	-0.093	-0.095	-0.096
10-15 years	-0.086	-0.053	-0.060	-0.083	-0.103	.
20-25 years	-0.060	-0.025	-0.045	-0.078	.	.
Manual						
0-5 years	0.025	0.033	0.049	0.047	0.012	0.009
10-15 years	0.034	0.023	0.028	0.039	0.037	.
20-25 years	0.033	0.008	0.020	0.048	.	.
Observations	169480	18788	39764	47363	42947	10402

Source: 1970, 1980, 1990, 2000, and 2010 IPUMS Census.

Table 13: Task Usage Regressions, Natives and Immigrants

	Analytical		Interactive		Manual	
	(1)	(2)	(3)	(4)	(5)	(6)
YSM/10	0.026***	0.021***	0.034***	0.027***	-0.019***	-0.014***
	(8.84)	(8.57)	(9.43)	(9.01)	(-5.81)	(-4.99)
YSM*50	0.001	0.002*	0.005**	0.005***	-0.004**	-0.005***
	(1.15)	(1.99)	(2.65)	(3.58)	(-2.49)	(-3.34)
YSM*70	-0.005*	-0.004	-0.010**	-0.009**	0.010**	0.009***
	(-1.86)	(-1.66)	(-3.00)	(-3.09)	(3.09)	(3.16)
YSM*75	-0.010***	-0.008***	-0.018***	-0.016***	0.015***	0.014***
	(-3.60)	(-3.55)	(-5.32)	(-5.62)	(4.64)	(4.82)
YSM*80	-0.015***	-0.011***	-0.026***	-0.021***	0.020***	0.017***
	(-5.23)	(-4.59)	(-7.52)	(-7.24)	(6.14)	(5.76)
YSM*85	-0.018***	-0.014***	-0.033***	-0.028***	0.028***	0.025***
	(-6.41)	(-5.88)	(-9.46)	(-9.40)	(8.50)	(8.26)
YSM*90	-0.025***	-0.020***	-0.035***	-0.029***	0.032***	0.028***
	(-8.53)	(-7.98)	(-10.02)	(-9.52)	(9.48)	(8.94)
YSM*95	-0.040***	-0.035***	-0.054***	-0.048***	0.057***	0.053***
	(-13.30)	(-13.74)	(-14.81)	(-15.40)	(16.70)	(17.14)
YSM*00	-0.052	-0.048	-0.081*	-0.076*	0.080	0.076
	(-1.40)	(-1.28)	(-2.11)	(-1.91)	(1.29)	(1.21)
Age	Yes	Yes	Yes	Yes	Yes	Yes
Education	Yes	Yes	Yes	Yes	Yes	Yes
State-Year	No	Yes	No	Yes	No	Yes
Observations	9474920	9474920	9474920	9474920	9474920	9474920
R^2	0.237	0.240	0.296	0.299	0.256	0.260

Notes: Dependent variables are analytical (1-2), interactive (3-4), and manual (4-5) task usages, which are measured by percentiles based on occupational task usage in the year 2000. All regressions include age, age squared, and age cubed, and years of education, all interacted with immigrant status. Survey year and cohort dummies also included. Columns (2), (4), and (6) include state dummy controls interacted with survey year. "YSM" refers to the years since migration of an immigrant, which equals zero for natives. Estimation includes 1970, 1980, 1990, 2000, and 2010 Census samples.
t statistics in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 14: Task Usage Regressions, Natives and Immigrants, with Language Proficiency and Group Shares

	Analytical			Interactive			Manual		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
YSM/10	0.019***	0.014***	0.018***	0.023***	0.018***	0.022***	-0.010***	-0.005**	-0.010***
	(11.14)	(5.95)	(6.77)	(16.16)	(7.59)	(7.85)	(-7.17)	(-2.23)	(-3.59)
YSM*50	0.002***	0.001	0.001	0.005***	0.004***	0.004***	-0.005***	-0.004***	-0.004***
	(6.90)	(1.33)	(1.40)	(20.12)	(6.08)	(5.58)	(-16.37)	(-5.70)	(-5.62)
YSM*70	-0.002	-0.002	-0.002	-0.005***	-0.005***	-0.004***	0.004***	0.004**	0.003**
	(-1.70)	(-1.25)	(-1.04)	(-6.31)	(-4.68)	(-3.97)	(3.30)	(2.72)	(2.41)
YSM*75	-0.006***	-0.005***	-0.006***	-0.012***	-0.011***	-0.011***	0.009***	0.008***	0.008***
	(-5.30)	(-3.84)	(-3.73)	(-13.94)	(-9.84)	(-9.22)	(6.39)	(5.18)	(5.18)
YSM*80	-0.009***	-0.007***	-0.009***	-0.018***	-0.016***	-0.017***	0.013***	0.011***	0.012***
	(-6.76)	(-4.18)	(-4.54)	(-15.10)	(-9.14)	(-8.89)	(7.27)	(4.98)	(5.43)
YSM*85	-0.013***	-0.011***	-0.011***	-0.024***	-0.022***	-0.023***	0.020***	0.019***	0.019***
	(-8.86)	(-5.89)	(-5.85)	(-20.62)	(-13.09)	(-12.42)	(11.00)	(8.42)	(8.54)
YSM*90	-0.019***	-0.016***	-0.016***	-0.025***	-0.022***	-0.022***	0.023***	0.021***	0.020***
	(-11.40)	(-7.48)	(-7.67)	(-19.10)	(-11.70)	(-12.38)	(11.07)	(8.32)	(8.27)
YSM*95	-0.034***	-0.030***	-0.030***	-0.045***	-0.041***	-0.040***	0.049***	0.045***	0.045***
	(-19.93)	(-13.41)	(-13.58)	(-32.04)	(-19.41)	(-19.95)	(24.10)	(17.77)	(17.76)
YSM*00	-0.047	-0.043	-0.044	-0.072*	-0.069*	-0.069*	0.072	0.069	0.069
	(-1.25)	(-1.26)	(-1.32)	(-1.84)	(-1.92)	(-2.00)	(1.14)	(1.15)	(1.19)
Only English		0.080***	0.073***		0.087**	0.080**		-0.067*	-0.058*
		(3.39)	(3.41)		(2.75)	(2.67)		(-2.13)	(-2.02)
Very Well		0.085***	0.078**		0.100**	0.093**		-0.082**	-0.074**
		(3.14)	(3.05)		(3.08)	(2.97)		(-2.41)	(-2.27)
Well		0.028***	0.025***		0.032***	0.030***		-0.027***	-0.025**

		(4.59)	(4.27)		(4.40)	(4.07)		(-3.36)	(-3.06)
Country Share			0.049			-0.131**			-0.068
			(0.97)			(-2.44)			(-0.72)
Language Share			-0.234***			-0.187***			0.275***
			(-6.88)			(-4.16)			(4.72)
Age	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Education	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
State-Year	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	8763345	8763345	8763345	8763345	8763345	8763345	8763345	8763345	8763345
R^2	0.241	0.243	0.244	0.302	0.305	0.305	0.261	0.263	0.263

Notes: Dependent variables are analytical (1-3), interactive (4-6), and manual (7-9) task usages, which are measured by percentiles based on occupational task usage in the year 2000. All regressions include age, age squared, and age cubed, and years of education, all interacted with immigrant status, and state dummy controls interacted with survey year. Survey year and cohort dummies also included. "YSM" refers to the years since migration of an immigrant, which equals zero for natives. Country (language) shares are the fraction of county residents from the same country of origin (speak the same language). The share of conationals equals zero for natives, while the share of language speakers equals zero for English speakers. Estimation includes 1980, 1990, 2000, and 2010 Census samples.

t statistics in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

References

Adserà, A. and A. Ferrer (2014): "The Myth of Immigrant Women as Secondary Workers: Evidence from Canada," *The American Economic Review*, 104, 360–364.

Bleakley, H. and A. Chin (2004): "Language Skills and Earnings: Evidence from Childhood Immigrants," *Review of Economics and Statistics*, 86, 481–496.

Borjas, G. J. (2015): "The Slowdown in the Economic Assimilation of Immigrants: Aging and Cohort Effects Revisited Again," *Forthcoming, Journal of Human Capital*.

Chiswick, B. R. (1978): "The effect of Americanization on the earnings of foreign-born men," *The Journal of Political Economy*, 86, 897–921.

Chiswick, B. R. and P. W. Miller (2010): "Occupational language requirements and the value of English in the US labor market," *Journal of Population Economics*, 23, 353–372.

Cohen-Goldner, S. and Z. Eckstein (2010): "Estimating the return to training and occupational experience : The case of female immigrants," *Journal of Econometrics*, 156, 86–105.

Dustmann, C. and A. V. Soest (2002): "Language and the Earnings of Immigrants," *Industrial and Labor Relations Review*, 55, 473–492.

Green, D. (1999): "Immigrant occupational attainment: Assimilation and mobility over time," *Journal of Labor Economics*, 17, 49–79.

Imai, S., D. Stacey, and C. Warman (2014): "From Engineer to Taxi Driver? Language Proficiency and the Occupational Skills of Immigrants," *Working Paper*.

Lessem, R. and C. Sanders (2013): "Decomposing the Native-Immigrant Wage Gap in the United States," *Working Paper*, 1–27.

Peri, G. and C. Sparber (2009): "Task Specialization, Immigration, and Wages," *American Economic Journal: Applied Economics*, 1, 135–169.

Ruggles, S., J. T. Alexander, K. Genadek, R. Goeken, M. B. Schroeder, and M. Sobek (2010): *Integrated Public Use Microdata Series: Version 5.0 [Machine-readable database]*, Minneapolis: University of Minnesota.

A Appendix: Task Usage Assignment

In this sections I describe the procedure for matching task data from the O*NET with data from the Census. Version 17.0 of the O*NET is used in this paper. Occupations in the O*NET are coded with a version of the Standard Occupation Classification (SOC) system. While several years in the Census, including the 2010 ACS, also use include SOC codes, they there is not a perfect match between the two coding schemes.

In order to assign task usages to all observations in the Census, from 1970-2010, I begin by merging the task usages from the O*NET for each SOC code to the 2010 Census using the full six-digit occupation codes (see *occsoc* code in the IPUMS). As there is not a perfect correspondence between these coding schemes, this leaves a number of occupations unmatched. For those individuals in the Census who are unmatched in the first round, I drop the final digit of their SOC occupation code and match them to the O*NET using this new code. For task usages, I take the mean task usages within that aggregated occupation group and use that as the task usage when merging. This matches a number of additional individuals, but again leaves some unmatched, so the process is repeated, i.e. another digit is dropped, until all individuals are properly matched. This approach allows for the maximum amount of variation to be maintained but, for those individuals in the Census whose occupation codes to not match perfectly to the O*NET codes, I can still assign task usages at a more aggregate level.

Once this merging process is complete, each individual in the 2010 Census is assigned a vector of 52 characteristics, based on their occupation. Each of these occupational characteristics is rescaled so that they represent the individual's percentile distribution in the population, weighted by sample weights. So, for example, if 30% of workers in the 2010 Census have lower "Oral Comprehension" scores than a given worker, that worker is assigned a value of 0.3 to their "Oral Comprehension" characteristic. Once the individual characteristics are rescaled, I take the average over each task bundle (analytical, interactive, and manual) to form the task bundles. Table 2 describes the grouping of occupational characteristics into

task bundles.

At this point, each individual in the 2010 Census has an analytical, interactive, and manual task usage. I then take the mean task usage, weighted by survey weights, within each *occ1990* occupation code. The result of this procedure is that each *occ1990* occupation is now assigned an analytical, interactive, and manual task usage. This occupation code is used consistently in all samples, and it is used to merge task usages across the surveys. This procedure assumes that changes in task usage over time result from changes in distribution of workers across occupations, and not changes in task content for each occupation.