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Non-Traditional Postsecondary Education Pathways of Adult Learners in the Toronto District School Board: Evaluating the Influence of Individual and Neighbourhood Characteristics – Appendix

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Appendix A

Propensity Score Matching Information from the Administrative Data onto the Survey

In an additional step to these analyses, we engage in the use of propensity score matching. Propensity score matching is a family of established statistical techniques that are used in a variety of instances, often to predict what a desired “treatment” result would have on an outcome of interest where no direct observational data exist (Pearl, 2009). To recall, a major strength of the survey data was its breadth of scope regarding the background of students and their opinions and attitudes. It did not, however, contain information about the actual pathways taken by the students after they had completed the survey. The administrative data, on the other hand, contain this information. There is no way of directly linking the survey respondents to the administrative data, however, as there are not matching case identifiers common to both sets of data. One way that we can estimate how likely survey respondents were to confirm PSE, however, is to use the logistic regression coefficients provided in the previous estimates (the ones performed on the variables that were common to both datasets in Table 7) and use them to estimate the predicted probability of PSE confirmation.

In the previous estimation of PSE confirmation (the second column of Table 7) we have:

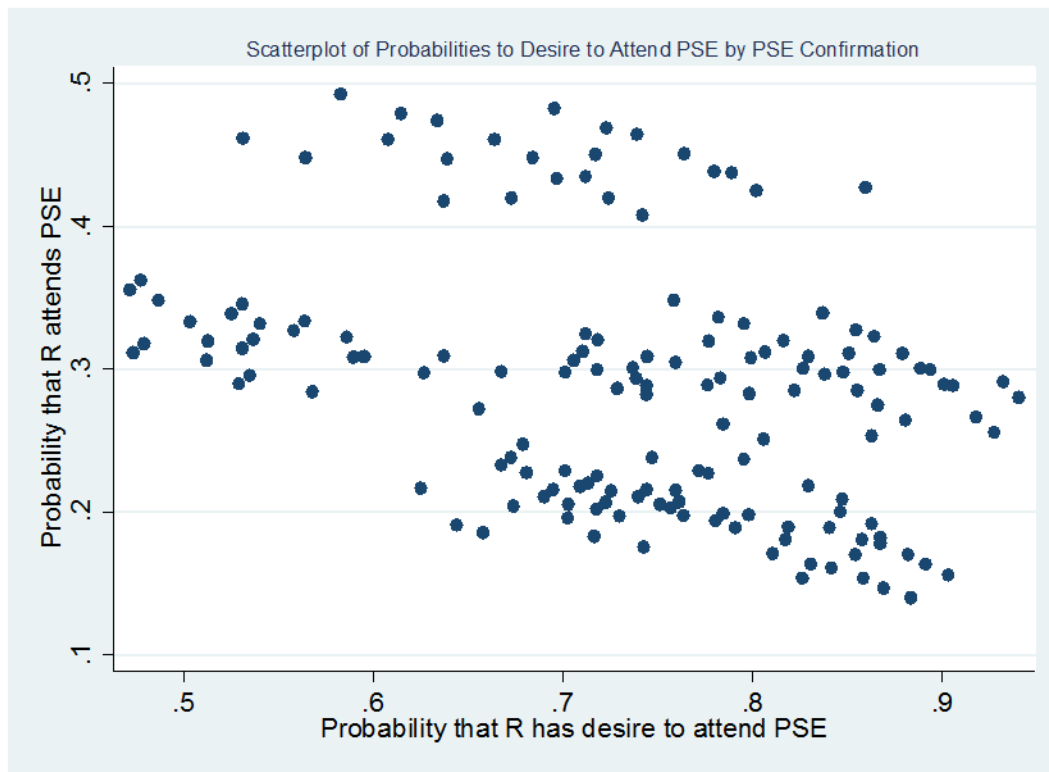
Logged odds of PSE Confirmation ($\log(p/1-p)$)
 $(-0.777) + (\text{Female} * 0.054) + (\text{Age30orLess} * 0.596) + (\text{CLA} * 0.359) + (\text{Africa} * 0.429) +$
 $(\text{Europe} * -0.095) + (\text{Asia} * .0470) + (\text{SouthAsia} * -0.065) + (\text{MiddleEast} * -0.127) + (\text{English} * -0.124) +$
 $(\text{1to3Years} * 0.149) + (\text{4to5Years} * 0.223) + (\text{6to10Years} * 0.094) + (\text{MoreThan10Years} * 0.044)$

The logged odds of this equation were then exponentiated (i.e., taken out of logged odds format) and converted to predicted probabilities of confirming PSE, based on the characteristics of each respondent as determined in the logistic regression equation. *In other words, the coefficients of the second model in Table 7 are applied to the corresponding variables in the survey data set and, for every case, it was possible to calculate a likelihood of confirming PSE.*

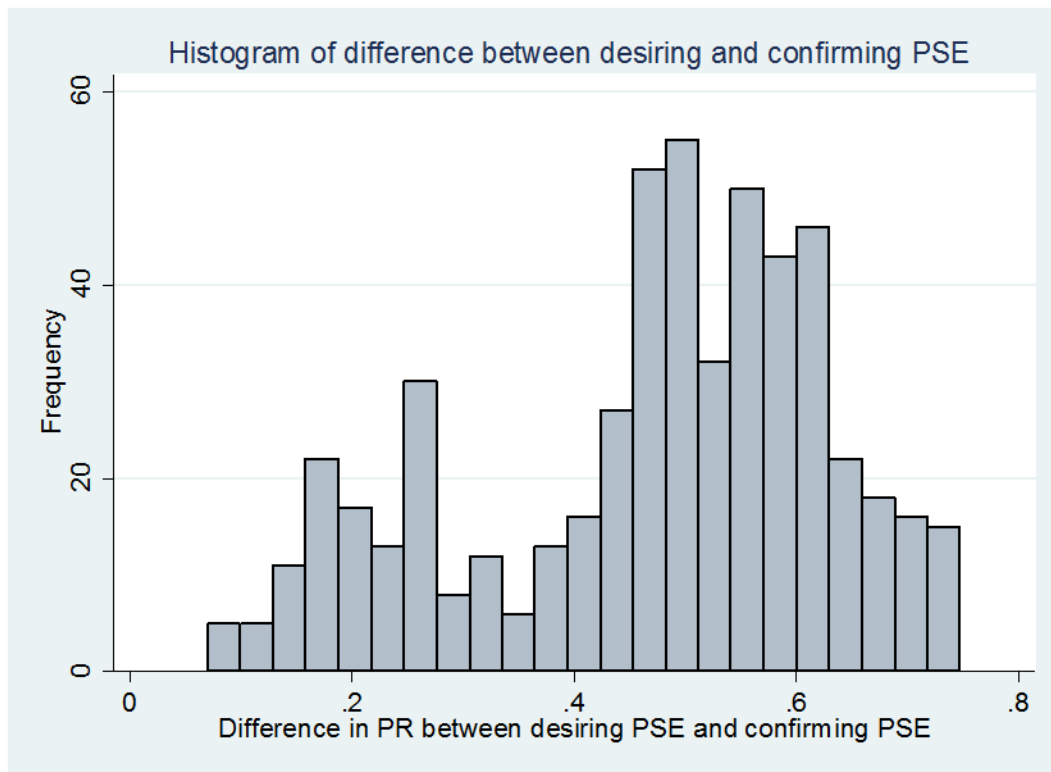
Using this matching technique, we find that in the survey dataset, the probability of attending PSE has a mean value of 0.28. That is, on average, there is a 28% likelihood that a student in the continuing education program will go on to confirm PSE. The range of this probability, however, varies considerably according to the characteristics of the student, ranging from a low of 0.14 to a high of 0.48. From the previous regression findings in Table 7, the “case” most likely to confirm PSE would be a female over 30, of Asian descent, who had been in Canada for 4 to 5 years and was not a native English speaker. The probability of a person with such characteristics confirming PSE is at the top end at 0.49. In contrast, a female over 30 of Caribbean origin who has recently arrived to Canada has a probability of confirming PSE of just 0.16. The direction and strength of the coefficients from the Confirmations column of Table 7 can give the reader an indication of how the various combinations of characteristics could act to hinder or enhance the likelihood of an individual confirming PSE.

After matching these values into the survey data, it is now possible to use the probability of PSE confirmation as an additional variable in the survey analysis. The first simple analysis is to examine the correlation between the probability of going to PSE and the aspiration of going to PSE. We calculate the predicted probabilities of the estimations of the Plans column in Table 7, which produces a range of values associated with the predicted probability of aspiring to PSE. These range from 0.47 to 0.94, with an average of 0.75. Thus, it is clear that the plans of going to PSE are certainly stronger than the likelihood of getting there.

How are postsecondary plans related to actual confirmations? It may seem intuitive that the answer is simply “weak”, but it is even more complex than that. A zero-order correlation reveals a moderately strong negative correlation between the two at $r=-0.42$. As PSE expectations increase, the likelihood of confirming PSE decreases. A scatterplot illustrates this curious relationship.



Further analysis can give us additional insight into the factors that contribute to this apparent disparity between planning to go and actually confirming acceptance. If we subtract the actual probability of going to PSE from the probability of planning to go, we are left with a difference (i.e., PROBABILITY OF DESIRING PSE - PROBABILITY OF CONFIRMING PSE CONFIRMATION). A histogram shows the distribution of this new variable that measures the difference between the probabilities of planning and confirmation.



As the histogram depicts, all scores are positive. This means that there is a consistently positive difference between the probability of planning PSE and the probability of confirming PSE. The further the bar is from zero, the higher the disparity between the probabilities of planning compared to confirming. We can investigate the determinants of this disparity with some relatively straightforward regression analyses using this “difference” as the outcome of interest.

There are many potential factors that may drive the differences described above. An exploratory regression using marital status, presence of young children, foreign university education, region of origin, citizenship and income is presented in Table 1. All variables apart from household income, unemployment status and home ownership were significant predictors of this difference. This is an important finding unto itself because it points to the *non-economic basis* for the difference between PSE plans and actual confirmations. While it was argued above that, in general, the majority of continuing education day school students come from “deprived” neighbourhoods, it appears that such degrees of deprivation are not important factors in explaining this particular difference.

Table 1: Ordinary Least Squares Regression of Difference between PSE Plans and Confirmations and Possible Determinants

Unstandardized Regression Coefficients

Female (1=yes)	-0.060 ^{***}
Child Under 4 (1=yes)	-0.079 ⁺
Female X Child Under 4	0.068 ⁺
Married (1=yes)	-0.088 ^{***}
Child Under 4 X Married	0.053 ⁺
Foreign University Credential (1=yes)	-0.085 ^{***}
Household Income	0.003
Unemployed (1=yes)	0.019
Canadian Citizen (1=yes)	-0.045 ^{***}
Home Owner	0.007
Region of Origin (Canada, US=1)	
Caribbean and Latin America	0.058 ^{**}
Africa	-0.134 ^{***}
Europe	-0.105 ^{***}
Asia	-0.179 ^{***}
South Asia	-0.110 ^{***}
Middle East	-0.138 ^{***}
Constant	0.648 ^{***}
<i>N</i>	464
Adjusted <i>R</i> ²	0.449

⁺ $p < 0.10$, ^{*} $p < 0.05$, ^{**} $p < 0.01$, ^{***} $p < 0.001$

In interpreting Table 1, it is important to understand that positive coefficients contribute to the increase in the difference between predicted plans and predicted confirmation, while negative coefficients decrease this gap. An easier way of thinking about these coefficients is that if they are negative, they speak to being more in line with the “reality” of the students’ situation (at least in terms of how “reality” is measured in quantitative analysis). Being female, having a child under 4 and being married all contribute negatively to this “gap.” Interesting, however, were the exploratory interaction terms that were added between sex and having a child under 4, and marital status and having a child under 4. When considered together, being female and having a child under 4, and being married and having a child under 4 have a weak positive association with the gap under consideration. The interaction terms suggest that these *combinations of factors* act in a unique manner that the individual factors alone cannot capture: being a female has a slightly different effect on your “gap” if

you have a young child, as does being married and having a young child. Perhaps these significant interaction terms signal a desire to better oneself for one's young children.

Unsurprisingly, having a foreign university credential was also negatively associated with the gap under consideration. It is likely that those with foreign credentials were less motivated to do additional studies, or perhaps less idealistic about their ability to actually pursue such a goal. Canadian citizenship also reduced the gap, suggesting that as a proxy for "time in Canada", those with more experience may have more "realistic" goals about what is possible. In terms of region of origin, compared to the reference category (born in Canada, US or UK), all groups apart from the Caribbean and Latin American had a negative association with the gap, with the coefficient for Asian being the least. This can be interpreted as the Asian being the most "realistic" in terms of predicted outcomes, with Caribbean and Latin American on the opposite end of the spectrum.

While this analysis of the gap between predicted plans and confirmations is exploratory, it is interesting to note that the explained variance in the dependent variable in Table 1 is nearly 45%, which is quite remarkable for any regression model. While some of the determinants (sex and region) were used as predictors in the original estimations that determined the predicted probabilities derived earlier, one may argue that there is a considerable amount of endogeneity to these models. However, it should be noted that while sex and region are important determinants in the exploratory model, without them included, 20% of the variation in the "difference" between plans and confirmation is still explained (results not shown).



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