The Tradeoff between Work and Higher Education: Evidence from the Introduction of Public Transportation to Arab Communities in Israel

Aamer Abu-Qarn* Shirlee Lichtman-Sadot †

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Abstract

We exploit the introduction of bus services to Arab towns in Israel, which substantially increased their residents' access to work and education opportunities, to evaluate the effect of public transportation on disadvantaged young adults' employment and educational attainment outcomes. We find evidence of a tradeoff between investment in education and time allocated to work - specifically, access solely to work opportunities increases labor force participation, and for females it decreases the probability of studying, while access to work and education opportunities increases the probability of studying and this is at the expense of labor force participation outcomes. Our identification relies on the randomness in timing of bus line introductions and schedule changes, due to the prolonged bureaucratic approval process for changes to bus lines in Israel. Our results demonstrate the importance of accounting for potential reductions in educational attainment when expanding work opportunities to disadvantaged communities. Furthermore, when faced with increased access to both work and education opportunities, young adults in our disadvantaged setting choose to invest in education and forego current income from work. Female responses are stronger in towns ranked higher socioeconomically, thus suggesting that it is not just limited physical accessibility that is hindering their labor force participation and educational attainment but possibly also traditional and cultural barriers, which are stronger in towns with lower socioeconomic ranking.

JEL Classifications: I24, I25, J22, J24, J61, O12.

Keywords: Public Transportation, Time Allocation, Educational Attainment, Labor Force Participation, Spatial Mismatch

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*Dept. of Economics, Ben-Gurion University of the Negev, Beer-Sheva 84105, Israel. E-mail aamer@bgu.ac.il.

†Dept. of Economics, Ben-Gurion University of the Negev, Beer-Sheva 84105, Israel. E-mail shirlees@bgu.ac.il.

1 Introduction

Economic and social disparities can persist or even widen if disadvantaged communities have limited access to work and/or education opportunities. The adverse effects of spatial mismatch on labor market outcomes have been widely documented in the U.S. (Kain (1968); Holzer (1991); Stoll (1999); Weinberg (2000); Andersson et al. (2018); Miller (2018)) and to a much lesser extent internationally or in developing countries (Franklin (2017)). Distance to higher education institutions has been shown to affect educational attainment (Frenette (2006)) - this has been further validated by studies using proximity to colleges or their availability as instrumental variables for college education (Card (1993); Currie and Moretti (2003)). Interestingly, there are limited studies that take into account the interplay between work and education outcomes when increasing access to either work or education opportunities, or to both simultaneously. This is despite obvious equilibrium implications due to constraints in the allocation of time to each of these and the potential that policies intended to increase disadvantaged communities' access to the labor market can backfire in terms of young adults' educational attainment.

This study assesses the introduction of public transportation to disadvantaged young adults and its effect on their employment outcomes and educational attainment. While doing this, we empirically address the tradeoff faced by young adults between time allocated to work and to education. First, we demonstrate qualitatively different responses among disadvantaged young adults to increased access to education versus work. Second, we examine what is chosen by these individuals that experienced increased accessibility to both in a developed economy. We exploit a large reform that took place in Arab communities in Israel beginning in 2007: the introduction of public transportation bus services. Despite being significantly disadvantaged economically, with low vehicle ownership rates, Arab communities in Israel have been historically deprived of public transportation infrastructure. This began to change in 2007, when the Ministry of Transportation (MOT) announced a reform to invest heavily in public transportation services to and within Arab towns in Israel. As a result of this reform, Arab communities' access to work and education opportunities substantially increased .

Despite extensive literature on spatial mismatch and an expanding literature on the potential contribution of public transportation in alleviating spatial mismatch and creating more and improved job opportunities,[1] we are not familiar with studies that evaluate public transport not just as a remedy to spatial mismatch, but also as a factor affecting young adults' educational attainment. On the one hand, public transit may increase access to higher education institutions. On the other hand, a fundamental component

[1] Kawabata (2003), Baum (2009) and Gautier and Zenou (2010) show how vehicle ownership positively affects labor market outcomes for low-skilled workers, single mothers with low education levels, and minority workers, respectively. Holzer et al. (2003), Sanchez (1999), and Tyndall (2017) show that public transportation can decrease spatial mismatch of employment prospects among minorities in U.S. metropolitan areas, and Ong and Houston (2002) show this for women on welfare in Los Angeles. In Phillips (2014) and Franklin (2017), when public transit travel subsidies are provided to job seekers from segregated areas in Washington D.C. or the outskirts of Addis Ababa in Ethiopia, respectively, job searches intensify and their time spans shorten. Martinez et al. (2018) find that improvements in the bus transit network in Lima, Peru increased employment rates and earnings among women. Additionally, some studies link higher employment rates or better employment outcomes with improved public transport systems more generally and not necessarily for disadvantaged or minority populations (Rotger and Nielsen (2015); Heuermann and Schmieder (2018)).

of human capital formation theories is the opportunity cost of obtaining an education through foregone current earnings from work (Becker (2009)), and if public transit increases access to work, then this channel may negatively affect educational attainment. The opportunity cost of education can increase even further when the perceived premium for high school completion or a college degree declines. Disadvantaged populations that are segregated from labor market opportunities often have low employment in higher skilled jobs. As such, it seems quite plausible that at least the perceived wage premium for higher education would decline when disadvantaged communities gain connectivity to areas with greater employment prospects that often include low skilled jobs. If public transportation provides connectivity to lower skilled work opportunities, without greater access to higher education institutions, then the effect of improved access is less ambiguous and we should observe a decrease in higher educational attainment in response.

Indeed, past studies have shown a positive relationship between educational attainment and the wage premium gap between higher skilled work and lower skilled work using cyclical variation in the demand for unskilled labor. In Charles et al. (2018), housing market booms improved labor market opportunities for young adults without a college education, thus reducing educational attainment for those with the smallest expected gains from a college degree. Natural resource industries typically employ larger shares of unskilled workers, and Cascio and Narayan (2015), Morissette et al. (2015), and Black et al. (2005) show lower high school completion rates or college degree attainment in response to tighter labor markets in the natural gas, oil, and coal industries, respectively. However, these responses may reflect only a delay of educational attainment rather than an overall decrease, as Emery et al. (2012) demonstrate following the oil boom affecting Alberta, Canada in the 1970's. In developing economies, Shah and Steinberg (2017) show that variation in agricultural output due to drought shocks in India affected educational attainment, and Atkin (2016) shows that in Mexico greater labor demand due to export expansions following international trade reforms decreased educational attainment.

In all these studies, the opportunity cost of investing in education changes due to labor demand conditions. To the best of our knowledge, no empirical study analyzes the tradeoff between work and education when demand conditions in the labor market remain constant and all that changes is the accessibility of work and/or education opportunities. Furthermore, with the exception of Charles et al. (2018) and Morissette et al. (2015), most existent studies focus on high school completion responses among youth, rather than higher education responses among young adults. Young adults should be more autonomous in their choices between work and education than youth. In addition, studies evaluating high school dropout rates mostly exploit changes in market wages occurring several decades ago - it may be that more recently the economically important margin of educational attainment is higher education rather than high school completion, as the returns to a high school degree have declined substantially in many economies worldwide.[2,3]

We are not aware of studies that analyze the tradeoff between work and education one step further by asking what individuals actually choose when both education and work opportunities increase, holding labor demand conditions constant. These questions are particularly relevant in light of past studies and resulting policy recommendations that aspire to improve labor market outcomes among disadvantaged populations. Our study highlights the importance of accounting for equilibrium implications when increasing access to either work or education opportunities, or both.

Our data and methodological framework enable us to disentangle potentially opposing effects of public transportation penetration via increased access to work opportunities, higher education institutions, or both. In our data, we distinguish between the effect of bus lines destined solely to work opportunities and the effect of bus lines destined both to work opportunities and higher education institutions. We link our bus data to responses from 4 cross-sectional surveys covering the Arab population in Israel during 2004-2014, which inquire, among other things, about labor force outcomes and educational attainment. Our difference-in-differences (DID) framework quantifies the intensity of treatment by using concurrent bus frequencies per 1000 residents, and estimates a differential effect based on buses' destination types.

Our identification strategy relies on randomness in the timing of introducing and changing the frequency of bus lines serving Arab towns. This randomness is generated due to an often prolonged bureaucratic process required by the MOT, which bears the regulatory responsibility for all public transportation networks, for the introduction of any bus lines, or even slight changes in bus line routes or frequencies. The exact length of this process, until approval for changes to bus lines and schedules is granted by the MOT, is random, and we assume that it is exogenous to our outcomes of interest. An additional channel of randomness within our analytical framework is based on assigning to each surveyed individual the extent of public transportation penetration in their town at the exact date of their interview, which we assume is orthogonal to our outcomes of interest. We particularly note that even within towns, the time span between the earliest and the latest interviewee for a given year can be several months.

Our analysis is separate for male and female responses to public transportation penetration due to considerable gender differences in terms of labor force participation within this highly traditional population. We observe the following work outcomes: the probability of working last week, usual weekly work hours, and monthly salary. For educational outcomes, we observe whether the individual is currently studying. We focus our analysis on young adults (males ages 18-30 and females ages 18-27), the primary population segment that faces the choice between higher education and work, while relying heavily on public

[2]On the growing differential between the high school graduation wage premium and the college graduation wage premium, see Lemieux (2008) for the U.S and Canada and Han et al. (2012) and Tansel and Bodur (2012) for emerging economies, such as China and Turkey, respectively. For Israel, the only comparisons between the two skill premiums we are aware of are presented in Gottschalk and Smeeding (1997) and Acemoglu (2003), which document a *decrease* in the wage premium for college degrees, while for most other countries covered in these studies the opposite is true. However, both studies cover Israel during the 1980's and 1990's when Israel experienced a large influx of migrants from the former U.S.S.R. with high education levels. It may be that 15 years later, this trend changed, and aligned with many other economies worldwide.

[3]There is also literature demonstrating a negative relationship between child labor and educational attainment (De Hoop and Rosati (2013); Baker et al. (2018)). The focus of this study is on young adults rather than children.

transportation as their major mean of transportation.

We find that for young adult males, each additional daily bus trip per 1000 residents that connects their town solely to work opportunities (but not higher education institutions) increases their probability of working by 3 percentage points. We do not detect a reduction in the probability of currently studying in response to these buses. When examining the effects of bus lines destined both to work opportunities and higher education institutions, we observe that young adult males choose education over work - their probability of working decreases and their probability of studying increases. These responses are mostly driven by males from the most disadvantaged towns in our sample.

For females, responses to public transportation penetration are mostly driven by females from higher socioeconomically ranked towns. We interpret this as evidence that females are constrained in terms of labor force participation and educational attainment not just by limited physical connectivity to work and education opportunities but also by traditional barriers, which are weaker in towns ranked higher socioeconomically. This is further validated by results demonstrating that females' responses to public transportation penetration are confined to more than a year after the initial introduction of public transportation. Thus, the response likely takes place after a transition period required to adapt to the new opportunities for young females and an adjustment of cultural and traditional norms as a result of this. The results for females show that greater intensity of bus lines destined solely to work opportunities increases labor market outcomes but decreases the probability of currently studying. A greater intensity of buses connecting both to work and education opportunities decreases labor market outcomes. While the probability of currently studying does not increase in response to buses connecting both to work and education, the negative effect in response to buses that do not connect to higher education institutions is offset. This suggests that, as with males, females are choosing schooling over work opportunities when access increases to both.

Our paper proceeds as follows. We discuss public transportation in Israel and in particular within Arab communities, while highlighting the long bureaucratic process often involved with introducing bus lines or changing them, on which our identification strategy relies. We then proceed to discuss our data on public transportation in Arab towns and labor market and education outcomes among the Arab population in Israel. Section 4 discusses the empirical strategy and identification, followed by results presented in Section 5, accompanied by a robustness check and a discussion of the results. Concluding remarks are provided in Section 6.

2 Public Transportation in Israel and within Arab Communities

Public transportation in Israel is primarily via buses, taxis or inter-city trains. Public transportation services are not provided within a free market - rather, they are under the regulatory supervision of the Israeli Ministry of Transportation (MOT), which determines the extent of competition between operators for each region and locality, provides permits and licenses for each route, and sets the routes, stations, frequencies and prices.

The Arab population comprises roughly 20% of the population of Israel. These are citizens of Israel, although the majority of them identify themselves as Arab or Palestinian by nationality and Israeli by citizenship. In terms of religious affiliation, most are Muslim (~85%), but there is a significant Arab Christian minority and a Druze minority. Their language is Arabic, although most are bilingual with their second language being modern Hebrew.

The vast majority of the Arab population in Israel resides in separate towns and cities. These towns and cities are for the most part ranked low socioeconomically - Arab towns and cities comprise a very large part of the most economically disadvantaged communities in Israel, and their population is characterized by low income, low employment rates, low educational attainment and high fertility rates. Many of these communities are traditional in their nature with barriers for women in obtaining higher education and developing careers, although this is slowly changing.[4]

Despite private car ownership rates being relatively low among Arabs, due to economic constraints, and many women not being able to drive due to traditional barriers, Arab communities within Israel have been significantly deprived of public transportation infrastructure until the last decade. According to an Israeli Government report from 2016, in 2009 41% of Arab localities in Israel had no public transportation services and an additional 43% had only a low level of public transportation services (Greenwald et al. (2018)). For many communities (including cities with populations of several tens of thousands), the only option for mobility prior to the introduction of public transportation was either walking to a bus/train station outside the community (usually more than a few kilometers) or taking pirate vans that served these communities, which cost significantly more than public transportation bus services in Israel, were sporadic in their time schedules, and posed a constraint on women from these traditional communities, who could not travel in crowded vans among men.

After several decades of historical neglect of public transportation infrastructure in Israel's non-Jewish communities, in 2007 the minister of transportation announced a 5-year plan to invest over 200 million NIS annually[5] in public transportation infrastructure within Arab communities. At the same time, a few Arab communities were already seeing greater investment in public transportation with new tenders being issued for bus line operators, and this was following local campaigning for the introduction of public transportation in these communities.[6] The actual investment in public transportation infrastructure ended up being substantially less than what was announced by the MOT in 2007. In 2011, the new minister of

[4]Car ownership and driving licenses among females within the Arab population have become much more common in recent years. Furthermore, fertility levels for the Arab population have declined substantially over the last 15 years and in 2016 have actually reached nearly identical levels to that of the Jewish population. During 2000-2004 the average number of children for Muslim women was 4.6, in comparison to 2.9 for Jewish women. Arab women employment rates have increased substantially in recent years. In 2009, employment among Arab women was 25%, in comparison to 73% for Jewish women (*The Arab Population in Israel: Facts & Figures 2018* (2018)).

[5]roughly equivalent to 57 million USD in 2007.

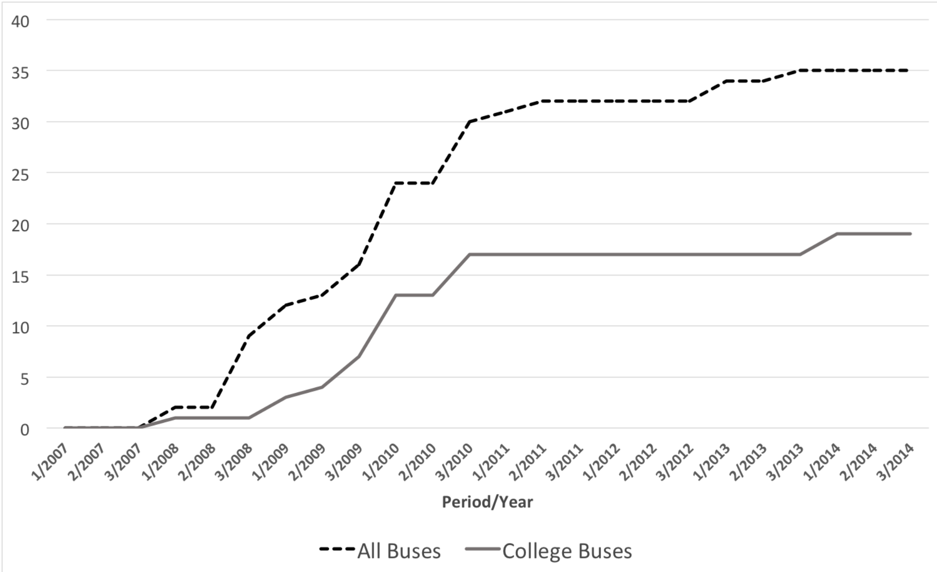
[6]In July 2007, the MOT announced that it will operate the first public transportation network serving Bedouin communities in Southern Israel in 3 towns - Rahat, Lakiya and Hura. This was shortly after the MOT's announcement of its 5-year public transportation plan in Arab communities, but it was after roughly two years of local campaigns run by the Beduoin community for the introduction of public transportation into their communities.

transportation announced that over 400 million NIS were spent on infrastructure and public transportation over the last few years and that 3.5 million persons from Arab towns and communities utilize the improved public transportation network annually. The new bus networks gradually developed over the next 7 years and increased significantly residents' mobility within and between their communities and access to large Jewish cities located close to them, thus expanding work and education opportunities to these residents. Despite substantial investment and improvements, the gaps in public transportation between Jewish and non-Jewish communities remain considerable, as demonstrated in a 2012 report by a non-profit organization (Naali-Yosef and Cohen (2012)).

Two recent studies evaluate public transportation expansions to Arab communities in Israel and the effect of this on labor market participation among Arabs. Barak (2019) and Greenwald et al. (2018) assign town-level bus line frequencies for the period 2010-2015 to individual-level or town-level data, respectively. These studies find either no effect or very small effects in response to greater bus line intensities. Neither Greenwald et al. (2018) nor Barak (2019) focus in their analysis on young adults, the population segment having the lowest vehicle ownership and which public transportation is likely to affect most. Moreover, Barak (2019) and Greenwald et al. (2018) do not separately evaluate the effects of buses connecting to higher education institutions as opposed to buses not connecting to higher education institutions, but rather examine the effects of bus networks in general. Our study demonstrates that this is vital for fully understanding the underlying effects of public transportation penetration on Arab communities, as the two different types of bus lines have opposite effects and evaluating them together can produce a null effect. In addition, our bus line data begins two years earlier than the bus line data utilized in Barak (2019) and Greenwald et al. (2018). This is important methodologically, as it is during 2008-2009 that many Arab communities transitioned from having no public transportation to having some public transportation, and as such, we are able to limit our sample to towns that had no public transportation until the start of 2008 and compare changes in response to public transportation penetration using a larger time span, beginning already in 2004. We believe that it is due to these methodological and data precision differences that our results for the young adult Arab population are stronger and more substantial than those presented for the broader Arab population in Barak (2019) and Greenwald et al. (2018).

Figure 1 presents the gradual penetration of public transportation in the towns in our sample. By construction, at the end of 2007, none of our 58 sample towns were served by buses. However, by 2014, 35 towns were served by bus lines, as depicted by the dashed line. The solid line shows how many of these towns were also served by bus lines destined to higher education institutions, and how this increased from zero in 2007 to 19 towns by 2014.

Figure 1: The Number of Sample Towns with Public Transportation Penetration



Notes: The sample includes 58 towns. Periods 1, 2, and 3 refer to representative Tuesdays in March, June, and end of December, respectively. (see Data Section for further details on our bus line data).

3 Data

Our data are obtained primarily from two sources. Data on all bus lines in Israel, their frequencies, origin and final destination were provided to us by the Israeli MOT for the period 2008-2014. Data on outcomes concerning educational attainment, school attendance and labor force participation of individuals within Arab communities in Israel were extracted from a survey of the Arab minority in Israel conducted by the Galilee Society in 2004, 2007, 2010, and 2014 (Arab Survey, hereafter).

Each cycle of the Arab Survey covers roughly 15,000 individuals from about 3,000 households , with the exception of the 2010 cycle which was limited to 8,500 individuals from 1,900 households. All four cycles are repeat cross-sections, and it is not possible to follow households through the years of the survey. Household members were asked about household and demographic characteristics, as well as their employment and education. We complement our data with general statistics concerning the population of each Arab community for each year available from the Israeli Central Bureau of Statistics (CBS).

The MOT data on bus lines details every bus line in Israel, its frequency, along with other details on three representative Tuesdays - at the end of March, June and December each year between 2008 and 2014.[7] Bus line data could not be obtained from prior to 2008. As such, if a town was served by bus lines as of early 2008, we could not know when these bus lines were introduced.[8] We thus could not determine what

[7]Note that the end of December is a normal work week in Israel. The dates selected - at the end of March, June and December - were determined by the MOT based on its capabilities in terms of extracting data from its system.

[8]MOT data for bus lines begin only in 2008 because prior to that all documentation of bus lines in Israel were not digitized by the MOT and no data was found available (we further contacted bus companies for this purpose and they could not assist as well with data prior to 2008).

the treatment variable values should be for these towns prior to 2008. As a result, we excluded 17 towns from our sample that were served by bus lines as of early 2008.[9] Overall, the analysis covers 58 towns, out of which 35 experienced bus line penetration during the sample period (between 2008 and 2014). A list of the towns in our analysis and the years each of these towns is covered in the Arab Survey is in Table 7 in the Appendix.

In order to construct our variables of interest concerning public transportation penetration, we examined the route for each bus line that serves Arab towns in Israel. While documenting bus lines' routes, we defined two important route characteristic. First, we defined a town as being served by public transportation only if that town had a bus line entering and stopping inside the town. If the town was only served by bus lines that stopped outside the town, then this town was not considered as being served by public transportation. Second, we distinguished between two types of bus lines: those serving at least one destination with a higher education institution and those not. In order to define relevant higher education destinations, we listed from the 2007, 2010 and 2014 Arab Surveys the institutions from which the adult population (ages 30-45) reported receiving a higher education certificate from. Any bus line that connected to a destination with a higher education institution that more than 3% of Arab higher education certificate holders reported attending was considered a bus line serving a higher education institution.[10] Based on this, we then aggregated for each town and each of the three annual dates for which bus services are observed the overall frequency of buses serving the town. We did this while distinguishing between bus lines connecting to higher education institutions and those not. All bus frequencies were then standardized by the relevant population for that town reported for that year by the Israeli CBS.

This bus line data was then merged with individual-level data from the Arab Survey for the years 2004, 2007, 2010 and 2014. For each year, we know the exact date the individual was interviewed,[11] and as such, we are able to assign the relevant frequency of each type of bus line - those serving destinations with higher education institutions and those not serving destinations with higher education institutions - at the precise date that individual was interviewed, relative to the three representative Tuesdays for which we have bus data for each year.[12]

Because our analysis focuses on the choice between work and educational attainment, the sample for regressions is limited to the young adult population - males ages 18-30 and females ages 18-27. Different age ranges that can still be representative of the young adult population for each gender resulted in similar estimates, although less precise at times. The young adult population should also be more responsive to public transportation, as car ownership is more relevant among the older population in Arab communities.

[9] A total of 26 Arab towns were served by bus lines as of early 2008, according to our data. Out of these, 19 towns are covered in the Arab Survey, but two are from Southern Israel, and we were able to verify for these two towns that public transportation was indeed only introduced to them in January 2008, so we were able to keep them in the sample.

[10] Our higher education institutions were the following: Achva Academic College, Ariel University, Beit Berl College, Ben-Gurion University of the Negev, Haifa University, Hebrew University of Jerusalem, Sakhnin College, Sapir College, Tel Aviv University.

[11] In some cases, the interview date was not provided. When this occurred, we derived the interview date from the median date for that town and year.

[12] For each interview date, we assign the bus line penetration values that are observed at one of the three dates for which we have data that is closest to the interview date.

Given the significant traditional differences between men and women within the Arab population in Israel, all results are reported separately by gender. For analyzing work and education outcomes, our dependent variables are: whether the individual reported working last week, usual weekly hours worked, monthly salary, and whether the individual is currently studying in a higher education institution.

After excluding the towns that had public transportation services at the end of 2007 and limiting the age range for our regression analysis, our male sample consists of roughly 2,700 observations and our female sample is roughly 2,000 observations - the number of observations for each regression varies due to missing values for some of the dependent variables.

In addition to our main regression specifications, we also present results with differential effects based on the Arab towns' socioeconomic ranking according to Israel's Central Bureau of Statistics. Towns' socioeconomic rankings are based on demographic variables, such as the mean age, dependency ratio, the share of families with 4 or more children, educational attainment, employment and retirement, and living standards (mean income, vehicle ownership and travel abroad). The ranking is in integers ranging from 1 - the lowest - to 10 - the highest. The index is updated every 2-3 years, with the exception of a break in updates between 2008 and 2013. Arab towns in Israel are ranked low in this index - in our sample of 58 towns, more than half are ranked 1 or 2. A socioeconomic ranking of 1 (2) in 2013 implied a mean of 9 (11) years of schooling for those aged 25-54, in comparison to the national Israeli mean of 13.5 years of schooling. Mean per capita monthly income in towns with a socioeconomic ranking of 1(2) was 1,181 (1,994) NIS, equivalent at the time to $325 ($549), in comparison to the national Israeli mean of 4,057 NIS, equivalent at the time to $1,118. The Arab towns that are not ranked 1 or 2 according to the socioeconomic index are also not very highly ranked socioeconomically, with the vast majority ranked at 3 or 4. For a socioeconomic ranking of 4, the mean years of schooling for the population aged 25-54 in 2013 was 12.7 and the mean per capita monthly income was 3,183 NIS ($877).

3.1 Summary Statistics

In Table 1, we present summary statistics of our sample of males aged 18-30 and females aged 18-27 in 58 Arab towns covered in the Arab Survey.

According to Table 1, there are significant differences between men and women in our sample. Women participate much less in the labor market, are much more likely to be married, though they are hardly household heads. Women, however, are more likely to be studying in higher education institutions than men. This is consistent with evidence on gender gaps in favor of females in educational attainment among disadvantaged populations (Autor et al. (2019)) and specifically among the Israeli Arab population, although primarily in STEM fields (Friedman-Sokuler and Justman (2019)).

Differences based on treatment status, are also documented in Table 1. Individuals from treated towns are less likely to be from the lowest socioeconomically ranked towns. Probably due to this, they are less likely to be married, the males are less likely to be household heads, and they are more likely to be in larger households because they are still residing with their parents. We assume that the town fixed effects in our regression analysis will alleviate much of the concern due to these substantial differences between treatment and control groups. As detailed in Section 4.1, our regression results stem primarily from differences within towns, as their public transportation penetration rates vary over time.

4 Empirical Strategy

Our detailed bus line data enable us to assign for each individual a measure for the intensity of bus lines serving their community at the time of the interview. We are further able to distinguish between the intensity of bus lines that serve destinations with higher education institutions and bus lines that do not . Thus, when estimating the effect of public transportation within a town on various outcomes, our specification takes the following form:

$$\begin{aligned} Outcome_{itmy} &= \alpha_0 + \alpha_1 AllBusIntensity_{itmy} + \alpha_2 CollegeBusIntensity_{itmy} \\ &\quad + \eta X_{itmy} + \gamma_t + \delta_y + \rho_m + \mu_t y_y + \varepsilon_{itmy} \end{aligned} \tag{1}$$

We evaluate outcomes related to labor force participation or educational attainment for individual i in town t surveyed in month m in year y. Two main coefficient estimates are of greatest interest to us: α_1 and α_2. α_1 is the coefficient on the variable $AllBusIntensity$, which measures the intensity of all buses serving the town, regardless of their destination. As such, α_1 tells us how our dependent variable changes when an additional bus per day per 1000 residents serves the town. However, this represents the effect of bus lines serving only work opportunities (and not higher education destinations), and this is due to an additional variable in the regression in equation (1) - $CollegeBusIntensity$. α_2, the coefficient on the variable $CollegeBusIntensity$, is the differential effect of an additional bus per day per 1000 residents that reaches a destination with a higher education institution. Thus, the full effect of one additional bus per day per 1000 residents that serves a higher education institution is $\alpha_1 + \alpha_2$. We stress that buses that connect to higher education institutions are assumed to connect also to employment opportunities. We are thus separately estimating the effect of bus intensity solely to work opportunities (α_1) and the effect of bus intensity to both work and education opportunities ($\alpha_1 + \alpha_2$).

We control for individual-level and town-level demographic characteristics in equation (1) (X_{ity}) - quadratic function of age, a series of indicators for the individual's relation to household head, the number of household members, and the town's socioeconomic ranking. Town-level fixed effects (γ_t) control for non-time-varying town-level characteristics that may be correlated with the outcomes of interest. Year fixed effects (δ_y) control for annual shocks in the outcomes of interest for towns in the sample. Interview month fixed ef-

Table 1: Summary Statistics

Variable	Treated - Public Transportation Penetration		Not Treated - No Public Transportation Penetration		Male P-Value for Difference based on Treatment	Female P-Value for Difference based on Treatment
	Males	Females	Males	Females		
Observations	2239	1705	511	349		
Worked Last Week	0.612	0.217	0.694	0.108	0.001	0.000
	(0.487)	(0.413)	(0.461)	(0.310)		
Currently Studying	0.160	0.265	0.077	0.144	0.000	0.000
	(0.367)	(0.442)	(0.267)	(0.352)		
Usual Work Hours	23.83	6.70	28.31	3.17	0.000	0.000
	(23.80)	(14.85)	(24.62)	(10.77)		
Usual Work Hours Conditional on Non-Zero	45.20	34.57	47.40	35.68	0.001	0.654
	(10.41)	(13.20)	(10.40)	(12.15)		
Monthly Salary	2014.5	616.4	2358.6	295.9	0.013	0.000
	(2871.5)	(1492.7)	(2605.7)	(1093.2)		
Monthly Salary Conditional on Non-Zero	4366.3	3194.3	4398.7	3442.2	0.855	0.475
	(2757.3)	(1820.9)	(1917.6)	(1771.4)		
All Bus Intensity	1.412	1.405	0.000	0.000	N/A	N/A
	(2.794)	(2.879)				
All Bus Intensity Conditional on Non-Zero	3.972	4.263	0.000	0.000	N/A	N/A
	(3.434)	(3.602)				
College Bus Intensity	0.445	0.450	N/A	N/A	N/A	N/A
	(1.153)	(1.214)				
College Bus Intensity Conditional on Non-Zero	2.091	2.172	N/A	N/A	N/A	N/A
	(1.674)	(1.839)				
Age	23.217	21.958	23.906	22.539	0.000	0.001
	(3.709)	(2.864)	(3.697)	(2.888)		
Married	0.200	0.352	0.356	0.544	0.000	0.000
	(0.400)	(0.478)	(0.479)	(0.499)		
Household Head	0.197	0.005	0.346	0.006	0.000	0.800
	(0.398)	(0.068)	(0.476)	(0.076)		
Son/Daughter of HH Head	0.791	0.634	0.648	0.433	0.000	0.000
	(0.407)	(0.482)	(0.478)	(0.496)		
Num of HH Members	3.342	3.317	3.012	3.163	0.000	0.088
	(1.669)	(1.451)	(1.933)	(1.855)		
Higher Socioeconomic Rank	0.476	0.450	0.339	0.327	0.000	0.000
	(0.500)	(0.498)	(0.474)	(0.470)		
Interview Month	6.723	6.952	6.250	5.905	0.000	0.000
	(2.771)	(2.763)	(2.590)	(2.535)		

Notes: The sample is males aged 18-30 and females aged 18-27. Standard deviations are in parenthesis. All bus intensity and college bus intensity refer to the weekday frequency of buses serving the town for each 1000 town residents. The last two columns are p-values for t-tests of the difference within the male or female population based on treatment status with treatment being defined as penetration of any buses during the sample period (by the end of 2014). The sample for the summary statistics is from the regression with monthly salary as the dependent variable - the regressions with the largest number of observations.

fects (ρ_m) control for any seasonality that may affect the outcomes of interest. Town-level linear time trends ($\mu_t y_y$) account for town-specific trends in our outcomes of interest during our sample period. All standard errors are clustered at the town level, to account for the possibility of within-town correlation of the error term, ε_{itmy} (Bertrand et al. (2004)).

Equation (1) is very much like a standard difference-in-differences (DID) specification, only the main variable of interest is an intensity of treatment measure, rather than just an indicator variable, and it is split into two - the intensity of treatment in terms of all buses and the differential intensity of treatment for buses reaching higher education institutions. Treated individuals are those residing in towns that received public transportation penetration during our sample period, and the post-treatment period varies between towns, based on the timing that bus lines began to serve them.

In addition to a general assessment of the effect of public transportation penetration, the coefficients of interest in equation (1) can provide insights to our two additional research agendas: whether we can find evidence of a tradeoff between investment in education and work, and what is actually chosen when access to both increases. α_1 in equation (1) provides an answer to the former question - if the results show increases in work outcomes and decreases in the probability of studying in response to greater public transportation solely to work opportunities, then this is evidence of a tradeoff between education and work. The sum $\alpha_1 + \alpha_2$ in equation (1) can provide answers to both research agendas. Its sign for different work or education outcomes shows what is actually chosen when both education and work opportunities become more available; furthermore, opposite signs for the sum $\alpha_1 + \alpha_2$ for work versus education outcomes is evidence of the tradeoff between the two.

In order to evaluate whether the findings from equation (1) depend on socioeconomic backgrounds, we alter equation (1) such that a differential effect is possible based on the individual's town socioeconomic ranking. We construct an indicator variable equal to 1 if the town was ranked socioeconomically at level 3 or higher and zero otherwise ($HighSocio$). We then estimate the following specification:

$$\begin{aligned} Outcome_{itmy} \quad = \quad & \beta_0 + \beta_1 AllBusIntensity_{itmy} + \beta_2 CollegeBusIntensity_{itmy} + \beta_3 AllBusIntensity * HighSocio_{itmy} \\ & + \beta_4 CollegeBusIntensity * HighSocio_{itmy} + \eta X_{itmy} + \gamma_t + \delta_y + \rho_m + \mu_t y_y + \varepsilon_{itmy} \qquad (2) \end{aligned}$$

In equation (2), β_1 and β_2 are estimates of the effect of one additional bus in general and the differential effect of higher education buses, respectively, for the population in towns with the lowest socioeconomic ranking. β_3 and β_4 are estimates of the differential effects of non-college and college buses, respectively, for individuals in towns with higher socioeconomic ranking. The estimated effect of one additional non-college bus per 1000 residents is β_1 or $\beta_1 + \beta_3$ for individuals from lower or higher socioeconomically ranked towns, respectively. The estimated effect of one additional college bus per 1000 residents is $\beta_1 + \beta_2$ or $\beta_1 + \beta_2 + \beta_3 + \beta_4$ for individuals from lower or higher socioeconomically ranked towns, respectively. All other variables in equation (2) are as defined in equation (1).

Our analysis also assesses whether effects observed in response to public transportation penetration vary based on the time that has elapsed since the initial introduction of public transportation to the town. It may be that responses take place immediately after or within a short time frame of the introduction of public transportation. Alternatively, responses may require new habits or even norms to form or developing awareness of the new service in the town, which would result in a longer time period passing by until a response is observed. To evaluate this, we differentiate between the effect of bus intensity measures during the year public transportation was introduced and the proceeding year and the effect of bus intensity measures more than one year after the introduction of public transportation to the town. This entails an alteration of equation (1) that splits the variables $AllBusIntensity$ and $CollegeBusIntensity$ each into two separate variables - $AllBusShortTerm$ and $CollegeBusShortTerm$ for the short term and $AllBusLongTerm$ and $CollegeBusLongTerm$ for the long term - the short term variables receive the value of the bus intensity measures assigned to each individual in our sample if that individual is observed in their town within 2 years of the introduction of public transportation and zero otherwise; the long term variables receive the value of the bus intensity measures assigned to each individual in our sample if that individual is observed in their town 2 years or more after the introduction of public transportation and zero otherwise.[13] This results in the following specification:

$$\begin{aligned} Outcome_{it\mathrm{my}} = \; & \lambda_0 + \lambda_1 AllBusShortTerm_{it\mathrm{m}y} + \lambda_2 CollegeBusShortTerm_{itmy} + \lambda_3 AllBusLongTerm_{itmy} \\ & + \lambda_4 CollegeBusLongTerm_{itmy} + \eta X_{itmy} + \gamma_t + \delta_y + \rho_m + \mu_t y_y + \varepsilon_{itmy} \end{aligned} \quad (3)$$

In equation (3), λ_1 and λ_3 estimate the effect of one additional bus (non-college) on the outcome of interest in the short and long term, respectively; the sums $\lambda_1 + \lambda_2$ and $\lambda_3 + \lambda_4$ estimate the effect of one additional college bus on the outcome of interest in the short and long term, respectively. All other variables in equation (3) are as defined in equation (1).

4.1 Identification

Our empirical analysis addresses three research questions. The first is the broader inquiry concerning the effect of introducing public transportation to disadvantaged communities on young adults' employment and educational attainment outcomes. The second is whether we can provide evidence of a tradeoff between time allocated to work and time allocated to investment in higher education. The third research question asks what disadvantaged young adults choose if both work and education become more accessible.

[13] An event study analysis would have been ideal for evaluating differential effects of the reform over time. However, in our specification, the effect of non-college buses is estimated separately from the effect of college buses, and the introduction timing of the two differs for many towns. This poses a challenge in an event study analysis, as it requires defining a base time - usually the period right before treatment initiation - and then variables that are defined based on the number of periods relative to the base time. Because our analysis focuses on two "treatments" - the introduction of buses in general and the introduction of college buses - it is not possible to define this base time, and as such, we could not perform an event study analysis in order to evaluate differential effects of buses over time.

In order to present evidence of the tradeoff between time allocated to work and time allocated to investment in higher education, we need exogenous variation in the time allocated either to work or to education and assessing how this affects time allocated to the other. Exploiting the introduction of public transportation to Arab communities in Israel provides variation in the time allocated to work, as some bus lines did not connect to education institutions but they nevertheless still connected the Arab population to greater employment opportunities. This allows us to assess how time allocated to education changes in responses to greater access to work opportunities. We do not assess the tradeoff between time allocated to work and time allocated to education in the opposite direction (i.e. when education becomes more accessible), as all bus lines destined to education institutions also connected the Arab communities to work opportunities, and thus we do not have a source for generating variation solely in the time allocated to education.

Answering what would be chosen between work and education if both are made more accessible to the young adult population in a disadvantaged setting requires exogenous variation in access to both work and education. We argue that we obtain this by exploiting the introduction of bus lines that are destined to higher education institutions. All these bus lines also connected the Arab communities with towns/cities that have greater work opportunities.

Regression results from equations (1)-(3) can provide answers to our research agendas, under the assumption that the introduction of bus lines - destined either to work opportunities or to work opportunities along with higher education opportunities - was exogenous and not correlated with other individual or town characteristics that may determine work or education outcomes. However, it seems quite reasonable that the destination of bus lines is not randomly assigned to towns and is in fact correlated with town or individual characteristics that may also be determinants of education and/or work outcomes.

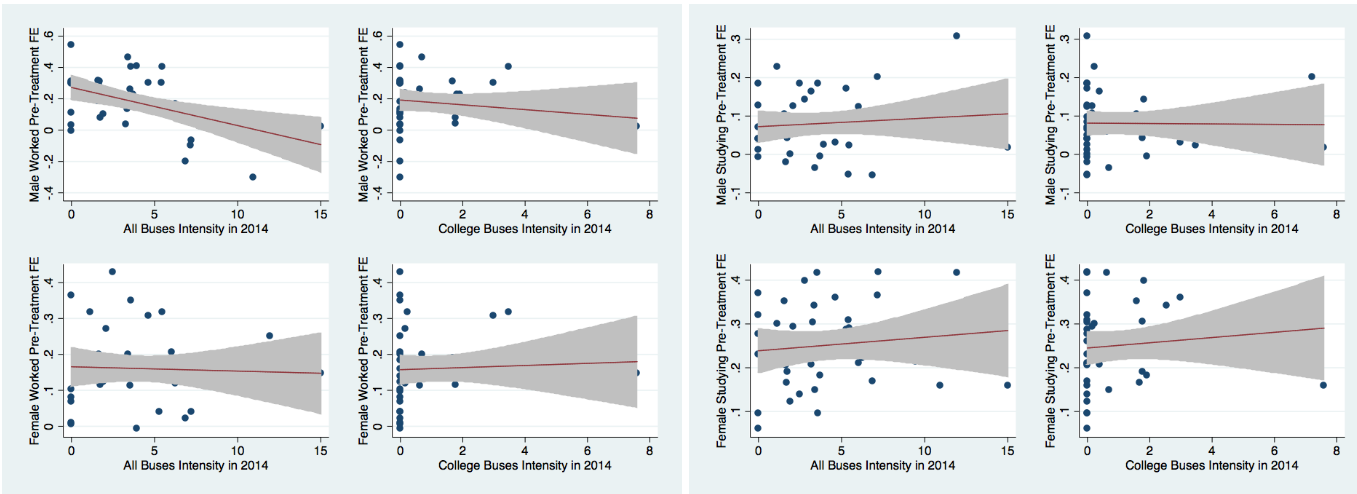
We examine this in Figure 2, which plots the relationship between those in the young adult population who reported working last week (Figure 2a) or reported currently studying (Figure 2b) in the 2004 and 2007 Arab Surveys, prior to the introduction of public transportation to towns in our sample, and the bus intensity as of 2014. Figure 2 plots each town's bus intensity measure as of 2014 along with its fixed effect estimate resulting from an individual-level regression as in equation (1) for 2004 and 2007 data and without the variables of interest concerning bus line intensity. The dependent variable is whether the individual worked last week or is currently studying in sub-Figures 2a and 2b, respectively. Linear regression lines along with their 95% confidence intervals (shaded in gray) are also presented to better examine whether a correlation exists between pre-treatment work/study rates and 2014 bus intensity. In all but one plot, the results exhibit no relationship between work and study rates prior to treatment and bus intensity as of 2014. There is some evidence that bus intensity in 2014 was greater in towns with lower male work rates prior to treatment.

Figure 2 is reassuring as it shows that for the most part there was no correlation between town characteristics prior to bus penetration and bus intensity as of 2014. This may be attributed to the fact that some towns may have experienced public transportation introduction just because they were on the way when

Figure 2: Relationship between Work/Study 2004 and 2007 Outcomes and 2014 Bus Intensity

(a) Worked Last Week

(b) Currently Studying



Notes: The sample of towns is limited to those in our sample and observed in either the 2004 or 2007 Arab Surveys - 39 towns in total. The y-axis represents each town's fixed effects estimate from individual-level regressions as described for equation (1), only without the bus intensity variables and only for the years 2004 and 2007. Bus intensity measures are the frequency of daily bus lines serving the town divided by the town population in thousands. Shaded gray areas represent the 95% confidence interval for a linear regression between the y-axis variable in the x-axis variable.

other towns were connected. Nevertheless, our main identification assumptions do not rely on assuming random assignment of bus line routes or destinations. Rather, our identification relies on the randomness of the *timing* that we observe individuals and the degree of bus penetration that they are exposed to at this exact time. This exploits two random factors: first, the randomness of the exact timing bus lines are introduced or their frequency is altered in Israel; second, the randomness of the exact interview date of the individuals in our sample.

All bus lines in Israel need to be approved by the MOT public transportation planning office, after which follows a long process for issuing tenders for operators and finally getting the bus lines to run. Even if a license has already been granted for the operation of a specific bus line, changes in bus line frequencies or routes - whether initiated by the operator, the local authority, the MOT itself, or anyone else - also require approval by the MOT.[14] This relatively prolonged bureaucratic process generates randomness in the timing of the bus line introductions and their changes in frequencies.[15]

Our Arab Survey data include the exact interview date for most individuals. For a large fraction of the towns in the sample, the interview dates for each year span over several months. If these specific

[14] As reference to this out-of-the-ordinary centralized planning held by the MOT, see a newspaper article from March 2019 (in Hebrew): https://www.themarker.com/dynamo/cars/.premium-1.7041329 - "Katz's Single Mistake - that we're all paying for" by Meirav Arlozorov. In this article, Israel's centralized transportation planning is described as unprecedented anywhere else in the world and extreme examples are provided such as the need for MOT's approval for even local road signs or traffic lights.

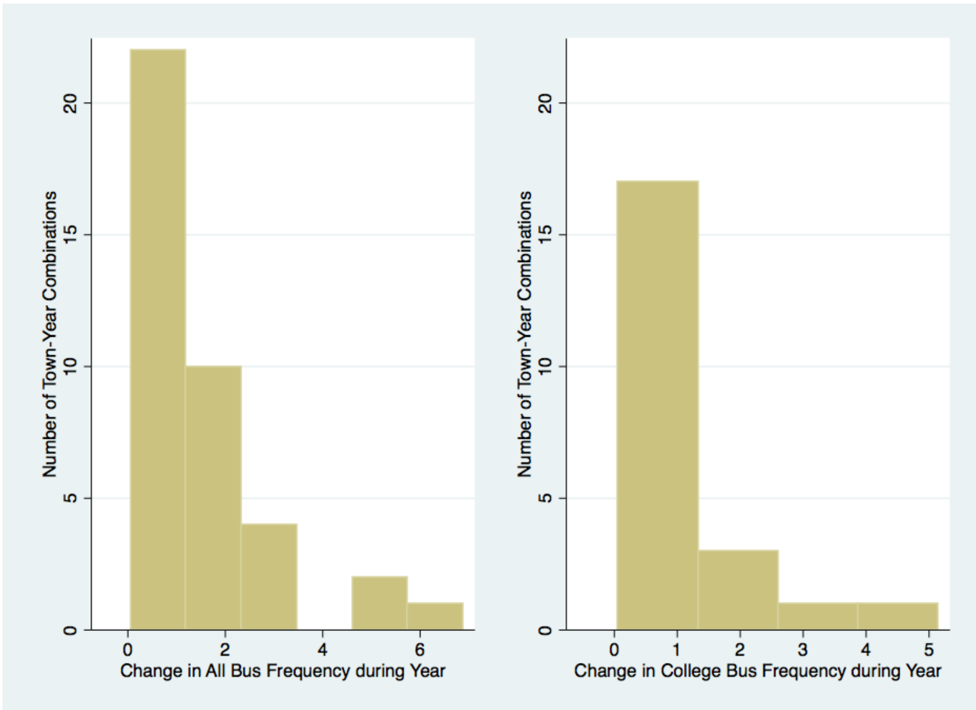
[15] One example is the introduction of bus lines to Beduin communities in Southern Israel. The MOT announced its plan to introduce public transportation networks to three Beduin communities in Southern Israel in July 2007 - Rahat, Laqiye and Hura. In practice, Hura was introduced its first bus line in the beginning of 2008, Rahat in the middle of 2009, and Laqiye at the end of 2010.

interview dates are random and there are changes over the course of the year in public transportation penetration, then this enhances the argument for plausibly exogenous variation in the assignment of bus penetration intensities across individuals. Indeed, Figure 3 shows that quite a few town-year combinations had non-zero changes in their bus frequencies during 2010 and 2014 - over 40 for the all-bus measure and nearly 30 for the college-bus measure. Furthermore, Table 2 exhibits a lack of correlation between the timing of an individual's interview and our outcomes of interest. Coefficient estimates are presented from regressions with our outcomes of interest as dependent variables and the number of days since the town's first interview for the year the individual is observed as the independent variable. Separate regressions are run for males and females and out of 8 coefficient estimates presented, only one is statistically significant. Arguably, this may be by chance. In Figure 4 we plot the distribution of the number of days between the first and last interview for our sample towns during 2010 and 2014 - when public transportation changed substantially over the course of the year for many towns. As can be seen, for more than 25 town-year combinations during 2010 and 2014, the time span between the first and last interview exceeded 40 days.

Indeed, our regression specification exploits the different timing of interviews for the same town during a survey year, which sometimes results in different bus intensity measures for the same town during a survey year. Table 7 in the Appendix lists all towns in our sample, along with the years that they are included in the Arab Survey. For each town-year combination in 2010 and 2014 - when public transportation measures were non-zero in our sample - Table 7 provides the number of days that span between the first and last interview for that year and the difference in the all-bus and college-bus measures in the sample for that year - resulting from the gaps in interview timing. As can be seen, in 2010, 10 towns had more than one value for all-bus penetration and 5 towns had more than one value for college-bus penetration. For 2014, these figures are lower due to smaller time spans in interview timing - 3 and 1 for all-bus and college-bus measures, respectively. These differences generate important variation in our regression specifications, which already include town fixed effects. Furthermore, some of these differences in bus penetration measures are very large - more than half or even exceeding the standard deviation of the bus penetration measure presented in Table 1 in Section 3.1.

To summarize, our setting provides randomness in assigning bus intensity measures due to the random timing of changes in bus lines in Israel as well as the random timing of interviews in the Arab Survey data. Furthermore, the time span between interviews for the same town during a survey year generates plausibly random variation in bus intensity measures (with the randomness due to the arguments made concerning the randomness in bus line changes and interview timing) within towns during a single survey year, and this is in addition to the variation in bus intensity measures across towns and over time.

Figure 3: Difference in Public Transportation Penetration between Beginning and End of the Year (Non-Zero Values)



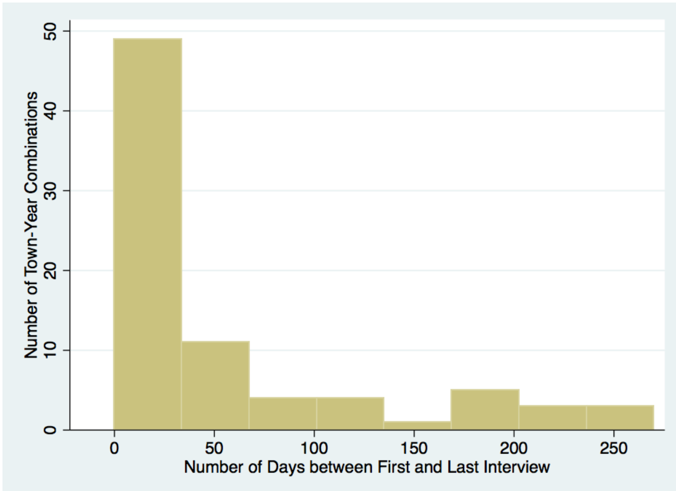
Notes: The figure presents the distribution of the difference in public transportation penetration between the beginning and end of the year for town-year combinations that had non-zero values (from 2010 and 2014). The left panel presents this difference for the all-bus intensity variable and the right panel presents this difference for the college-bus intensity variable.

Table 2: Interview Timing and Outcomes of Interest

Dependent Variable	Worked Last Week	Usual Weekly Hours Worked	Monthly Salary	Currently Studying
		Males		
Days Since First Town Interview	0.000148	0.00223	-0.497	-0.000209**
	(0.000133)	(0.00639)	(0.776)	(9.75e-05)
Number of Observations	2,710	2,723	2,750	2,729
R^2	0.066	0.120	0.057	0.043
		Females		
Days Since First Town Interview	-0.000143	-0.00611	-0.475	-1.85e-05
	(0.000130)	(0.00467)	(0.466)	(0.000140)
Number of Observations	2,028	2,051	2,054	2,043
R^2	0.068	0.057	0.069	0.068

Notes: The coefficient estimate presented is for the variable indicating the number of days since the first interview in the town for that year in regressions at the individual level for our sample population - males ages 18-30 and females ages 18-27 in the top and bottom panel, respectively. Town and year fixed effects are included in the regressions.

Figure 4: Time Span (Days) between First and Last Interview for Town-Year Combinations



Notes: The town-year combinations in the figure are only from 2010 and 2014, years when public transportation penetration could have varied substantially both at the extensive and intensive margin for some towns over the course of the year.

5 Results

5.1 Baseline Regression Results - Young Adult Population

Table 3 presents results for our baseline specification - equation (1) - which differentiates between the effect of buses that are destined to higher education institutions and buses that are not destined to higher education institutions. The top panel of Table 3 presents results for the young adult male population and the bottom panel for the young adult female population. For each dependent variable, we present results for specifications without individual-level controls, followed by results for specifications with individual-level controls. For the most part, the coefficient estimates do not vary substantially between the two specifications for each dependent variable, with the exception of the results concerning monthly salaries for females. With this exception in mind, this is overall evidence that our variables of interest are not correlated with individual-level characteristics.

The top panel of Table 3 suggests that the young adult male population increases its labor force participation measures - probability of working and monthly salary - in response to buses that do not connect with higher education institutions. However, when assessing the effect of buses that connect to higher education institutions, the probability of working and the usual weekly work hours decrease and the monthly salary no longer increases. In terms of the probability of studying, while we do not observe a decrease in this in response to buses that do not connect to higher education institutions, we do observe a marginally statistically significant increase in the probability of studying in response to buses that do connect to higher education institutions (p-value is 0.15).

In contrast to the male young adult population, for the females no statistically significant responses are observed as a result of additional buses - whether connecting to higher education institutions or not. This may suggest that the barriers for females to increase their labor force participation or attain higher education are not just in terms of physical accessibility, but rather also possibly to a large extent cultural or related to traditional customs.

Quantitatively, for the male population, there is an increase of 3 percentage points in the probability of working for each bus serving the town per 1000 residents. The mean bus intensity among treated towns is 3.97 (see Table 1) - thus we observe a mean increase of a little less than 12 percentage points in response to bus penetration, which is slightly less than 20 percent of the mean. In response to buses destined to higher education institutions, males decrease the probability of working by 5.76 percentage points for each bus serving their town per 1000 residents. The mean college bus intensity among treated towns with college buses is 2.09, so the mean increase is a little over 12 percentage points, roughly 20 percent of the mean. At the intensive margin, hours worked do not appear to change significantly in response to non-college buses, but in response to each college bus per 1000 residents there is a decrease of 5.23 weekly work hours, which implies a mean decrease that is 44 percent of the mean. Males' monthly salaries increase by 164.3 NIS in response to each non-college bus per 1000 residents, so the mean increase is 31 percent of the mean monthly salary. Lastly, the probability of studying increases by an imprecise 4.5 percentage points for each college bus per 1000 residents, which implies a mean increase of 62 percent increase from the mean probability of studying - however, the high imprecision of this estimate may have caused it to be inflated.

Our results exhibit the importance of accounting for differential effects of buses destined solely to work opportunities as opposed to buses connecting both to work and to higher education opportunities. When examining the male population results in Table 3, it can be seen that the contrasting effects of the two different types of bus lines on work outcomes would likely offset each other and result in statistically insignificant effects of bus lines if one only considered the effect of bus lines in general, rather than separating the effect of bus lines based on their connectivity to work or education opportunities. Table 8 in the Appendix demonstrates this. Moreover, this highlights at least some of what is driving the differences in the magnitude of the effect of public transportation penetration to Arab communities in Israel between our study and other recent studies (Greenwald et al. (2018); Barak (2019)).

5.2 Differential Effects based on Socioeconomic Status

We next proceed to examine whether the effects observed in Table 3 for males differ based on the individual's town socioeconomic ranking and whether behind the null effects for females in Table 3 there are significant effects for individuals from higher or lower socioeconomically ranked towns. Table 4 presents results from equation (2) for our four dependent variables. At the bottom of each panel, p-values for t-tests of significant effects of non-college or college buses on individuals from lower or higher socioeconomically ranked towns are presented.

For males, Table 4 shows us that the effects found in Table 3 are primarily driven by individuals from

Table 3: Public Transportation Penetration - Differential Effect for Buses destined to Higher Education Institutions

Dependent Variable	Worked Last Week		Usual Weekly Hours Worked		Monthly Salary		Currently Studying	
	Males - Ages 18-30							
All Bus Intensity	0.0334***	0.0301**	0.466	0.814	194.0***	164.3**	-0.0116	-0.00515
	(0.0112)	(0.0126)	(0.701)	(0.823)	(66.32)	(73.95)	(0.0105)	(0.0154)
College Bus Intensity	-0.0818**	-0.0877***	-5.006**	-6.047***	-378.3	-374.8	0.0492	0.0452
	(0.0332)	(0.0302)	(2.231)	(2.148)	(239.3)	(237.5)	(0.0356)	(0.0363)
Number of Observations	2,710	2,710	2,723	2,723	2,750	2,750	2,729	2,729
R^2	0.099	0.211	0.176	0.277	0.097	0.175	0.083	0.135
Mean Dependent Variable	0.627	0.627	24.66	24.66	2078	2078	0.145	0.145
P-Value for Overall College Bus Effect	0.0495	0.00437	0.0121	0.00106	0.379	0.260	0.224	0.150
	Females - Ages 18-27							
All Bus Intensity	0.0221	0.0124	0.629	0.419	29.04	3.710	0.0166	0.0148
	(0.0174)	(0.0194)	(0.455)	(0.499)	(87.33)	(81.98)	(0.0135)	(0.0128)
College Bus Intensity	-0.0494	-0.0276	-2.144	-1.642	38.94	106.9	-0.0185	-0.0150
	(0.0430)	(0.0510)	(1.333)	(1.396)	(154.2)	(172.6)	(0.0403)	(0.0325)
Number of Observations	2,028	2,028	2,051	2,051	2,054	2,054	2,043	2,043
R^2	0.111	0.184	0.105	0.157	0.124	0.203	0.108	0.196
Mean Dependent Variable	0.199	0.199	6.102	6.102	561.9	561.9	0.245	0.245
P-Value for Overall College Bus Effect	0.393	0.680	0.141	0.244	0.527	0.362	0.953	0.995
Town, Year Fixed Effects	✓	✓	✓	✓	✓	✓	✓	✓
Linear Time Trends	✓	✓	✓	✓	✓	✓	✓	✓
Individual Controls		✓		✓		✓		✓

Notes: Each column in each panel (males vs. females) presents the coefficient estimate for α_1 and α_2 from equation (1). Control variables are the following: quadratic function of age, indicators for relation to household head, indicators for month of interview, number of household members. P-Value for Overall College Bus Effect represents the two-sided test p-value for the sum of the two coefficient estimates presented - $\alpha_1 + \alpha_2$ from equation (1). Standard errors clustered at the town level are in parenthesis. *** p<0.01, ** p<0.05, * p<0.1

the lowest socioeconomic rank. The work variable regressions produce statistically significant increases in response to non-college buses and statistically significant decreases in response to college buses. For studying, a large and statistically significant increase in the probability of studying is observed for individuals from the lowest socioeconomically ranked towns. In contrast to this, the p-values for the effects of both non-college buses and college buses for individuals from the higher socioeconomically ranked towns are all not statistically significant, with the exception of a statistically significant increase in salaries in response to non-college buses.

Table 4 shows statistically significant responses to college and non-college buses among females from higher socioeconomically ranked towns. The probability of working in response to each non-college bus per 1000 residents increases by 8.9 percentage points but decreases by 13.1 percentage points in response to each college bus per 1000 residents. At the intensive margin (hours worked) no significant effect is found but for monthly salaries, females from higher socioeconomically ranked towns experience increases (451.3 NIS) in response to non-college buses and decreases (352.9 NIS) in response to college buses. Despite these results, which are consistent with the tradeoff between work and education in response to greater access to work and/or education opportunities, we still do not observe any statistically significant responses among females in terms of the probability of currently studying - not even for females from higher socioeconomically ranked towns. For females from the lowest socioeconomically ranked towns we have two results that are not consistent with the tradeoff between work and investing in education - they appear to be earning less and studying more in response to non-college buses.

5.3 Short and Long Term Effects

We investigate whether the results in Tables 3 and 4 differ between the short term and long term following the introduction of public transportation to Arab towns. Individuals observed during the short-term are those observed less than two years since their town experienced some public transportation services. Individuals observed in the long-term are those observed two years or more after the introduction of public transportation in their town. Table 5 presents the results from equation (3) discussed in Section 4. The top panel provides results for males, and the bottom panel provides results for females, with separate regressions for towns ranked low versus high socioeconomically.

For the male population, as in Table 4, most of the statistically significant results are for the lowest-socioeconomic-status towns, and they are for both the short and long term. For females, there are some results for the lowest-socioeconomic-status towns, with some reductions in work-related outcomes in response to college buses in the long term and even an imprecise increase in the probability of studying in response to college buses in the long term (p-value 0.142). However, the most consistent female results emerge for the sample of higher socioeconomically ranked towns (as in Table 4) and they show increases in work-related measures and decreases in the probability of studying in response to all buses in the long term and decreases in work-related measures in response to college buses in the long-term. These long term

Table 4: Public Transportation Penetration - Differential Effect based on Bus Destination and Town's Socioeconomic Ranking

	Males				Females			
Dependent Variable	Worked Last Week	Usual Hours Worked	Monthly Salary	Currently Studying	Worked Last Week	Usual Hours Worked	Monthly Salary	Currently Studying
All Bus Intensity	0.0277**	1.634**	137.1	0.00175	-0.00392	0.496	-94.30*	0.0202**
	(0.0130)	(0.753)	(92.23)	(0.0142)	(0.0143)	(0.587)	(48.28)	(0.00962)
College Bus Intensity	-0.0899***	-8.600***	-455.3*	0.0668**	0.00484	-2.202	219.8	-0.0230
	(0.0293)	(1.786)	(258.2)	(0.0280)	(0.0474)	(1.591)	(158.8)	(0.0257)
All Bus Intensity*Higher Socio	0.00732	-3.153*	73.51	-0.0182	0.0928***	-0.503	545.6***	-0.0298
	(0.0278)	(1.804)	(136.3)	(0.0228)	(0.0341)	(0.999)	(87.83)	(0.0381)
College Bus Intensity*Higher Socio	0.00862	10.75**	330.0	-0.0907	-0.225**	2.701	-1,024***	0.0628
	(0.0702)	(5.025)	(440.7)	(0.0594)	(0.0896)	(2.775)	(245.6)	(0.126)
Number of Observations	2,710	2,723	2,750	2,729	2,028	2,051	2,054	2,043
R^2	0.211	0.279	0.176	0.140	0.188	0.158	0.213	0.196
Mean Dependent Variable	0.627	24.66	2078	0.145	0.199	6.102	561.9	0.245
P-Value for College Bus Effect - Lowest Socio	0.00205	5.50e-07	0.115	0.000280	0.980	0.143	0.321	0.888
P-Value for All Bus Effect - Higher Socio	0.202	0.355	0.0928	0.448	0.00642	0.992	3.12e-07	0.806
P-Value for College Bus Effect - Higher Socio	0.285	0.850	0.782	0.283	0.0146	0.794	0.00439	0.738
Town, Year Fixed Effects	✓	✓	✓	✓	✓	✓	✓	✓
Linear Time Trends	✓	✓	✓	✓	✓	✓	✓	✓
Individual Controls	✓	✓	✓	✓	✓	✓	✓	✓

Notes: Each column in each panel (males vs. females) presents the coefficient estimate for β_1, β_2, β_3 and β_4 from equation (2). Control variables are the following: quadratic function of age, indicators for relation to household head, indicators for month of interview, number of household members. P-Value for College Bus Effect - Lowest Socio represents the two-sided test p-value for the sum of the two coefficient estimates presented - $\beta_1 + \beta_2$ from equation (2). P-Value for All Bus Effect - Higher Socio represents the two-sided test p-value for the sum $\beta_1 + \beta_3$ from equation (2). P-Value for College Bus Effect - Higher Socio represents the two-sided test p-value for the sum $\beta_1 + \beta_2 + \beta_3 + \beta_4$ from equation (2). Standard errors clustered at the town level are in parenthesis. *** p<0.01, ** p<0.05, * p<0.1

results for females from higher socioeconomically-ranked towns are in sharp contrast to the short term results for females from higher socioeconomically-ranked towns, which are statistically insignificant for all measures. Thus, Table 5 provides an important insight along with the results in Table 4 - not only are the results for females most apparent among higher socioeconomically ranked towns, but also the responses are confined to the long term.

5.4 Robustness Check - Older Adult Population

Evidence of the tradeoff between work and educational attainment should only be relevant for the young adult population and not for the older adult population. We therefore ran the same regressions in equations (1) and (2) on all individuals aged 35-50 from our sample of 58 towns. Our dependent variables were the same work-related dependent variables as in the main analysis - whether the individual worked last week, usual weekly hours worked, and monthly salary. We also ran regressions with years of schooling as the dependent variable, which allows us to examine whether public transportation penetration is correlated with pre-determined individual characteristics, as educational attainment should be complete by age 35.

The results of these regressions are presented in Table 6. Increases in the work-related dependent variables in response to public transportation measures make sense, considering that public transportation penetration can also increase labor force participation among older adults, in addition to its effect on younger adults. However, decreases in labor force participation in response to public transportation measures would be difficult to explain, as older adults should not face a tradeoff between work and investing in higher education. Indeed, most of the effects of public transportation penetration that are observed in Table 6 are either null or positive. The differential effect for college buses on male salaries in higher socioeconomically ranked towns is negative but this is only offsetting a positive effect of non-college buses and the overall effect of college buses on salaries for males from higher socioeconomically ranked towns is not statistically significant. The only negative effects observed are decreases in weekly hours worked for males from the lowest socioeconomically ranked towns in response to college buses and for low socioeconomically ranked females' probability of working last week in response to non-college buses. While ideally, our robustness check would have no negative effects, it is still plausible that these results are by chance out of 36 effects observed among the work dependent variables.

When years schooling is the dependent variable in Table 6, it appears that there is a correlation between some of the public transportation measures and the older adult population years schooling. College bus frequencies in the lowest socioeconomically ranked towns are correlated with males having more years of schooling and non-college bus lines in the higher socioeconomically ranked towns are positively correlated with males' years of schooling. For females the correlations are positive for the lowest socioeconomically ranked towns and college bus lines and for higher socioeconomically ranked towns and non-college bus lines, but negative for the higher socioeconomically ranked towns and the college bus lines. These correlations confirm what was already discussed in Section 4.1 concerning the identification strategy - it seems

Table 5: Public Transportation Penetration - Short and Long Term Effects

Dependent Variable	Worked Last Week		Weekly Hours Worked		Monthly Salary		Currently Studying	
Sample	Low Socio	High Socio	Low Socio	High Socio	Low Socio	High Socio	Low Socio	High Socio
				Males				
All Bus Intensity - Short Term	0.0323**	-0.101	2.143***	-4.928**	211.1**	-11.85	0.00483	0.176
	(0.0131)	(0.0746)	(0.523)	(1.969)	(79.55)	(897.1)	(0.0189)	(0.116)
College Bus Intensity - Short Term	-0.0883***	0.0815	-7.742***	0.460	-486.0***	73.21	0.0624*	-0.307**
	(0.0245)	(0.0983)	(1.151)	(3.906)	(152.3)	(1,110)	(0.0332)	(0.126)
All Bus Intensity - Long Term	0.0401	0.0476	5.988***	-1.115	694.7***	127.9	0.0182	-0.0538***
	(0.0265)	(0.0409)	(1.350)	(1.837)	(150.6)	(185.2)	(0.0382)	(0.0145)
College Bus Intensity - Long Term	-0.127***	-0.110	-22.34***	0.890	-1,907***	-79.28	0.0567	0.00753
	(0.0340)	(0.0869)	(1.850)	(3.897)	(280.3)	(402.2)	(0.0613)	(0.0253)
Number of Observations	1,482	1,228	1,487	1,236	1,511	1,239	1,496	1,233
Mean Dependent Variable	0.638	0.614	24.73	24.57	2106	2044	0.136	0.157
P-Value for College Bus Effect - Short Term	0.000584	0.799	2.07e-07	0.288	0.0107	0.903	0.00112	0.00452
P-Value for College Bus Effect - Long Term	0.000879	0.214	0	0.927	1.59e-06	0.876	0.0455	0.0362
				Females				
All Bus Intensity - Short Term	-0.0145	-0.0666	0.546	-0.215	-144.1**	-37.27	0.0295**	-0.0324
	(0.0107)	(0.123)	(0.401)	(3.490)	(58.54)	(286.1)	(0.0138)	(0.183)
College Bus Intensity - Short Term	0.00913	0.113	-2.243***	4.409	279.6**	113.5	-0.0312	0.0195
	(0.0152)	(0.116)	(0.730)	(3.087)	(110.3)	(281.6)	(0.0260)	(0.215)
All Bus Intensity - Long Term	0.0127	0.146***	2.667**	0.599	-19.10	547.6***	-0.0209	-0.0672*
	(0.0334)	(0.0184)	(1.159)	(1.064)	(141.9)	(74.82)	(0.0337)	(0.0388)
College Bus Intensity - Long Term	-0.172**	-0.243***	-9.261***	2.311	-367.7	-754.5***	0.0733	0.130
	(0.0659)	(0.0516)	(2.517)	(2.353)	(260.3)	(173.9)	(0.0499)	(0.120)
Number of Observations	1,156	872	1,171	880	1,172	882	1,165	878
Mean Dependent Variable	0.176	0.229	5.126	7.401	507.5	634.2	0.214	0.286
P-Value for College Bus Effect - Short Term	0.520	0.453	0.000125	0.0538	0.0314	0.580	0.938	0.941
P-Value for College Bus Effect - Long Term	0.00120	0.0194	0.000103	0.0778	0.0191	0.0763	0.142	0.526
Town, Year Fixed Effects	✓	✓	✓	✓	✓	✓	✓	✓
Linear Time Trends	✓	✓	✓	✓	✓	✓	✓	✓
Individual Controls	✓	✓	✓	✓	✓	✓	✓	✓

Notes: Each column in each panel (males vs. females) presents the coefficient estimates for λ_1, λ_2, λ_3 and λ_4 from equation (2). Control variables are the following: quadratic function of age, indicators for relation to household head, indicators for month of interview, number of household members. P-Value for College Bus Effect - Short Term represents the two-sided test p-value for the sum of the two coefficient estimates presented - $\lambda_1 + \lambda_2$ from equation (3). P-Value for College Bus Effect - Long Term represents the two-sided test p-value for the sum $\lambda_3 + \lambda_4$ from equation (3). Standard errors clustered at the town level are in parenthesis. *** p<0.01, ** p<0.05, * p<0.1

rather plausible that bus lines are not randomly assigned. Given that our identification relies more heavily on the randomness of the timing of interviews and the randomness of the introduction of bus lines and changes in their schedule, the results of the last column of Table 6 are worth noting but should not pose a threat to the identification strategy and interpreting the results as causal.

5.5 Results Discussion

To better understand whether young adult Arabs in Israel are trading off between work and higher education and what their choice actually is when work and higher education opportunities expand simultaneously, we examine the coefficient estimates of work and study outcomes together. According to Table 4, males - particularly from lower socioeconomically ranked towns - are increasing their labor force participation measures in response to non-college buses; however, we do not observe a response to non-college buses in terms of whether they are currently studying. Thus, it appears that non-college bus lines are increasing labor force participation among males from lower socioeconomic backgrounds but this is not instead of investment in higher education.

Lack of evidence of the tradeoff between work and education in response to bus lines that are not destined to higher education institutions may be due to numerous factors. It may be that some individuals are still increasing their educational attainment due to the greater bus connectivity through buses that are not directly destined to higher education institutions but nevertheless connect to other buses leading to higher education institutions, and this is offsetting any reductions in educational attainment among those using the bus lines to connect solely to work opportunities. It may also be that the new bus lines save time and individuals who are studying are now able to allocate time more efficiently to both work and study rather than only studying. On this note, we stress that in all towns in our sample, non-college bus introduction either preceded or coincided with college bus introduction so those already studying when non-college buses were introduced were those doing this despite not having a direct bus line linking them to a higher education institution, indicating that they could be substantially more rigid in their decision to study, or alternatively their response to buses that increase solely access to work opportunities is less elastic .[16]Lastly, it may also be that the increase in employment outcomes is driven, at least to some extent, by individuals who would not have worked or studied absent the new bus lines, and with the addition of bus lines transition from being inactive either in the labor force or in terms of educational attainment.[17]

The results concerning the tradeoff between work and education differ when analyzing the effect of buses destined both to work and higher education institutions on males from lower socioeconomically

[16]This argument is not entirely accurate, as our analysis examines the response to bus lines at the intensive margin, so we also measure changes in the intensity of bus lines over time and not just a transition from no bus lines to some bus lines. Nevertheless, it may be that a large part of the effect estimated for α_1 from equation (1) or β_1 from equation (2) is driven by the actual introduction of bus lines.

[17]In regressions examining the effect of bus lines on the probability of either working or studying (combined as a single dependent variable) among our young adult sample (not presented in this paper), we find increases of 2.4 and 3 percentage points in this probability that are statistically significant at the 10% level for males and females, respectively, in response to buses not destined to higher education institutions. The response to buses destined both to work and higher education institutions is not statistically significant.

Table 6: Public Transportation Penetration and the Older Adult Population

Dependent Variable	Worked Last Week		Usual Weekly Hours Worked		Monthly Salary		Years Schooling	
Males								
All Bus Intensity	0.0161	0.0194	1.384	2.841	198.5	-1.281	0.181	0.0635
	(0.0300)	(0.0399)	(1.726)	(2.311)	(248.6)	(208.9)	(0.124)	(0.136)
College Bus Intensity	0.0110	-0.0223	-4.608	-9.602**	-191.7	116.2	0.199	0.455
	(0.0608)	(0.0860)	(4.199)	(4.326)	(455.1)	(441.7)	(0.425)	(0.418)
All Bus Intensity*		-0.0135		-5.624		775.1***		0.449
Higher Socio		(0.0491)		(3.385)		(256.0)		(0.313)
College Bus Intensity*		0.116		19.37**		-1,445*		-1.086
Higher Socio		(0.102)		(9.199)		(798.8)		(0.847)
Number of Observations	1,835	1,835	1,804	1,804	1,841	1,841	1,783	1,783
R^2	0.158	0.159	0.241	0.247	0.162	0.166	0.216	0.218
Mean Dependent Variable	0.773	0.773	31.31	31.31	2930	2930	11.11	11.11
P-Value for College Bus Effect (Lowest Socio)	0.498	0.963	0.294	0.0147	0.983	0.728	0.275	0.113
P-Value for All Bus Effect - Higher Socio		0.786		0.198		0.000925		0.0992
P-Value for College Bus Effect -Higher Socio		0.00418		0.270		0.300		0.836
Females								
All Bus Intensity	-0.0245	-0.0333**	-0.793	-0.627	-20.03	-105.7	0.170	-0.0351
	(0.0188)	(0.0162)	(0.799)	(0.860)	(100.6)	(69.87)	(0.138)	(0.162)
College Bus Intensity	0.0860**	0.0939**	1.079	0.641	283.4	365.8**	-0.0330	0.446
	(0.0363)	(0.0376)	(1.643)	(1.564)	(196.7)	(173.9)	(0.341)	(0.282)
All Bus Intensity*		0.0302		-0.630		300.7		0.744**
Higher Socio		(0.0329)		(1.597)		(196.7)		(0.286)
College Bus Intensity*		-0.0377		1.892		-400.5		-2.055***
Higher Socio		(0.0854)		(4.332)		(577.3)		(0.646)
Number of Observations	1,915	1,915	1,924	1,924	1,926	1,926	1,829	1,829
R^2	0.172	0.173	0.135	0.135	0.173	0.176	0.318	0.322
Mean Dependent Variable	0.240	0.240	6.751	6.751	778.2	778.2	9.703	9.703
P-Value for College Bus Effect (Lowest Socio)	0.00695	0.0259	0.769	0.987	0.0949	0.0570	0.597	0.0163
P-Value for All Bus Effect - Higher Socio		0.930		0.408		0.320		0.0115
P-Value for College Bus Effect -Higher Socio		0.310		0.660		0.690		0.0392
Town, Year Fixed Effects	✓	✓	✓	✓	✓	✓	✓	✓
Linear Time Trends	✓	✓	✓	✓	✓	✓	✓	✓
Individual Controls	✓	✓	✓	✓	✓	✓	✓	✓

Notes: Each column in each panel (males vs. females) presents the coefficient estimates for α_1 and α_2 from equation (1), followed by the estimates for β_1, β_2, β_3 and β_4 from equation (2) in the next column (for each dependent variable). Control variables are the following: quadratic function of age, indicators for relation to household head, indicators for month of interview, number of household members. P-Value for College Bus Effect (Lowest Socio) represents the two-sided test p-value for the sum $\alpha_1 + \alpha_2$ from equation (1) in the first column of each dependent variable, followed by the two-sided t-test p-value for the sum $\beta_1 + \beta_2$ from equation (2) in the next column. P-Value for All Bus Effect - Higher Socio represents the two-sided test p-value for the sum $\beta_1 + \beta_3$ from equation (2). P-Value for College Bus Effect - Higher Socio represents the two-sided test p-value for the sum $\beta_1 + \beta_2 + \beta_3 + \beta_4$ from equation (2). Standard errors clustered at the town level are in parenthesis. *** p<0.01, ** p<0.05, * p<0.1

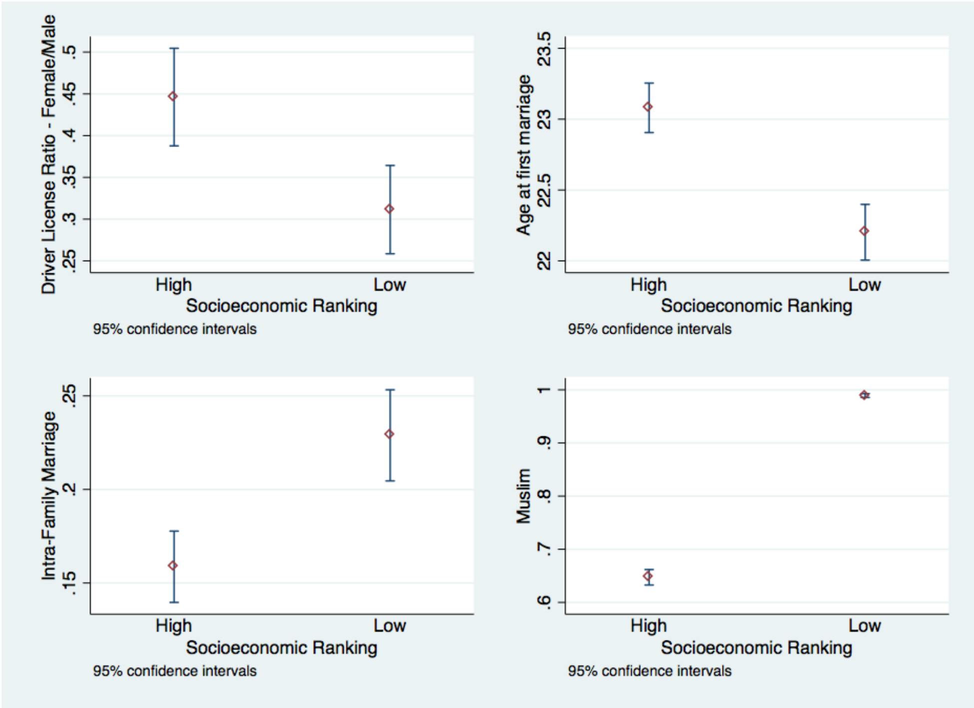
ranked towns. The results in Table 4 show a negative response for work outcomes and an increase in the probability of currently studying. Here we see that males from lower socioeconomically ranked towns are choosing investment in education over work and there is clear evidence of the tradeoff between the two.

For females, most of the response to bus lines is among those from higher socioeconomically ranked towns, and according to Table 5, this is even further confined to the long term - more than a year after the initial introduction of public transportation. The results from the bottom panel of Table 5 present evidence of a tradeoff between work and education among these females in response to non-college buses. Work outcomes - particularly the probability of working and salaries - increase in response to non-college buses in the long-term, while simultaneously the probability of studying decreases. The response to college buses among females from higher socioeconomically ranked towns is negative in terms of the probability of working and their salaries, although the results do not present an increase in the probability of studying. There is, however, an offsetting of the negative and statistically significant coefficient when studying is the dependent variable in response to non-college buses. Thus, college buses appear to be reducing the negative effect on studying of bus lines that connect solely to work opportunities. This and the decrease in work-related outcomes in response to college buses is consistent with at least some females from higher socioeconomically ranked towns choosing schooling over work when connectivity increases to both.

It should be noted that there are a few results in Tables 4 and 5 that are not consistent with a tradeoff between work and study - there is consistently an increase in the probability of studying among females from lower socioeconomic backgrounds in response to non-college buses, and in Table 5 we observe an increase in weekly work hours among females from higher socioeconomic backgrounds in response to college buses. Also, according to Table 5, males from higher socioeconomically ranked towns appear to be decreasing their probability of studying in response to college buses, and there is no increase in work-related outcomes such that a choice of work over education would be a possible explanation. However, this result may be spurious as it does not appear for males from higher socioeconomically ranked towns in Table 4. The overall results in Tables 4 and 5 - including several results for females from lower socioeconomically ranked towns - are qualitatively in the direction that is consistent with a tradeoff between work and investment in education.

Overall, the results presented in Tables 3-5 suggest the following: public transportation penetration affects work and study outcomes among male young adults from lower socioeconomic backgrounds in both the short term and long term; for female young adults, responses to public transportation penetration are more strongly observed for those from higher socioeconomic backgrounds and are for the most part confined to the long term. For males, the results can be explained primarily due to lower vehicle ownership rates among those from lower socioeconomically ranked towns - as such, public transportation has a more noticeable effect on their outcomes and this is relatively immediate. For females, we believe that most of the effect is on females from higher socioeconomically ranked towns because of traditional barriers inhibiting females from engaging in work or study activities outside their town, and these traditional barriers are stronger in towns ranked lower socioeconomically. The short versus long term results in Table 5 strengthen

Figure 5: Measuring Extent of Traditional Norms for Lower vs. Higher Socioeconomically Ranked Towns



Notes: The Driver License Ratio is based on data on all driving license holders by town and sex for 2006 from the Israel Central Bureau of Statistics. All other measures are based on individual-level data from the 2007 Arab Survey for the entire population ages 18-55. The Driver License Ratio is the ratio of females to males with driving licenses for each town. Age at first marriage is for both sexes. Intra-Family Marriage is an indicator variable for females if they reported marrying a family member at the cousin level or less. Within-tribe marriages are not considered intra-family marriages for this purpose. Muslim is an indicator variable if the individual reported being Muslim, as opposed to either Christian or Druze, the other religious affiliations possible for the Arab population in Israel.

this even further, as overcoming traditional barriers should not be immediate and requires adaptation of customs and norms, and indeed the effects we observe are almost entirely in the long term. This is even for the higher socioeconomically ranked towns - despite being characterized by weaker traditional barriers, they are still quite traditional.

In Figure 5 we present evidence that towns ranked lower socioeconomically are indeed more traditional in their nature. We plot the mean and 95% confidence intervals for four town characteristics that can represent the extent of traditional norms: the ratio of female to male drivers' license holders; age at first marriage; intra-family marriages (mostly at the cousin level); and being Muslim, as the Muslim population in Israel is considered more conservative than the Arab-Christian population, in particular with regards to female labor force participation (Yonay et al. (2015)). The results in Figure 5 do indeed suggest that there are substantial and statistically significant differences in all four of these measures between towns or individuals from towns that are ranked lower versus higher socioeconomically. This strengthens the hypothesis that traditional barriers are still inhibiting the female young adult population from fully exploiting the opportunities arising from public transportation penetration to their towns.

The results for females add to better understanding the underlying incentives or environments that can increase female Arabs' labor force participation. Schlosser (2005) finds that economic incentives - in this case, free child care - increased labor force participation among Arab women in Israel, thus lending support to the notion that it is not only traditional barriers that inhibit female labor force participation among this population. Our results also highlight an additional aspect besides traditional barriers that inhibits female Arabs' labor force participation - accessibility to the labor market. In addition, in Schlosser (2005), the economic incentive is effective solely for educated mothers. This is also similar to our results concerning stronger effects for women from higher socioeconomically ranked towns. It may be that educated mothers are less constrained by traditional barriers, as we assume for females residing in towns ranked higher socioeconomically.

6 Concluding Remarks

Improving employment outcomes and educational attainment for disadvantaged communities has received much attention in the past few decades, as this is expected to generate benefits economically, socially, and ethically in terms of equal opportunities. This study evaluates one policy measure - public transportation investment - and shows that improvements in employment and educational attainment can indeed be obtained due to this. When comparing investment in public transportation infrastructure to investment in schooling infrastructure, road infrastructure, or establishing mass employment centers within disadvantaged communities, the cost of public transportation seems rather minimal, especially if it is in terms of bus lines, although the aforementioned policy measures may all be worthy as well. Thus, public transportation may not only be effective in enhancing the welfare of disadvantaged communities but also cost-beneficial, especially when compared to numerous alternative policy measures.

We show that proper assessment of the effects of public transportation on disadvantaged young adults requires taking into account the potential opposing effects of access to work versus education opportunities. Despite the tradeoff between time allocated to investment in education and time allocated to work being a fundamental assumption in theories of human capital formation (Becker (1965); Ben-Porath (1967); Schultz (1960)), few empirical papers have addressed this tradeoff. Our results show that young adult Arabs in Israel - a disadvantaged and traditional population in a Western developed economy - respond positively in terms of work and education outcomes when connected to greater work and education opportunities, respectively. However, the tradeoff between work and education is vital, and equilibrium implications should be considered when increasing connectivity to either work or education opportunities (or both).

Several policy implications are derived from this study. First, greater connectivity to work opportunities should be accompanied by greater connectivity to higher education as well - otherwise, this could backfire in terms of the long-term prospects of the population, as young adults may choose work opportunities over investment in higher education. Moreover, simply providing greater connectivity to both work and education opportunities may suffice if policy makers are interested in increasing higher educational attainment - at least in our setting, it appears that the young adult population for the most part chose investment in education over work when opportunities to both were expanded. Second, physical accessibility may not be the only factor inhibiting proper integration of females from traditional communities into the economy - traditional barriers may also play a role and these could take time to dissipate, although this is not guaranteed in communities that are characterized by a higher level of traditional norms.

While our results are for traditional and disadvantaged communities within a developed economy, they may be generalizable to disadvantaged segregated communities in general, whether within a developed or developing economy. Furthermore, it may be interesting to evaluate the applicability of this study's results to other traditional and disadvantaged communities in Western economies, such as the indigenous population in Australia or native Americans in the United States.

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Appendix

A List of Towns in the Sample

Table 7 provides a list of all 58 towns in our sample with information on when the different types of buses were initially introduced, the number of observations (males ages 18-30 and females 18-27) during each year and the differences in interview timing and bus penetration measures for 2010 and 2014, the years after the introduction of public transportation to the towns in the sample.

B Evaluating the Effect of Public Transportation without Differentiating between Bus Line Destinations

Table 8 presents our regression results when only the effect of buses in general is evaluated - i.e. equation 1 without the variable $CollegeBusIntensity$. As can be seen no meaningful responses are found among males for work outcomes, and this is contrast to the results presented in Table 3.

Table 7: Town List

Town Name	District	Any Bus Introduction	College Bus Introduction	2004 Obs	2007 Obs	2010 Obs	2014 Obs	2010 Interview Difference	2010 Difference in All Buses	2010 Difference in College Buses	2010 Sample Difference in All Buses	2010 Sample Difference in College Buses	2014 Interview Difference	2014 Difference in All Buses	2014 Difference in College Buses	2014 Sample Difference in All Buses	2014 Sample Difference in College Buses
Jaljulye	Center	Q3-4 2008	-	30	-	9	18	1	0.115	0.000	0.000	0.000	11	0.000	0.000	0.000	0.000
Kafar Bara	Center	Q3-4 2008	-	18	33	18	-	174	5.000	0.000	5.000	0.000	-	-	-	-	-
Kafar Qasem	Center	Q2 2011	-	21	57	28	8	1	0.000	0.000	0.000	0.000	5	0.000	0.000	0.000	0.000
Qalansawe	Center	Q1 2010	Q1 2010	20	45	46	20	4	0.729	0.729	0.000	0.000	6	0.429	0.429	0.000	0.000
Tayibe	Center	Q1 2010	Q1 2010	80	47	41	37	251	0.375	0.375	0.375	0.375	50	0.249	0.199	0.000	0.000
Tire	Center	Q1 2010	Q1 2010	78	128	32	38	5	0.611	0.611	0.000	0.000	23	5.369	0.369	0.000	0.000
Zemer	Center	Q3-4 2008	-	-	25	26	-	123	2.542	0.000	0.000	0.000	-	-	-	-	-
Ar'Ara	Haifa	Q3-4 2010	Q1 2014	46	25	40	-	64	0.531	0.000	0.000	0.000	-	-	-	-	-
Daliyat Al-Karmel	Haifa	Q1 2010	Q1 2010	66	61	61	32	183	3.376	3.376	0.318	0.318	24	0.060	0.060	0.000	0.000
Ein Hod	Haifa	-	-	-	-	-	34	-	-	-	-	-	92	0.000	0.000	0.000	0.000
Jisr Az-Zarqa	Haifa	Q3-4 2013	-	40	28	11	24	6	0.000	0.000	0.000	0.000	1	0.292	0.000	0.000	0.000
Kafar Qara	Haifa	Q3-4 2010	Q1 2014	36	19	40	-	212	0.764	0.000	0.000	0.000	-	-	-	-	-
Ma'Ale Iron	Haifa	Q1 2013	-	-	-	19	20	2	0.000	0.000	0.000	0.000	2	0.000	0.000	0.000	0.000
Meiser	Haifa	-	-	-	-	12	15	141	0.000	0.000	0.000	0.000	6	0.000	0.000	0.000	0.000
Ras Ali	Haifa	-	-	-	-	19	-	43	0.000	0.000	0.000	0.000	-	-	-	-	-
Umm Al-Fahm	Haifa	Q3-4 2010	Q3-4 2010	109	145	14	11	3	0.844	0.084	0.000	0.000	0	0.156	0.000	0.000	0.000
Abu Ghosh	Jerusalem	Q1 2009	Q1 2009	-	26	-	16	-	-	-	-	-	35	0.000	0.000	0.000	0.000
Ein Rafa	Jerusalem	-	-	-	33	-	14	-	-	-	-	-	1	0.000	0.000	0.000	0.000
Beit Jann	North	Q3-4 2008	-	41	32	-	28	-	-	-	-	-	6	0.000	0.000	0.000	0.000
Demeide	North	-	-	-	-	-	17	-	-	-	-	-	16	0.000	0.000	0.000	0.000
Ein Al-Asad	North	-	-	-	35	-	28	-	-	-	-	-	9	0.000	0.000	0.000	0.000
Fassuta	North	Q1 2011	-	-	-	28	-	61	0.000	0.000	0.000	0.000	-	-	-	-	-
I'Billin	North	Q1 2010	Q1 2010	-	33	36	18	37	1.624	1.538	0.000	0.000	23	2.560	0.080	0.000	0.000
Iksal	North	Q3-4 2008	-	27	48	16	27	184	0.161	0.000	0.081	0.000	0	0.000	0.000	0.000	0.000
Jish(Gush Halav)	North	-	-	-	-	-	29						31	0.000	0.000	0.000	0.000
Judeide-Maker	North	Q1 2010	-	36	42	26	25	216	1.720	0.000	1.075	0.000	58	0.305	0.000	0.000	0.000
Julis	North	Q1 2010	-	-	-	30	-	7	2.931	0.000	0.000	0.000	-	-	-	-	-
Kabul	North	Q3-4 2009	Q3-4 2009	-	29	41	-	200	1.774	0.403	1.774	0.403	-	-	-	-	-
Kamane	North	-	-	45	-	13	-	118	0.000	0.000	0.000	0.000	-	-	-	-	-
Kisra-Sumei	North	Q3-4 2008	-	-	23	39	-	9	0.000	0.000	0.000	0.000	-	-	-	-	-
Majd Al-Kurum	North	Q1 2009	Q1 2010	-	12	62	15	243	6.884	5.145	6.884	4.855	0	0.897	0.000	0.000	0.000
Muqeible	North	-	-	33	-	-	12	-	-	-	-	-	51	0.000	0.000	0.000	0.000
Na'Ura	North	-	-	34	36	24	27	113	0.000	0.000	0.000	0.000	17	0.000	0.000	0.000	0.000
Nahef	North	Q1 2009	Q1 2009	47	-	58	16	270	1.468	0.000	1.468	0.000	0	0.336	0.000	0.000	0.000
Peqi'In (Buqei'A)	North	Q3-4 2008	-	-	33	-	22	-	-	-	-	-	15	1.429	0.000	0.000	0.000
Sajur	North	Q3-4 2009	-	44	-	-	23	-	-	-	-	-	4	1.000	0.000	0.250	0.000
Sha'Ab	North	Q3-4 2009	Q3-4 2009	35	38	34	-	49	1.167	1.167	0.000	0.000	-	-	-	-	-
Sheikh Dannun	North	-	-	-	-	42	-	61	0.000	0.000	0.000	0.000	-	-	-	-	-
Tayibe(Baemeq)	North	-	-	-	-	-	17	-	-	-	-		33	0.000	0.000	0.000	0.000
Tuba-Zangariyye	North	Q1 2013	-	-	27	-	30	-	-	-	-		14	0.000	0.000	0.000	0.000
Yirka	North	Q1 2010	-	33	32	29	34	234	1.200	0.000	1.200	0.000	33	0.000	0.000	0.000	0.000
Ar'Ara-Banegev	South	Q3-4 2010	Q3-4 2010	47	54	29	21	69	2.283	0.472	0.000	0.000	0	0.000	0.000	0.000	0.000
Albatil Karkur	South	-	-	-	-	32	-	1	0.000	0.000	0.000	0.000	-	-	-	-	-
Algarrah	South	-	-	-	-	-	30	-	-	-	-		2	0.000	0.000	0.000	0.000
Alhmira	South	-	-	-	-	-	29	-	-	-	-		2	0.000	0.000	0.000	0.000
Almtahar	South	-	-	-	-	27	25	1	0.000	0.000	0.000	0.000	32	0.000	0.000	0.000	0.000
Altwail	South	-	-	-	-	26	-	0	0.000	0.000	0.000	0.000	-	-	-	-	-
Ateer	South	-	-	-	-	20	-	0	0.000	0.000	0.000	0.000	-	-	-	-	-
Beer Almshash	South	-	-	-	-	-	23	-	-	-	-	-	1	0.000	0.000	0.000	0.000
Hura	South	Q1 2008	Q1 2008	-	41	27	35	49	0.800	0.800	0.000	0.000	2	1.968	0.160	0.000	0.000
Kuseife	South	Q1 2008	Q3-4 2009	-	46	32	21	30	1.092	0.345	0.000	0.000	13	1.559	1.344	0.000	0.000
Kuhla	South	-	-	-	-	-	19	-	-	-	-	-	2	0.000	0.000	0.000	0.000
Laqye	South	Q3-4 2010	Q3-4 2010	-	56	-	22	-	-	-	-	-	93	0.982	0.089	0.893	0.000
Rahat	South	Q2 2009	Q2 2009	79	138	109	51	183	0.000	0.000	0.000	0.000	79	0.248	0.083	0.232	0.066
Rahma	South	-	-	-	-	-	27	-	-	-	-	-	1	0.000	0.000	0.000	0.000
Tel Sheva	South	Q3-4 2010	Q3-4 2010	34	32	29	-	115	1.847	1.847	1.847	1.847	-	-	-	-	-
Tal Almalah	South	-	-	30	-	23	-	30	0.000	0.000	0.000	0.000	-	-	-	-	-
Wadi Alni'Am	South	-	-	27	-	-	3	-	-	-	-	-	0	0.000	0.000	0.000	0.000

Notes: Total number of towns: 58. Any/College Bus Introduction is quarter during which the relevant type of bus was initially introduced. Interview Difference is the number of days between the first and last interview for that year in the sample. Obs is the number of males ages 18-30 and females ages 18-27 interviewed from that town in that year. Difference in Buses is the difference in bus frequency between the start and end of the year, while Sample Difference in Buses is the difference observe in the sample, due to differences in interview timing within towns.

Table 8: Public Transportation Penetration without Differential Effects based on Bus Destination

Dependent Variable	Worked Last Week	Usual Weekly Hours Worked	Monthly Salary	Currently Studying
		Males - Ages 18-30		
All Bus Intensity	0.00308	-1.055	49.00	0.00879
	(0.0106)	(0.720)	(51.73)	(0.0108)
Number of Observations	2,710	2,723	2,750	2,729
R^2	0.209	0.274	0.174	0.135
Mean Dependent Variable	0.627	24.66	2078	0.145
		Females - Ages 18-27		
All Bus Intensity	0.00365	-0.101	37.58	0.0101
	(0.00930)	(0.242)	(59.17)	(0.00944)
Number of Observations	2,028	2,051	2,054	2,043
R^2	0.184	0.157	0.205	0.196
Mean Dependent Variable	0.199	6.102	561.9	0.245
Town, Year Fixed Effects	✓	✓	✓	✓
Linear Time Trends	✓	✓	✓	✓
Individual Controls	✓	✓	✓	✓

Notes: Each column in each panel (males vs. females) presents the coefficient estimate for α_1 from equation (1), although without the variable $CollegeBusIntensity$. Control variables are the following: quadratic function of age, indicators for relation to household head, indicators for month of interview, number of household members. Standard errors clustered at the town level are in parenthesis. *** p<0.01, ** p<0.05, * p<0.1