

Camo2Commerce (C2C) intermediate analysis

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Contents

| | |
|--|----|
| Executive summary | 1 |
| Camo2Commerce (C2C) Program Description | 2 |
| Analysis..... | 2 |
| Data sources and sample size | 2 |
| Descriptive statistics and graphs | 2 |
| Graphical analysis of earnings | 8 |
| Regression analysis | 13 |
| Summary of findings..... | 15 |
| Caveat and some thoughts about future work | 16 |

Executive summary

Per Pacific Mountain Workforce Development Council's (PMWDC) request, Employment Security Department's (ESD) Labor Market and Economic Analysis (LMEA) has performed an intermediate analysis of the Camo2Commerce (C2C) program. This report is the second analysis of the program subsequent to the first report delivered in August 2018, which provided descriptive statistics and a basic regression analysis. Based on the analysis results in the August report, PMWDC requested for a further analysis that account for interaction effects between C2C program participation and other categorical variables.

This report consists of the following three sections: intermediate analysis results, program description, and data and method requirement for the next phase analysis while the primary focus is on the analysis results section. This report differs from the August report in the following aspects: (1) we used more control variables and took account for interaction effects of different variables in the regression analysis, (2) we conducted various graphical analyses, and (3) we used log-transformed wage data as one of the labor market performance measures.

By descriptive and graphical analysis, LMEA found that there are a few characteristics in C2C participants which are distinguished from C2C non-participants. For example, C2C participants' intended destination were highly concentrated in three Workforce Development Councils (WDCs) (Workforce Central, Pacific Mountain, and Seattle King County) whereas C2C non-participants intended destination was more balanced across Washington state. Also, almost all C2C participants have received some type of military education and received a medal or award during their service (over 99 percent) while only a moderate proportion of the C2C non-participants have received military education and a medal or award (around 70 percent).

Through graphical analysis of veterans' quarterly wage after separation, LMEA found that there are many high-earning outliers in both C2C participants and non-participants. More importantly, LMEA found that C2C participants' earnings are slightly greater than non-participants' earnings.

Regression analysis indicated that C2C program participation is associated with a significant wage increase and a significant reduction in job search time. Regression analysis may not be the most appropriate method to evaluate a net impact of this type of program because program participants are not randomly assigned and the regression model is subject to self-selection bias when using non-randomized experimental data. However, compared to the August report, this intermediate analysis allows a greater degree of confidence to attribute the estimated difference between C2C participants and non-participants to the effectiveness of the program.

Camo2Commerce (C2C) Program Description

C2C, administered by PMWDC, is a federally funded veterans employment initiative. The goal of the program is to assist transitioning service members and their spouses in a seamless transition into the civilian workforce. The program provides one-on-one career counseling services and helps veterans develop career opportunities based both on the available careers in the area of work and on their skills. The program achieves these via interview and resume training, specific skills workshops, and supportive client services.

C2C partners with local employers and provides a matching service based on their needs for skills and service members. The program works to fill partner employers' job openings with candidates enrolled in the program. When a partner employer fills their job opening with a candidate enrolled in the program, C2C covers the initial cost of training that employee and provides employers with reimbursement of up to 50 percent of the participant's wages during their initial training period (for up to 3 months), as well as a federal tax credit.

Analysis

Data sources and sample size

For this analysis, we used the same data used in the August report but made use of a more extensive set of variables in the regression and graphical analyses. The dataset consists of demographic variables from Department of Defense's (DOD's) Defense Manpower Data Center (DMDC), provided by the Washington Department of Veterans Affairs (hereafter referred to as "TransData"), and wage records from ESD's internal database. TransData contains various information on 22,369 separated veterans. After excluding 12 records that contained negative ages and service periods, the total sample size was 22,357.

We collected Social Security Numbers (SSNs) and names, along with program enrollment and end date, through ESD's Efforts to Outcome (ETO) database. We identified that out of a total of 1,858 C2C participants 777 C2C participants were included in the TransData. Of the 777 separated veterans who were C2C participants (accounting for 3.5 percent of all separated veterans), only 598 had wage records post-separation. Of the 21,580 separated veterans who were C2C non-participants, 12,421 had wage records post-separation.

In the following sections, we focus on the 598 C2C participants who have wage records post-separation and contrast them with 12,421 non-participants that also had wage records using graphs and descriptive statistics.

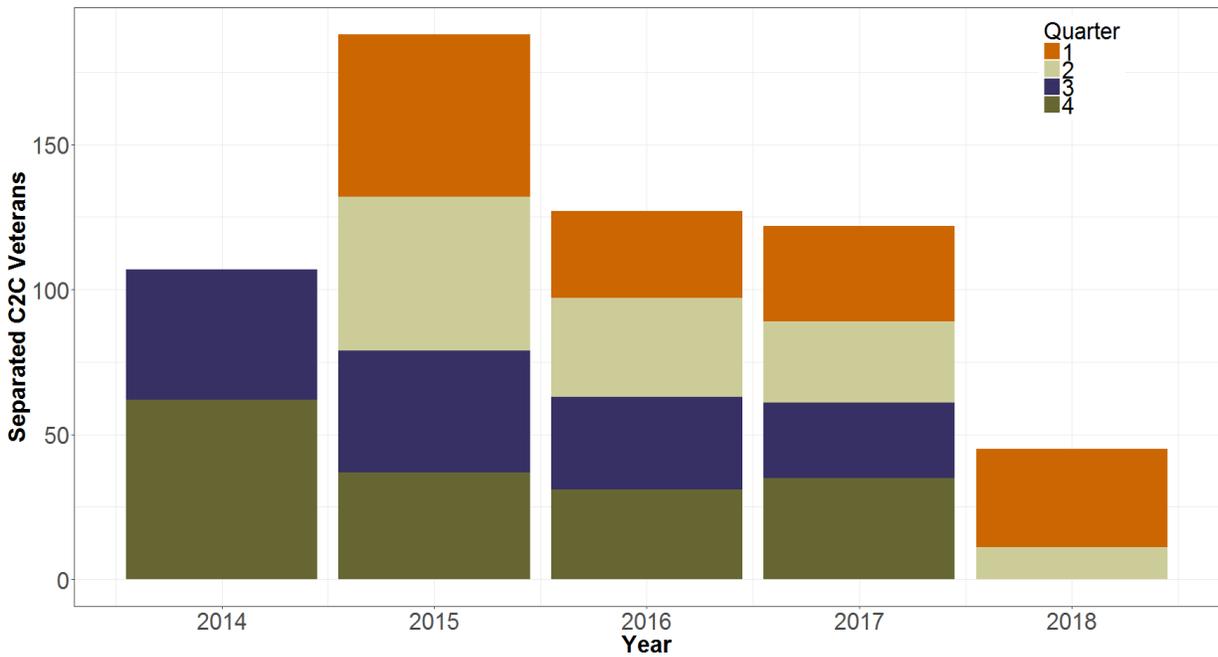
Descriptive statistics and graphs

Figure 1 shows the number of separated veterans who participated in the C2C program for each quarter since the third quarter of 2014 through the second quarter of 2018.

For each quarter, roughly 40 service members who participated in the C2C program were separated from the military; more veterans were separated in the first two years than in later years.

Figure 1. Number of C2C participants, separated from the military since 2014 3rd quarter Washington state, 2018

Source: Employment Security Department/LMEA; Department of Defense/DMDC, TransData

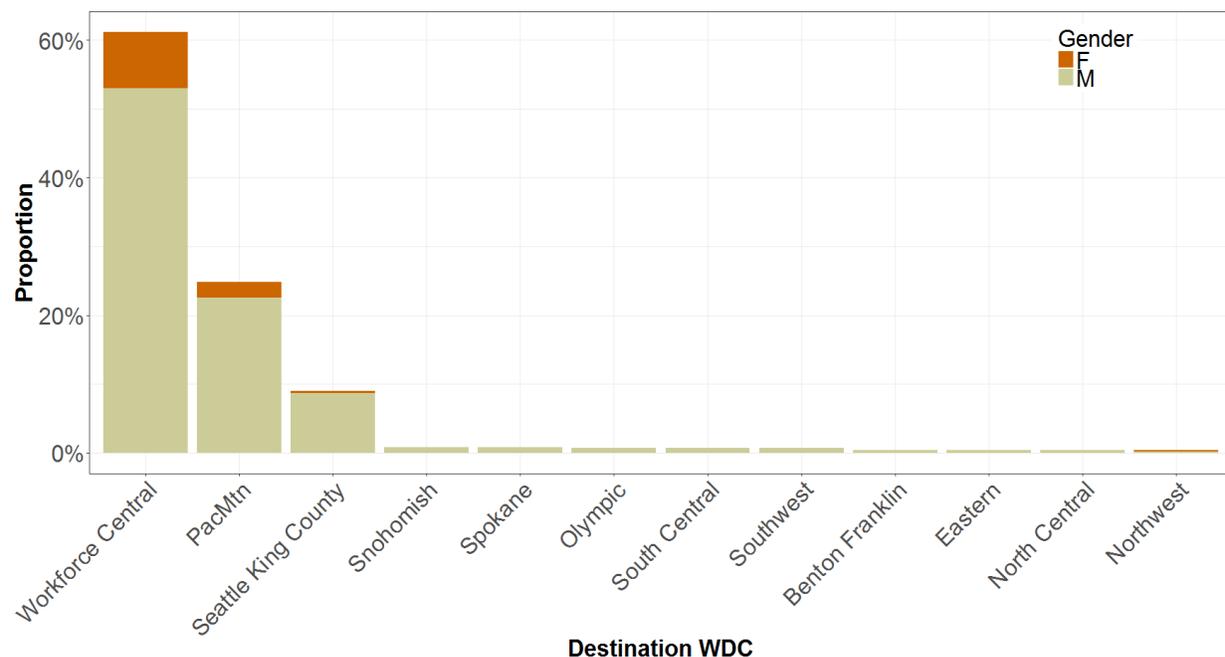


TransData included information about veterans' intended destination after their separation. The distribution of C2C participants' intended destination WDC is illustrated in *Figure 2*.

Figure 2. C2C participants' destination WDC

Washington state, 2018

Source: Employment Security Department/LMEA; Department of Defense/DMDC, TransData



The majority of the C2C participants' intended destination was Workforce Central followed by Pacific Mountain and Seattle-King County. In fact, over 90 percent of the participants intended to reside in the three WDCs while the rest of the nine WDCs combined accounts for less than 10 percent.

C2C participants' locational distribution after separation contrasted with those of non-participants are shown in *Figure 3*.

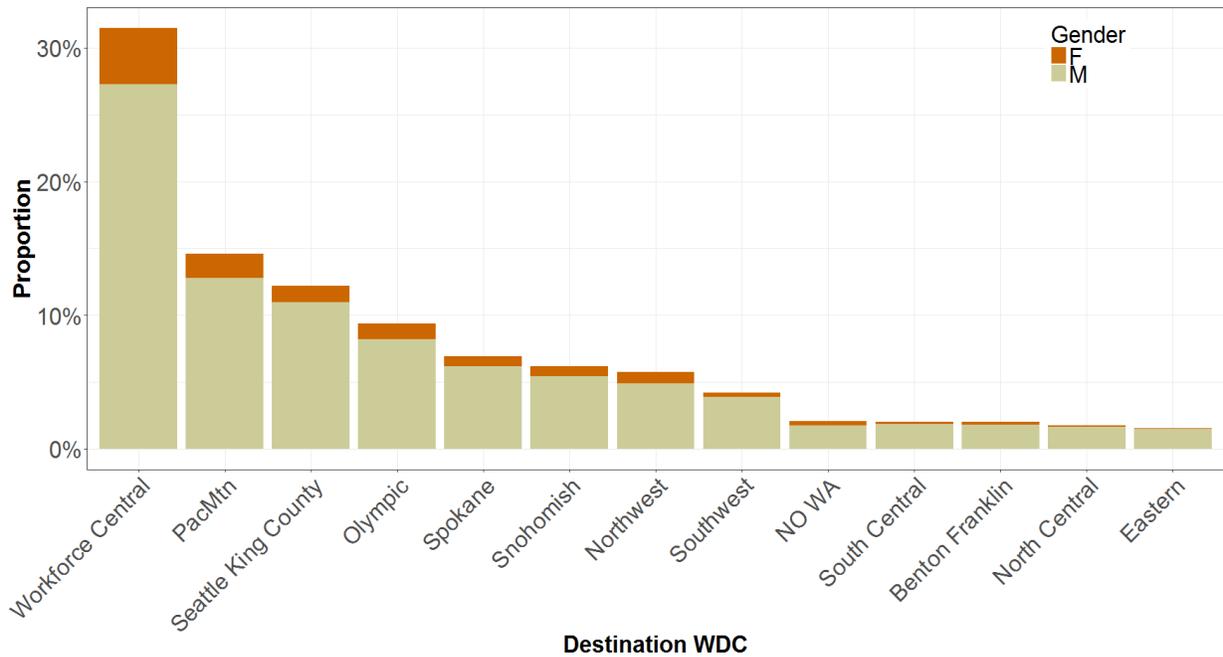
While the three most popular destinations for the C2C non-participants are consistent with those for C2C participants, they do not dominate as they do for the participants; the top three WDCs account for approximately 60 percent. The difference may reflect varying degrees of access, by location, to the C2C program.

Wages and employment are significantly influenced by labor market conditions; we used this information to account for different labor market effects in the regression analysis. Note that this is merely a proxy since we do not retain their physical work location information.

Figure 3. C2C non-participants' destination WDC

Washington state, 2018

Source: Employment Security Department/LMEA; Department of Defense/DMDC, TransData



¹ NO WA denotes destinations outside Washington state. We included them in the analysis because they still have Washington wage records.

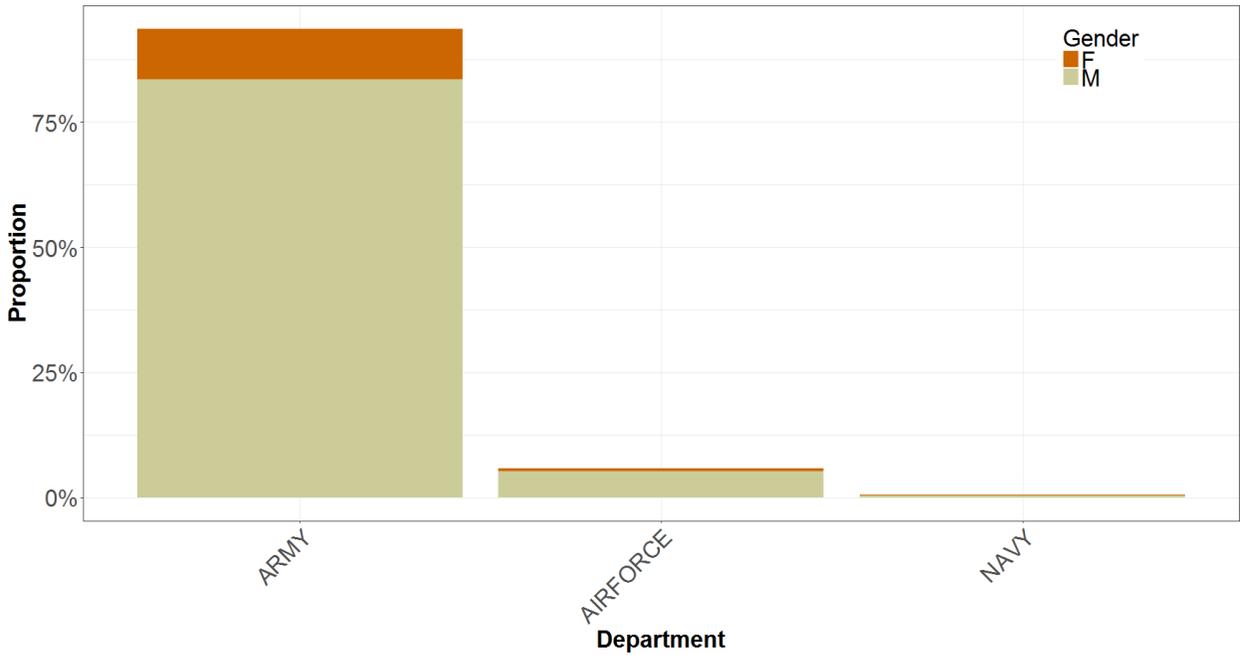
Next, we illustrate distribution by military departments. *Figure 4* and *Figure 5* present proportions for each of three military departments (i.e., Airforce, Army, and Navy), US Marine Corps (USMC) and Department of Homeland Security in which C2C participants and non-participants served before their separation.

As shown in *Figure 4*, 93.7 percent of the C2C participants served in Army. Only 5.8 percent and 0.5 percent served in the Airforce and Navy, respectively. None of the C2C participants served in USMC or in US Homeland Security.

Figure 4. Military Department for C2C participants

Washington state, 2018

Source: Employment Security Department/WITS; Department of Defense/DMDC, TransData



C2C non-participants showed a more balanced composition (*Figure 5*). A little more than a half of the C2C non-participants served in Army (53.4 percent), and the other half served in Navy (19.7 percent), Airforce (13.3 percent), USMC (11.3 percent), and US Homeland Security (2.2 percent). We created a set of dummy variables for each department and added them in the linear regression model to control for potential impacts of department – military departments may offer additional assistance to their service members in their transition.

Figure 5. Military Department for C2C non-participants

Washington state, 2018

Source: Employment Security Department/LMEA; Department of Defense/DMDC, TransData

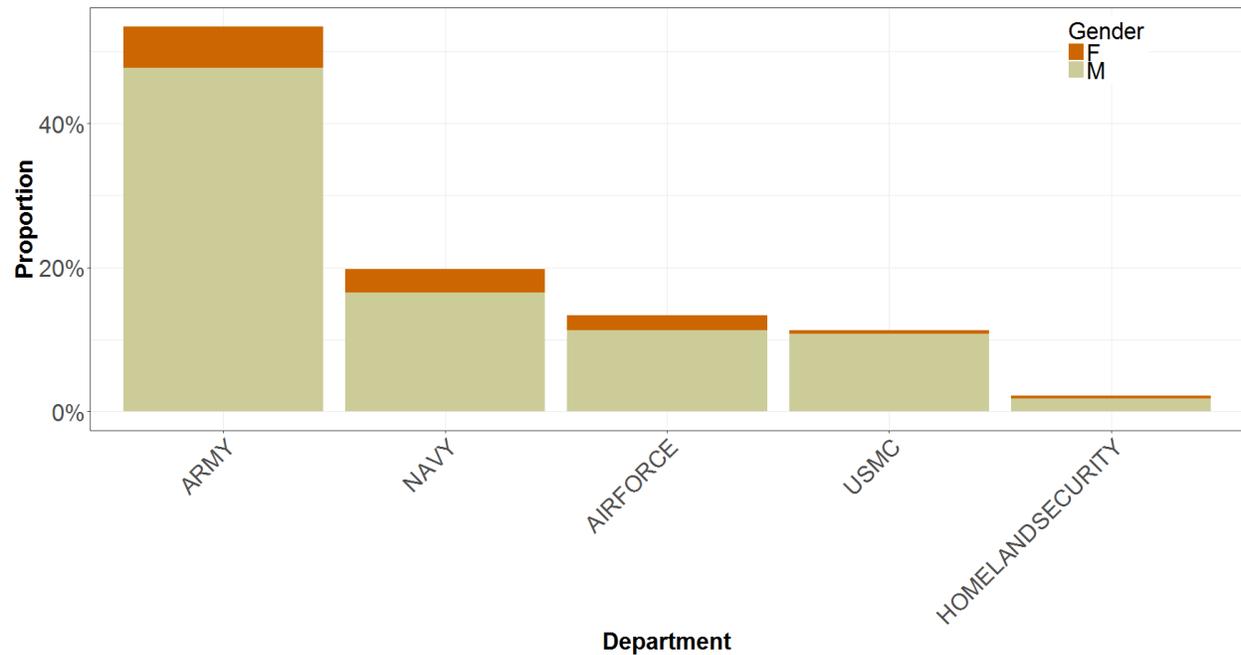


Figure 6 shows the proportion of males, officers, military education recipients, medal or award recipients, average age at separation, and average service period for C2C participants and non-participants.

It is worth noting that more than 99 percent of the C2C participants received military education and a medal or award during their service period whereas roughly 70 percent of the non-participants received military education and a medal or award. It is especially remarkable when considering C2C participants' average service period is about 1.5 years less than that of non-participants.

All the variables in the table, except military education and medal/award variables, are included in the regression model as control variables. The military education and medal or award variables were excluded to avoid a multicollinearity because they are highly correlated with C2C participation.

Figure 6. Descriptive statistics for C2C participants and non-participants¹

Washington state, 2018

Source: Employment Security Department/LMEA; Department of Defense/DMDC, separations data

| Group | Separated veterans with wage records (n=13,019) | |
|--|---|----------------------|
| | C2C participants | C2C non-participants |
| Gender (Proportion of male) | 89.1% | 89.6% |
| Officer (Proportion of officer) | 10.9% | 9.7% |
| Military education (Proportion of veterans with any military education) | 99.3% | 69.6% |
| Medal or award (Proportion of veterans with any medal or award during service) | 99.7% | 72.6% |
| Average age (in years) at separation | 30.1 | 30.9 |
| Service period (in years) | 6.96 | 8.76 |

Graphical analysis of earnings

In order to obtain some insight into the underlying differences in earnings by different groups, we conducted various graphical analyses. In this section, we present some figures that illustrate wage distributions for C2C participants and non-participants and explain why log-transformed wages were used rather than regular wages in the regression model. The graphical analysis had guided the regression model in terms of the model specification.

The distribution of quarterly wages for C2C participants and non-participants are presented in *Figure 7*. The horizontal axis represents quarterly wages after separation and the vertical axis is proportion of veterans corresponding to each wage level. *Figure 7* uses regular (i.e., non-transformed) quarterly wages.

The vertical straight lines denote a group average. Apparently, C2C participants' average quarterly wages were higher than non-participants' for both genders although the difference is very small among females.

However, as is generally the case, the distribution is right-skewed for each group with a long tail reflecting outliers in earnings. The shapes of the distributions do not appear smooth and they are far from a bell-shape (i.e., a normal distribution). For example, the group averages are significantly greater than their medians, which implies that there are many high earning outliers for each group: the median wages were about 63 percent and 81 percent of the average wages for females and males respectively. This is concerning because outliers can have a disproportionate influence on linear regression model estimation.

Figure 7. Distribution of quarterly wage by gender, officer and C2C participation
Washington state, 2018

Source: Employment Security Department/LMEA; Department of Defense/DMDC, TransData

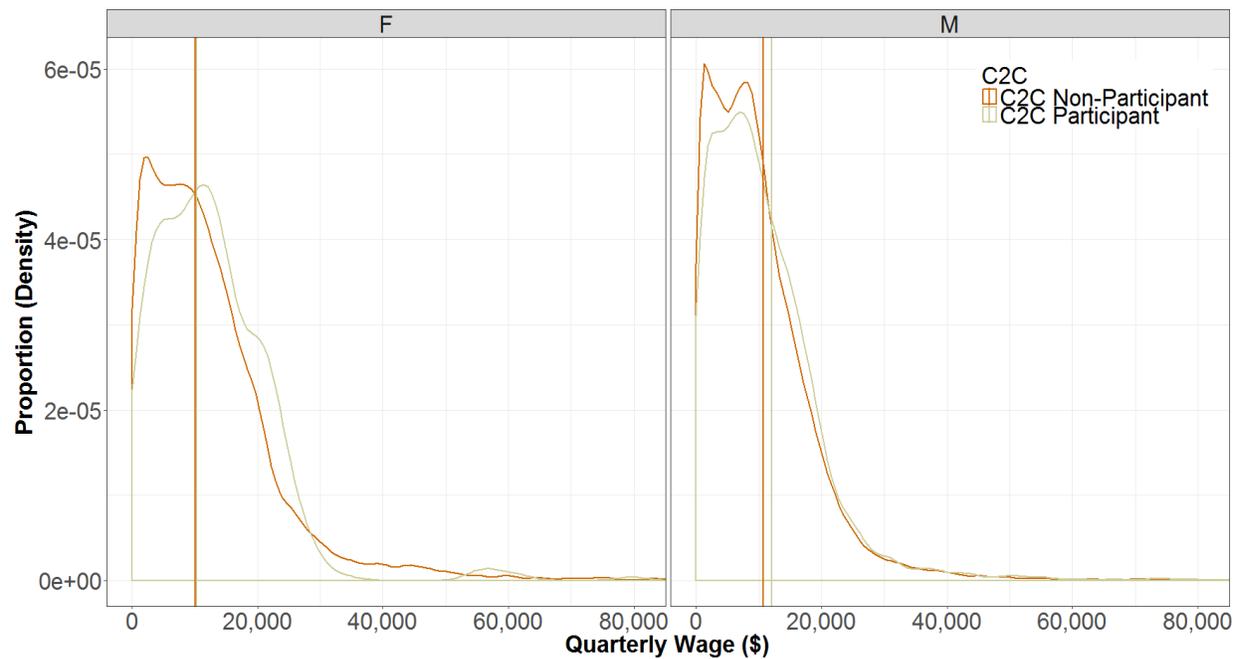


Figure 8 shows a box-plot of quarterly wage for C2C participants and non-participants.

For each group, the left and right line of the box are 25th and 75th percentile and the centerline is the 50th percentile, i.e., the median. Thus, each box contains 50 percent of the middle-earning class. Consistent with the distribution density plot in Figure 7, the box-plot (Figure 8) shows that for each gender, C2C participants' quarterly wage are slightly greater than that of non-participants'. Figure 8 also shows that each group has a significant number of outliers – outliers are denoted by dots.

Figure 8. Box-plot of quarterly wage by gender and C2C participation
Washington state, 2018

Source: Employment Security Department/LMEA; Department of Defense/DMDC, TransData

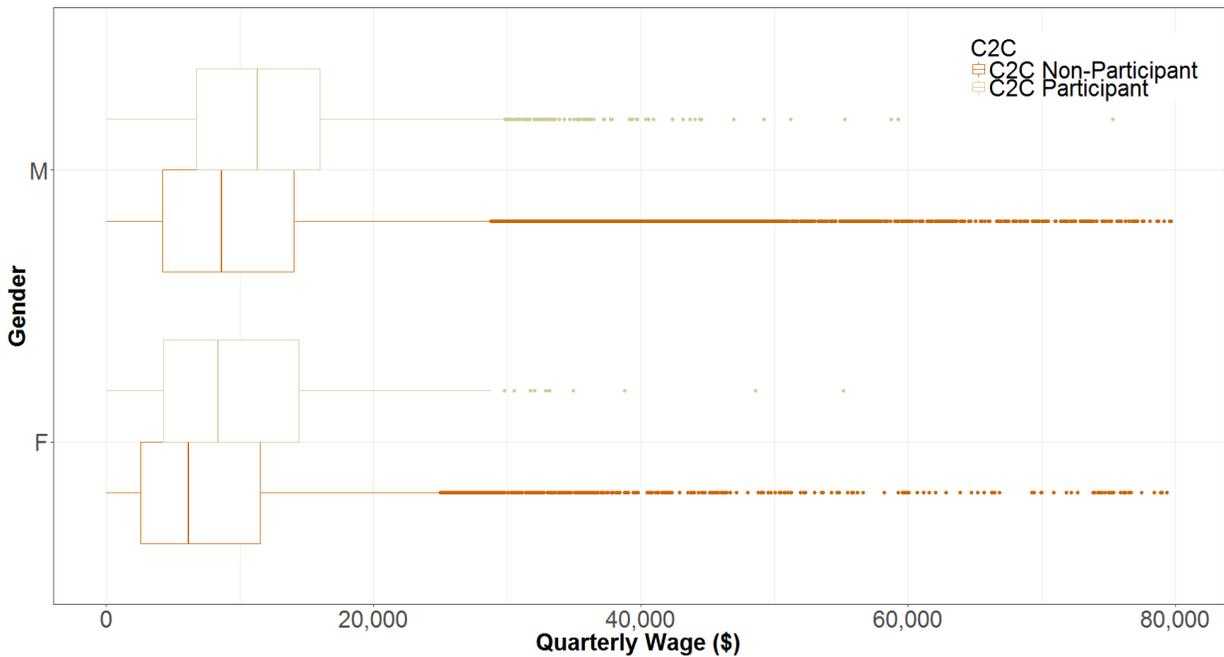
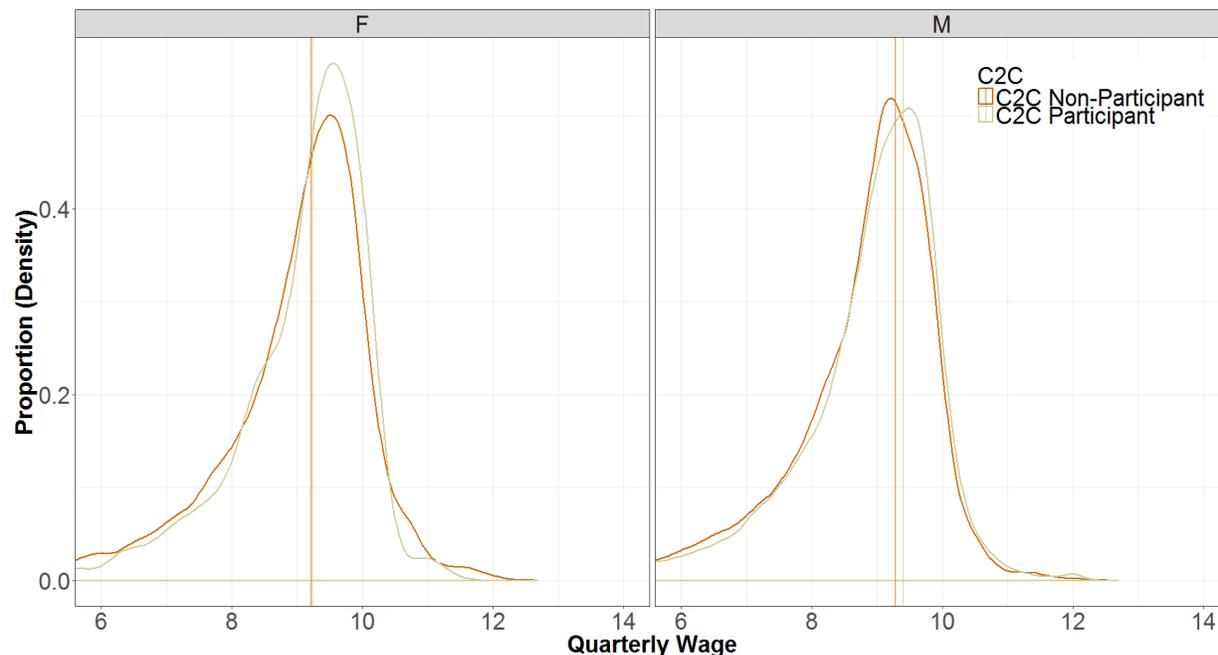


Figure 9 shows the distribution of log-transformed quarterly wage for C2C participants and non-participants.

Compared to Figure 7, the distribution of log-transformed quarterly wage in Figure 9 appears much closer to a bell-shape and does not have a long right tail. In the regression analysis, we used log-transformed quarterly wages instead of regular quarterly wages as a measure for program effectiveness for the following reasons: (1) estimation is less sensitive to outliers and (2) estimated coefficients can be interpreted as “percent” changes.

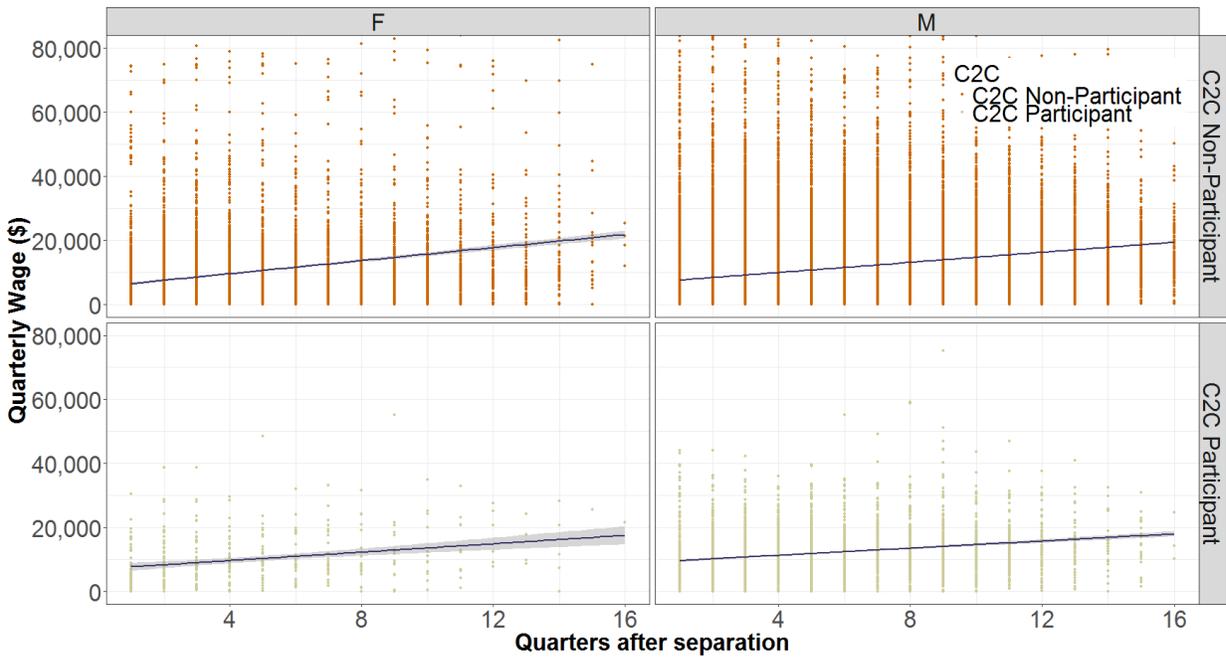
Figure 9. Distribution of log-transformed quarterly wage by gender and C2C participation
 Washington state, 2018
 Source: Employment Security Department/LMEA; Department of Defense/DMDC, TransData



To see how separated veterans' earnings change over time after separation, we plotted quarterly wages against the number of quarters after the separation and fitted a linear regression line. See *Figure 10*.

The blue straight line is a fitted regression line and the shaded area around the fitted regression line is a 95 percent confidence interval. The regression lines for each group are positively sloped, which implies that separated veterans' earnings have increased over time after their separation. It is also worth noting that although their earnings have increased over time, after separation, the rate of increase was slightly lower for C2C participants.

Figure 10. Quarterly wage change over time after separation
 Washington state, 2018
 Source: Employment Security Department/LMEA; Department of Defense/DMDC, TransData



The purple straight line is fitted regression line and the shaded area around the fitted regression line is a 95 percent confidence interval. The regression lines for each group are positively sloped, which implies that separated veterans’ earnings have increased over time after their separation. It is also noteworthy that although their earnings have increased over time after separation, the increase rate was slightly lower for C2C participants.

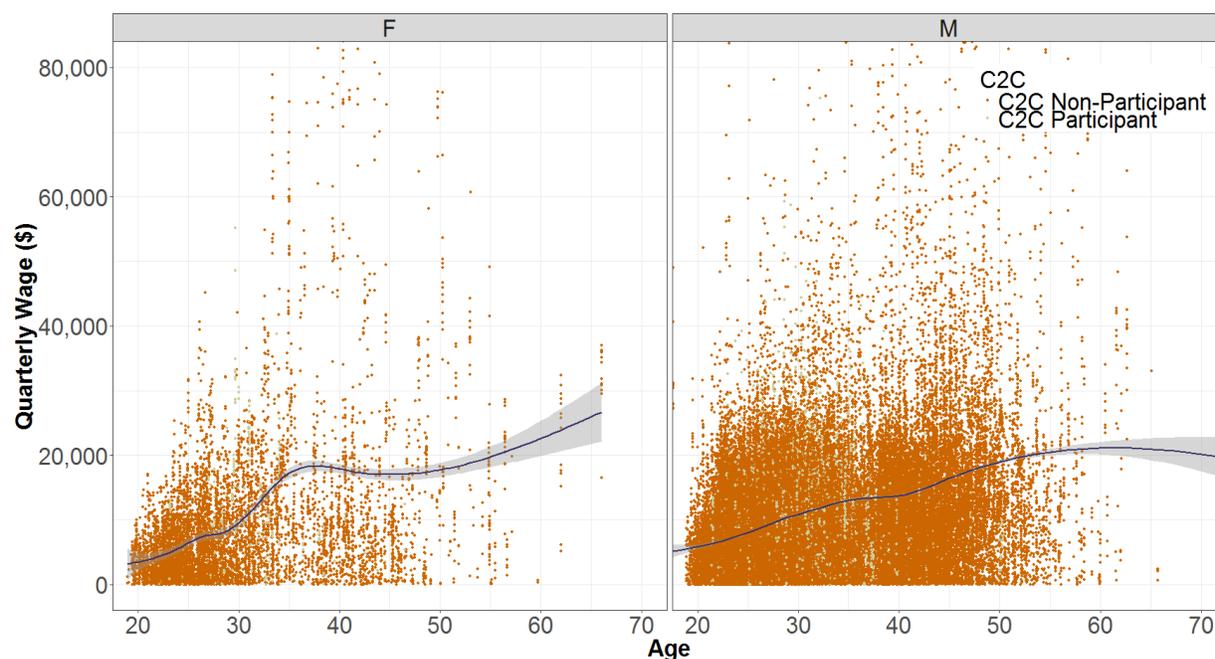
Human capital theory suggests that individuals’ earnings have a life-cycle that is hyperbolic over their age (i.e., earnings increase at an increasing rate in early years but increase at a decreasing rate later). To see whether our data fits to the theory, we plotted quarterly wages against age. See *Figure 11*.

The purple lines were drawn based on a generalized additive model (GAM) that takes into account a general tendency of the wages over age. *Figure 11* shows that the GAM purple lines are roughly hyperbolic especially between age of 20 and 50 where the majority of the data falls. To take account for the hyperbolic earning life-cycle, we added a squared-age variable to the regression model as well as the age variable – the squared-age term takes into account changes in the change rate.

Figure 11. Quarterly wage change over time after separation

Washington state, 2018

Source: Employment Security Department/LMEA; Department of Defense/DMDC, TransData



Regression analysis

In this section, we present results of the regression analysis. We performed a regression analysis on all the variables described in the sections above, as well as some interaction variables created by combining a few categorical variables with C2C participation. To see impacts of the C2C program on the participants' labor market outcomes, we used quarterly wage after separation and job search time as outcome variables (dependent variables). Specifically, we regressed a set of the following independent variables on quarterly wages and job search time:

- C2C program participation (participant or non-participant),
- Gender (male or female),
- Age at separation (in year),
- Squared-Age (Age^2),
- Officer (officer or non-officer),
- Department (Air Force, Army, Navy, USMC, or US Homeland Security; the base category is Air Force),
- Medal or Award (received or not received),
- Service period (in year),
- Quarters after separation (in quarter), and
- WDCs (12 WDCs or No Washington).

The following interaction terms were also included to see whether any subgroup of veterans benefit more (or less) than the other groups:

- C2C*Gender,

- C2C*Age,
- C2C*Officer,
- C2C*Department, and
- C2C*(Quarters after separation).

Regression analysis results are presented in *Figure 12*. WDC dummy variables and interaction terms C2C*Department are omitted to avoid clutter.

C2C program participation has a statistically significant and positive effect on separated veterans' quarterly wages. Specifically, participation of the program increases quarterly wages by almost 200 percent, which is the greatest impact among all the categorical variables considered, followed by officer, which increase earnings by 102 percent.¹ A caveat is noteworthy: the estimated effect of the C2C participation may include effects from other important factors that were not included in the regression. For example, we had to omit military education and medal or award variables to avoid multicollinearity, which could affect earnings.

The other non-interaction variables that are statistically significant and positively associated with the earnings after separation include age, department-USMC, service period and quarters after separation. Combined with the positive effect of age, the negative impact of squared-age on earnings implies that earnings increase at a decreasing rate, which supports a hyperbolic earnings curve.

Another interesting result is the negative estimate of C2C*(quarters after separation). Combined with the positive estimate of quarters after separation, this estimate indicates that although both C2C participants and non-participants experienced some increase in wage, the rate of increase for C2C participants was about 30 percent lower than for non-participants. A direct interpretation would be that C2C program serves its participants negatively on their future earnings. Nevertheless, considering C2C participation has a significant positive impact on the participants' earnings, the following explanation would be also worth noting: C2C helps its participants find better jobs that offer higher wages, which could have a trade-off with the rate of increase over time.

C2C program also helped program participants find a job after their separation from the military more quickly than non-participants. Estimation results also show that C2C program participants found their first job about one and a half quarters quicker, which is the most significant impact among all the variables included. The other non-interaction variables that are statistically significant and negatively associated with the job search time include gender (male), squared-age, department-Army, and service period. Interestingly, having served as an officer did not help reduce job search time while it had a significant positive impact on their earnings after separation.

These findings are generally consistent with those reported in the August report. However, as we used a more extensive set of control variables as well as various interaction terms, we are more confident to claim that the strong positive association between C2C participation and earnings after separation and the strong negative association between C2C participation and job search time may be regarded as a causal effect of the program.

¹ Effect in percentage can be calculated using coefficient estimates by the following formula: $\exp(\text{coefficient}) * 100\% - 100\%$. For example, effect of C2C program in percent is $\exp(1.093) * 100\% - 100\% = 198\%$.

Figure 12. Regression results

Washington state, 2018

Source: Employment Security Department/ LMEA; Department of Defense/DMDC, TransData

| Independent Variables | Dependent variable | | |
|------------------------------------|------------------------------|------------------------|------------------------------|
| | Wage (log of quarterly wage) | | Job search time (in quarter) |
| | Coefficient | Effect (in percentage) | |
| C2C program | 1.093*** | 198% | -1.454** |
| Gender (male) | 0.276*** | 32% | -0.229*** |
| Age at separation | 0.103*** | 11% | 0.119*** |
| Squared-age | -0.001*** | -0.1% | -0.002*** |
| Officer | 0.705*** | 102% | -0.070 |
| Department-Army | -0.084*** | -8% | -0.198*** |
| Department-Navy | -0.167*** | -15% | -0.009 |
| Department-USMC | 0.051*** | 5% | -0.135 |
| Department-US Homeland Security | -0.018 | -2% | -0.142 |
| Service period | 0.006*** | 0.6% | -0.027*** |
| Quarters after separation | 0.100*** | 10% | - |
| C2C * Gender (male) | 0.057 | 6% | -0.665** |
| C2C * Age | -0.024*** | -2% | 0.030* |
| C2C * Officer | 0.041 | 4% | -0.183 |
| C2C * Quarters after separation | -0.030*** | -3% | - |
| Constant | 6.054*** | - | 0.112 |
| Observation | 78,105 | | 13,019 |
| R-square | 0.186 | | 0.017 |

Note: In job search time equation, quarters after separation variable is omitted because it is the variable counting number of quarters after they get their first job.

*p<0.1; **p<0.05; ***p<0.01

Summary of findings

Our descriptive analysis revealed both similarities and differences between C2C participants and non-participants. Both groups dominantly consisted of males, about one tenth of them served as an officer during their service in military, and they were, on average, in their early 30s when they separated from the military. However, they were distinguished by intended destinations, military departments in which they served, service period, and by proportion of military education and medal or award recipients. Specifically, C2C participants' intended destinations were highly concentrated in three WDCs (Workforce Central, Pacific Mountain, and Seattle-King County). Over 90 percent of them served in Army, and almost all of them have received some type of military education and a medal or award.

Our graphical analysis of wage suggested that there are many high earning outliers in both C2C participants and non-participants. However, when it comes to the central tendency of each group, we confirmed the greater majority of the C2C participants achieved higher earnings after their

separation from the military. We found that veterans' earnings tend to increase over time after their separation for both participants and non-participants.

Both descriptive and graphical analyses guided the regression model in terms of variable selection and data transformation. For example, due to high earning outliers, we decided to use log-transformed wages rather than regular wages in the regression model. In addition, we found that earnings tend to increase at a decreasing rate between age of 20 and 50 and the finding led us to including squared-age as an additional variable in the regression model.

The regression results indicated that C2C program participation is the single most significant factor that helps increase the program participants' earnings (200 percent increase) and decrease their job search time (one and a half quarters). The estimate of the effect of C2C participation on earnings was statistically significant at a 1 percent level, which implies that the effect of the program is not null at 99 percent chance. Similarly, the estimate of the effect of C2C participation on job search time was statistically significant at a 5 percent level, which implies that the effect of the program is not null at 95 percent chance. Though the estimated effects could contain effects of other important variables that are omitted in this analysis, both the level of statistical significance and the size of the effects indicate a potential strong association between C2C program participation and positive labor market performance.

Caveat and some thoughts about future work

Despite the brief program description above, we need further information about the program to be able to do a more sound and in-depth program evaluation. Apparently, the C2C program provides service members and their spouse with customized non-uniform services. If C2C participants receive different program services, it should be appropriate to expect different outcomes across participants. However, in the absence of such data, this analysis treated all the program participants equally and grouped them as "C2C participants". Ideally, though, program administrators should keep track of the type of services provided to each program participant and make them available for program evaluation.

Empirical literature on the evaluation of active labor market policies (ALMP) often finds that different types of ALMPs have a different impact on program participants' labor market performance. For example, Card et al. (2010)² conducted a meta-analysis of recent microeconomic evaluations of active market policies and found that job search assistance programs yield relatively favorable impacts whereas public sector employment programs are less effective. They also found that training programs have positive impacts in the medium-term although they often appear ineffective in the short term. Jespersen et al. (2008)³ evaluated various Danish programs and concluded that subsidized public and private sector employment programs have a positive net social benefit, while classroom-training programs do not. These findings suggest that overall effectiveness of a program highly depends on the type of services it provides.

In addition to the program administrative data, there should be more efforts in data collection on demographic information for veterans and their households. For example, education (general education rather than the military education), health status, and household income data are very

² Card D., Kluve J., and Weber A. 2010. "Active Labour Market Policy Evaluations: A Meta-Analysis" *The Economic Journal*, 120, 452-477.

³ Jespersen, S.T., Munch, J.R. and Skipper, L. 2008. "Costs and Benefits of Danish Active Labour Market Programmes" *Labour Economics*, 15, 859-84.

important in explaining individuals' labor market performance but they were not included in this analysis.

Though various graphical and regression analyses were used to evaluate the program, one of the most popular program evaluation methods includes matching methods. This is popular in program evaluation because they address a so-called self-selection bias, which is caused by non-randomized samples. For example, C2C program participants self-select to be participants rather than being randomly selected to be participants. In fact, we confirmed that over 99 percent of the C2C participants have received military education and received at least a medal or award during their service while only about 70 percent of the non-participants did. This is noteworthy because it should make one wonder if the C2C participants were “already” a more qualified (or more motivated) group of people compared to the non-participants, i.e., they would have outperformed non-participants regardless of program participation. If it were the case, a direct comparison between participants and non-participants would likely lead to over-estimating the effect of the program. Matching methods address this problem by matching a program participant with his or her counterpart(s) who are non-participants, but statistically similar to the program participant. Thus, this method requires a rigorous set of demographic information to ensure statistical similarity, which include variables that were not available for this analysis.

A commonly used matching method is Propensity Score (PS) matching. One of the theoretical findings in the literature of PS matching is that for a valid matching there should be a positive (but less than 100 percent) possibility of participating in the program for both program participants and control group – this is referred to as common support assumption. The finding suggests that individuals who are either required to participate in the program or ineligible to participate in the program have to be removed from the study sample. Therefore, if we move on using matching methods for a net impact study of the C2C program in the future, we will need program eligibility criteria as additional information. LMEA looks forward to enhancing the partnership with PMWDC and conducting a net impact study of the C2C program in the near future.