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The Boys are Back in School: Increased Chinese Import Exposure's Effect on Community College Enrollments

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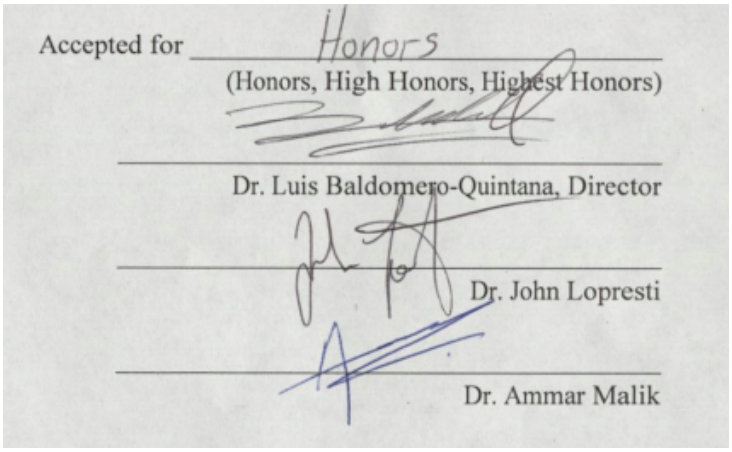

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Abstract

I analyze how Chinese import competition impacts community college enrollments in US commuting zones by using the variation of import exposure across the United States. After controlling for broader changes in the US economy, the findings show that there is fairly large and positive effect on enrollments for men between the years 1990 and 2007. The results for female enrollments are small or negative. However, these results for both men and women are imprecisely estimated. The findings of this paper resemble previous findings in the literature, namely Greenland and Lopresti (2016), Ferriere et. al (2021), and Lee (2021) which demonstrate increases in high school graduation rates and college enrollments. At the same time, due to the demographics of community colleges, these results expand insight on the human capital adjustment of lower income individuals caused by import competition (*Kane & Rouse, 1995).*

1.0 Introduction

Recent research in international trade has shown that an increase in import competition leads to a wage gap and decline in employment for unskilled workers as well as a weakening of the US manufacturing industry (Greenland and Lopresti, 2016). These declining labor market conditions can keep individuals in school rather than entering the workforce at a younger age, thus leading to higher high school graduation rates (Greenland and Lopresti, 2016). However, in this paper I analyze how declining labor market conditions caused by an increase in Chinese imports affects enrollments at community colleges. I focus on community colleges because they offer a range of opportunities to develop human capital from vocational focused certificates to associates degrees. Moreover, community colleges tend to cater to individuals of lower income and

who stay in the local labor market after graduation (Kane & Rouse*,* 1995*)*. Therefore, community college enrollments offer the opportunity to study the different human capital adjustment of lower income men and women in local labor markets in the face of increased import competition.

Furthermore, how early an individual enters the workforce is also impacted by gender as there are more women pursuing higher education than men. For example, during the time period of interest for this paper there were 1.3 women attending undergraduate institutions for every man attending (Goldin et. al, 2006). This trend is caused by a variety of factors which disincentivize men from attending college such as, higher effort costs and a lower wage premium (Jacob, 2002). Therefore, these preexisting labor market conditions cause men to enter the workforce earlier than women (Goldin et. al, 2006). Thus, human capital decisions can be impacted by both increased import competition and gender. Hence, this paper builds on past research on human capital adjustment and international trade by determining if an increase in Chinese imports leads to a change in community college enrollments based on gender.

Moreover, educational opportunities, such as community colleges, increase an individual's human capital and wages according to the Mincer and Ben-Porath models (Mincer, 1958, Ben-Porath, 1967). These models explain personal income distribution in relation to investment in human capital and help understand why individuals would forgo earnings to pursue further educational opportunities like community colleges. Firstly, the Mincer model shows wages as a function of schooling and experience and that individuals with more education have higher incomes due to the higher investment in human capital. Therefore, education is a positive, significant and profitable human capital investment for individuals (Mincer, 1958). Similarly, the Ben-Porath model describes earnings in relation to human capital investment and education. Ben-Po-

rath (1967) shows that there will be a period of no earnings while an individual pursues education which is followed by a period of earning wages. Wages increase at a decreasing rate as experience and on the job training increases human capital. However, as age increases productivity decreases and thus income will not increase by the same amount (Ben-Porath, 1967). Ben-Porath (1967) also argues that a longer period of education means the longer an individual forgoes wages but, when this period of education is complete the earnings will be higher. Furthermore, these models show that an increase in import competition may reduce the opportunity cost of an extra year of education because job opportunities will be scarcer. However, at the same time, these models show that there could be a potential increase in the opportunity cost of education if the parents of an individual face a job loss due to import exposure. In this situation an individual may choose to enter the labor market instead of continuing their education in order to support their family financially. Therefore, these models help economists understand the human capital decisions of individuals but not how they will be impacted by an increase in import competition.

On this note, this study seeks to determine if individuals chose to pursue further education in the form of community colleges as a result of increased imports from China. This study was achieved through using the percent change of community college enrollments by gender between the years 1990 and 2007 and through utilizing the IV strategy of Autor et. al (2013). To avoid biased results I used the instrument of Autor et. al (2013) in a two stage least squares regression with a series of robustness checks. The IV estimator is a measure for import exposure from China in other developed countries and helps avoid endogeneity concerns. The results of these regressions showed that for a $1000 increase in Chinese imports per worker there was a change in the percent change of enrollments between –6.6% and .8% for women and 8.6% and 13.5% for men, although my estimates are imprecise. The impact of greater Chinese imports is

fairly large and positive for men and small or negative for women. This result is most likely due to more men working in trade-sensitive industries, like manufacturing (Jacob, 2002 and Autor et. al, 2013).

This paper builds on and contributes to the existing literature regarding international trade, education, and the development of human capital. The findings of this paper are consistent with results in Lee (2021) and Ferriere et. al (2021) which show that exposure to trade leads to greater college enrollments. Moreover, the results are also consistent with Greenland and Lopresti (2016) which demonstrates that a decline in the labor market keeps students in school even post high school graduation due to the higher opportunity cost of dropping out. Finally, it builds findings in Ferriere et. al (2021) by offering insight into choices and opportunities of lower income individuals to pursue further education and skill development.

In this paper I will describe community colleges and their role in the labor market in section 1.1, the relationship between gender and educational attainment in section 1.2, the data in section 2, the econometric model in section 3, the empirical results in section 4, and in section 5 I conclude my results.

1.1 Community Colleges and the Labor Market

Community colleges are two-year public institutions which provide the opportunity for human capital development to nearly 10 million individuals attend in the United States (Acton, 2021). Similar to four-year universities, community colleges develop human capital but at a much cheaper cost than four-year universities. By offering lower tuition, community colleges are able provide significant labor market returns to a different demographic of students than a 4-year university.

Firstly, community colleges offer three different types of awards which include certificates, diplomas, and associate degrees. These awards can develop vocational skills or facilitate transferring to a four-year university and yield significant labor market returns (Jepsen et. al, 2014). For example, Jepsen et. al (2014) found that after receiving a degree or diploma, women saw $2,400 higher quarterly earnings and men a $1,500 increase. Therefore, community colleges are an important source of development of human capital in the United States and are of interest when researching trade's impact on human capital decisions.

Furthermore, community college enrollments are of interest because the demographics of students who enroll are distinctive from 4 year universities. Community colleges are more likely to attract lower income students in part due to the lower tuition (Kane & Rouse, 1995). On average in 2019 tuition at community colleges was $3,800 compared to the average public 4 university tuition of $9,400 (*Fast Facts: Tuition Costs of Colleges and Universities (76)*, 2021). Therefore, community colleges are a more accessible option for increasing one's human capital. Additionally, the demographics differ from four year institutions because a quarter of degree seeking students at community colleges are foreign born individuals or children of immigrants (Teranishi et. Al, 2011). Moreover, the students at these institutions usually enroll in a college close to home, and are likely to remain in the local labor market post-graduation (Acton, 2021). Thus, their decision to enroll in community college is influenced by local market conditions and not national trends (Acton, 2021, 1130). Therefore, studying community colleges offer the opportunity to study human capital adjustments in the local labor market for a different demographic of individuals than those who attend four year universities.

In the following section the focus of the paper will switch to discuss the difference in human capital development based on gender in the United States.

1.2 Gender and Educational Attainment

Men and women will most likely face different human capital decisions and adjustments in the face of increased import competition due to preexisting labor market conditions such as the gender gap in higher education. In the past men out numbered women at institutions of higher learning however, after World War II that began to change. During the post war period the number of women pursuing higher education in the US rapidly increased leading to the disappearance of the gender gap in enrollments by 1980. However, now the United States faces a different gender gap: there are less men attending college than women (Goldin et. al, 2006). This education gap is caused by a combination of factors including cultural shifts in America, lower effort costs for women related to non-cognitive abilities, and a higher wage premium for women with a higher education (Goldin et. al, 2006, Pekkarinen, 2012, Jacob, 2002).

Firstly, the gender gap in higher education was initiated by cultural shifts in the United States after World War II (Pekkarinen, 2012). In post war America cultural changes helped remove barriers to women entering the workforce and having careers. The emergence of second wave feminism and more government protection against sex-based discrimination in the workplace encouraged more women to enter and remain in the workforce. Furthermore, societal acceptance of birth control helped women plan their futures and increased the median age of marriage, thus changing women's expectations about their futures and ability to have a career. Therefore, cultural changes in the US contributed to the gender gap in education because women faced less barriers to enter the workforce thus encouraging more women to invest in higher education (Goldin et. al, 2006).

Similarly, the educational gender gap in the US is caused by non-cognitive factors which make it so women have lower effort costs to attend college. Firstly, girls outperform boys in grade school, which is primarily due to non-cognitive factors (Goldin et. al, 2006). These non-cognitive factors include slower maturation for boys, higher levels of impatience, more behavioral problems, and their over representation in populations with learning disabilities (Goldin et. al, 2006 and Pekkarinen, 2012). Therefore, these factors cause boys to perform worse than girls in high school thus increasing the effort cost for men to attend to college and making them more likely to enter the workforce earlier than women (Goldin et. al, 2006).

Finally, the educational gender gap is due to the fact that women have a higher wage premium from higher education than men. The wage premium is higher in part due to their success in breaking into white collar jobs traditionally dominated by men. However, women who do not attend college are less successful at entering the relatively high paying jobs that do not require a college degree, like manufacturing or construction (Jacob, 2002). Therefore, women stand to gain more in terms of wages from attending college and men have better opportunities when directly entering the workforce from secondary school (Jacob, 2002).

The gender gap in higher education in the US means that there are preexisting labor market conditions that impact men and women face differently. Therefore, an increase in import competition will have an unequal effect on the opportunity costs of education for men and women. Thus, in general it is expected that men and women will likely make different human capital decisions in the face of increased import competition.

The next section discusses the data that is used to determine the impact of import competition on community college enrollments.

2.0 Data

The data used in this paper is from three main sources: Autor et. al (2013), the Integrated Postsecondary Education Data System (IPEDS), and the Integrated Public Use Microdata Series (IPUMS).

Autor et. al (2013) gathered the dataset used for the controls, the measure for import exposure, and the instrumental variable at the commuting zone level. The data for the measure for exposure to Chinese imports in the US was derived from UN Comtrade data for the years 1991, 2000, and 2007 at the 6-digit product level. This measure is also created through data from the County Business Pattern Program (CBP) data series for the years 1980, 1990, and 2000. The CBP provides information on employment, firm size distribution, and payroll by county and industry. On the other hand, the instrument was also created from UN Comtrade data at the 6-digit product level for the years 1991, 2000, and 2007 for developed nations of Australia, Denmark, Finland, Germany, Japan, New Zealand, Spain, and Switzerland (Autor et. al, 2013).

The outcome variable of interest for this paper is the percent change in community college enrollments for men and women between the years 1990 and 2007. Due to the long nature of the period of interest, the percent changes were stacked by decade 1990 to 2000 and 2000 to 2007. Moreover, in this paper I define community colleges as two-year public institutions whose highest award granted is an associate degree. Therefore, two-year private institutions and those not offering associate degrees are not studied in this paper. The data for the enrollments in community colleges as I previously stated is sourced from Integrated Postsecondary Education Data System (IPEDS). This data included the zip codes where each community college is located. To map the community colleges to their respective commuting zones I used a crosswalk file of zip codes to commuting zones. Then the enrollments were summed by commuting zone. However,

commuting zones without community colleges and community colleges which did not have data on their enrollments for these years were excluded from the analysis. A random sample of the excluded colleges showed that the schools primarily did not exist in the period of interest or are located in Indian Nations. The lack of data from colleges in Indian Nations could be due to the fact that before 1993 participation in IPEDS was not mandatory therefore, these schools may have chosen not to participate (*NCES Handbook of Survey Methods - Integrated Postsecondary Education Data System (IPEDS)*, n.d.). A full list of the colleges which did not provide any data can be found in the appendix (section 6.1). Lastly, the sample of commuting zones used in this model includes only 358 of the 744 US commuting zones whereas, Autor et al (2013)'s sample includes 722. Therefore, the sample used for this model may have different characteristics. A full list of the number of commuting zones by state included in this sample compared to those in Autor et. al (2013) are included in the appendix (Section 6.4).

Table 1: Summary Statistics

Variables	N	Mean	Std. Dev.	Median	25th	75th
Percent Change Enrollments 1990-2007	**716**	**0.495**	**3.01**	**0.163**	**-0.00255**	**0.398**
Percent Change Male Enrollments 1990-2007	**714**	**0.385**	**1.289**	**0.146**	**-0.0273**	**0.371**
Percent Change Female Enrollments 1990-2007	**716**	**0.494**	**2.27**	**0.179**	**-0.00303**	**0.4103**
Imports Per Worker in CZs with Community Colleges in US Dollars	**742**	**2.095**	**2.201**	**1.42**	**0.725**	**2.790**

Note: Summary statistics of percent change in enrollments by commuting zones which contain community colleges. Commuting zones which did not contain community colleges were excluded from the model. These Summary Statistics encompasses the whole period of 1990-2007.

3.0 Estimation

I use a two-stage least squares regression to determine the effect of Chinese import competition on enrollments. Equation 3 shows the model I use to estimate this effect. In this model $\boldsymbol{Y}$ is percent change of community college enrollments between the years 1990 and 2007. Additional covariates are represented by vector χ.

$$\Delta Y = \alpha + \beta_1 \Delta IPW_{uit} + \chi'_{it}\beta_2 + \varepsilon_{it} \quad (1)$$

ΔIPW_{uit} is the measure for local labor market exposure to Chinese import competition, and shows the change in import exposure per worker by commuting zone. It is constructed in equation 2 where L_{ijt}, the start of the period of employment for year *t* in region *i* which scales ΔM_{ucjt}, the change in US imports from industry *j* (Autor et. al, 2013, 2128).

$$\Delta IPW_{uit} = \Sigma_j \frac{L_{ijt}}{L_{ujt}} \frac{\Delta M_{ucjt}}{L_{it}} \quad (2)$$

Following the strategy of Autor et. al (2013) ΔIPW_{uit} is instrumented by ΔIPW_{oit}, which is a measure for import exposure from China in other developed countries. The construction of ΔIPW_{oit} is shown in equation 4 where ΔM_{ocjt} is the change in the other developed countries' imports for industry *j* which is scaled by L_{it-1} which is the employment levels by region from the previous decade in order to mitigate simultaneity bias (Autor et. al, 2013).

$$\Delta IPW_{oit} = \Sigma_j \frac{L_{ijt-1}}{L_{ujt-1}} \frac{\Delta M_{ocjt}}{L_{it-1}} \quad (3)$$

I use the two-stage least squares regression analysis due to concerns that the outcome variable would be correlated with US demand shocks. Demand shocks in the US that would affect both the labor market and the amount of imports could cause biased results of an OLS regression. The instrument is necessary to ensure that the increase in enrollments is due to an increase in imports from China and not due to variables that impact both the imports of the cities and community college enrollment, like productivity or amenities of the commuting zones. There are endogeneity concerns because an increase in imports from China could be caused by factors other than China's rising productivity in the 1990s and early 2000s. For example, an increase in imports in a commuting zone could be due to their inability to produce enough goods for their desired levels of consumption. Thus, the CZ would need to import more goods from China. The

low productivity could mean that there is not employment available so individuals enroll in community colleges in order to increase their human capital and thus their marketability on the labor market. Moreover, in these commuting zones that import more goods the main industry may be services and therefore, skilled labor is more desired. Thus, more people will enroll in institutions of higher education, consequently causing an increase in community college enrollments.

Moreover, the instrument is valid if the change in Chinese imports is driven by supply side factors of China, like their shift from a command economy to a market economy and their ascension to the WTO and not US demand shocks (Greenland and Lopresti, 2016). Therefore, the IV strategy identifies China's rising productivity and comparative advantage in combination with lowered trade costs as the source of the trade shocks in the US. Thus, any correlated import demand shocks in the US do not affect the results of this study (Autor et. al, 2013). The results of the model are discussed in the next section.

4.0. Results

To determine the impact of Chinese import exposure on the percent change in community college enrollments between the years 1990 and 2007, I use 2SLS regressions for a sample with men and a sample with women. I use different specifications as a robustness check. The first regressions were implemented without the controls but a series of demographic and labor force controls were added to the five other regressions as robustness checks. These controls were included to account for shifts in the US economy which took place over the 20-year period of interest that are unrelated to an increase in imports (Greenland & Lopresti, 2016). The controls were the same as used in Autor et. al (2013). The control used on the second regressions was share of manufacturing in commuting zones at the start of period employment to further address

the concern that rising trade with China is due to a domestic decline in US manufacturing and not China's increase in productivity. A geographic dummy variable for region specific trends in manufacturing employment was added to the regressions for the third robustness check. This control impacts community college enrollments because it shows which regions may be sensitive to trade and therefore, where people may need to enroll in community college in the face of a declining labor market. The fourth regression added percent of college-educated population, percent of foreign-born population, and percent of employment among women. These controls affect community colleges because people who have already received a college degree are unlikely to re-enroll, immigrants are more likely to attend community colleges, and the number of women employed will impact the number who want to enroll (Teranishi et. Al, 2011) . However, the fifth regression focused on controlling for percent of employment in routine occupations and average offshorability index of occupations while the last regressions included the full set of controls. These two controls also show which regions may be sensitive to trade and where there will most likely be an adjustment in human capital. These controls account for broad changes in the US economy and make the proceeding results more robust.

Table 2: Percent Change in Total Enrollments 1990-2007

	1	2	3	4	5	6
Number of CZs	**358**	**358**	**358**	**358**	**358**	**358**
R^2	**0.0034**	**0.0058**	**0.035**	**0.0369**	**0.0506**	**0.0549**
F-Statistic	**117.23**	**136.49**	**71.31**	**77.47**	**71**	**91.39**
Change in Imports from China to US	**0.0199**	**-0.01865**	**-0.01028**	**-0.02141**	**-0.0789**	**-0.05633**
	(0.045)	**(0.0498)**	**(0.0497)**	**(0.05385)**	**(0.08206)**	**(0.08242)**
% of employment in manufacturing	**X**	**1.04E-02**	**0.01408**	**0.0148**	**2.99E-02****	**0.016970**
		(0.01205)	**(0.0112)**	**(0.01623)**	**(0.01477)**	**(0.01687)**
% of college educated population	**X**	**X**	**X**	**-0.005119**	**X**	**-0.0238**
				(0.01594)		**(0.01857)**
% of foreign born population	**X**	**X**	**X**	**6.26E-03**	**X**	**-0.01756**
				(0.0059)		**(0.01629)**
% of Employment among women	**X**	**X**	**X**	**1.94E-02**	**X**	**-0.00772**
				(0.03073)		**(0.01793)**
% of employment in routine occupations	**X**	**X**	**X**	**X**	**-0.104995**	**-0.0989**
					(0.05879)	**(0.05824)**
Average offshorability index of occupations	**X**	**X**	**X**	**X**	**0.7947**	**1.1819****
					(0.4512)	**(0.6011)**
Census Division Dummies	**No**	**No**	**yes**	**yes**	**yes**	**yes**

Note: *** Significant at the 1% level
** Significant at the 5% level
*Significant at the 10% level

4.1 Change in Female Enrollments

Table three provides the results from the regression analysis for the two stage least squares regressions performed for the percent change in female enrollments in community colleges between the years 1990 and 2007.

Table 3: Percent Change in Female Enrollments 1990-2007

	1	2	3	4	5	6
Number of CZs	**358**	**358**	**358**	**358**	**358**	**358**
R^2	**0.0029**	**0.0066**	**0.0413**	**0.0448**	**0.0619**	**0.0692**
F-Statistic	**117.23**	**136.49**	**71.31**	**77.47**	**71**	**91.39**
Change in Imports from China to US	**0.04466**	**0.00047**	**0.00854**	**0.0007**	**-0.06582**	**-0.0364**
	(0.0494)	**(0.05584)**	**(0.05574)**	**(0.06315)**	**(0.09391)**	**(0.09525)**
% of employment in manufacturing	**X**	**0.01196**	**0.0141**	**0.01347**	**0.0321****	**0.0157**
		(0.0126)	**(0.0113)**	**(0.02111)**	**(0.01599)**	**(0.0216)**
% of college educated population	**X**	**X**	**X**	**-0.00742**	**X**	**-0.02814**
				(0.02292)		**(0.02031)**
% of foreign born population	**X**	**X**	**X**	**0.00423**	**X**	**-0.02249**
				(0.0058)		**(0.0165)**
% of Employment among women	**X**	**X**	**X**	**0.02823**	**X**	**-0.00226**
				(0.0343)		**(0.02451)**
% of employment in routine occupations	**X**	**X**	**X**	**X**	**-0.11342***	**-0.10622**
					(0.06903)	**(0.06794)**
Average offshorability index of occupations	**X**	**X**	**X**	**X**	**0.8622962***	**1.3031****
					(0.50377)	**(.61911)**
Census Division Dummies	**No**	**No**	**yes**	**yes**	**yes**	**yes**

Note: *** Significant at the 1% level
** Significant at the 5% level
*Significant at the 10% level

The findings for females shows that with an increase in Chinese imports there is either a very modest increase in enrollments or a small negative impact. In fact, table three shows that for every $1000 increase in Chinese imports the change in percentage points of the percent change of female enrollments ranges from –6.6% to .8% for the commuting zone although these estimates are imprecise. These results show that an increase in import competition from China has a negative effect or a marginally positive effect on women's decisions to enroll in community colleges. In the next section the results of the regressions for men will be discussed and compared to those for women.

4.3 Change in Male Enrollments

Table four provides the results for the 2SLS regression analysis performed to determine Chinese import competition's impact on enrollments in community colleges for men between the years 1990 and 2007. The results show that a $1000 increase in Chinese imports leads to between a 8.6% and 13.5% increase in percentage points of the percent change in male enrollments in the commuting zone though the estimates are imprecise. Men saw a greater increase in the percent change of enrollments caused by an increase in Chinese imports than women. This effect is not unexpected due to the fact that men are more likely to enter the workforce after high school into jobs, like manufacturing, that are sensitive to trade (Jacob, 2006). Moreover, in general more women attend college than men therefore, I anticipated that the change in enrollments caused by an increase in imports would be greater for men. Therefore, a greater number of men may have chosen to continue their education in the face of a declining local labor market. Tables with results from regressions run with the difference in enrollments weighted by the population aged 18-44 are included in the appendix (Section 6.2).

Table 4: Percent Change in Male Enrollments 1990-2007

	1	2	3	4	5	6
Number of CZs	**357**	**357**	**357**	**357**	**357**	**357**
R^2	**0.0209**	**0.023**	**0.0734**	**0.0816**	**0.0865**	**0.0956**
F-Statistic	**115.89**	**138.65**	**71.78**	**78.41**	**71.24**	**93.70**
Change in Imports from China to US	**0.0607**	**0.1072**	**0.1346**	**0.1227**	**0.08636**	**0.09488**
	(0.0736)	**(0.106)**	**(0.1138)**	**(0.10343)**	**(0.1144)**	**(0.1154)**
% of employment in manufacturing	**X**	**-0.0126**	**-0.01156**	**-0.01971**	**-0.000237**	**-0.01748**
		(0.0110)	**(0.0095)**	**(0.00891)**	**(0.01243)**	**(0.00947)**
% of college educated population	**X**	**X**	**X**	**-0.028****	**X**	**-0.0401**
				(0.0126)		**(0.02191)**
% of foreign born population	**X**	**X**	**X**	**0.0132**	**X**	**-0.002**
				(0.0138)		**(0.0095)**
% of Employment among women	**X**	**X**	**X**	**0.0372**	**X**	**0.02001**
				(0.0266)		**(0.0147)**
% of employment in routine occupations	**X**	**X**	**X**	**X**	**-0.07183**	**-0.07560****
					(0.0707)	**(0.0668)**
Average offshorability index of occupations	**X**	**X**	**X**	**X**	**0.5591***	**0.811**
					(0.6323)	**(0.8004)**
Census Division Dummies	**No**	**No**	**yes**	**yes**	**yes**	**yes**

Note: *** Significant at the 1% level
** Significant at the 5% level
*Significant at the 10% level

Finally, the results from tables 2-4 show a large but imprecise effect of increased import competition on the percent change of enrollments in community colleges. This effect is consistent with previous findings which show that an increase in import competition leads to individuals to choose more educational opportunities. Despite using year fixed effects, clustering standard errors at the state level, and weighting by population the results are not statistically significant. This lack of statistical significance could be because not every commuting zone is included in the model. Only commuting zones in which a community college is located are included and these CZs could have fundamentally different characteristics than the ones excluded

thus making the estimates imprecise. The imprecise estimates differ from the findings of Greenland and Lopresti (2016) in regards to high school graduation rates and Ferriere et. al (2021) regarding enrollments in 4 year universities. These two papers show a statistically significant effect of increased import competition on various levels of education. However, despite being imprecisely measured, my findings expand on Ferriere et. al (2021) by showing that there are effects on the human capital decisions of individuals who are more likely to attend two year colleges i.e. of a lower income.

5.0 Conclusion

The results of this research show that an increase in Chinese imports leads to an increase in community college enrollments between 1990 and 2007 for men and has essentially no impact for women. Nevertheless, these estimates are imprecise. The positive effect on enrollments of men corroborates with previous research and theories that shows that a decline in labor market opportunities leads to a shift in human capital decisions.

This shift is seen when a $1000 increase in Chinese imports causes an increase of between 8.6% and 13.5% of the percent change of male enrollments and –6.6% to .8% change in female enrollments. Male enrollments experience a substantial increase in the percent change of enrollments whereas women were negatively impacted by the increase in Chinese import competition. These findings show that Chinese import exposure has an unequal impact on human capital decisions based on gender. This effect is expected since men tend to dominate industries that are more sensitive to trade exposure (Jacob, 2002 and Autor et. al, 2013). Furthermore, this paper contributes to the existing body of knowledge on trade's impact on education by showing the uneven effects based on gender and the human capital adjustment among lower income individu-

als. As lower income individuals are more likely to attend 2-year colleges than 4-year universities. However, due to the imprecise nature of the results this paper also begs further research into the subject of increased trade's impact community colleges and human capital adjustments within the local labor market.

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6.0 Appendix

6.1 Excluded Community Colleges

The community colleges included in this list were excluded as observations from the regression analysis because they either did not exist during the period of interest or failed to report information within that time period.

Table 5: Excluded Community Colleges

Institution Name	ZIP	City	State
Moreno Valley College	**92551**	**Moreno Valley**	**CA**
East San Gabriel Valley Regional Occupational Program	**91790**	**Glendora**	**CA**
College of The Muscogee Nation	**74447**	**Okmulgee**	**OK**

Tohono O'Odham Community College	**85634**	**Sells**	**AZ**
College of Western Idaho		**Nampa**	**ID**
Tillamook Bay Community College	**97141**	**Tillamook**	**OR**
Heartland Community College	**61761**	**Normal**	**IL**
CUNY Stella and Charles Guttman Community College	**10018**	**New York**	**NY**
Hacienda La Puente Adult Education	**91746**	**La Puente**	**CA**
Carver Career Center	**25306**	**Charleston**	**WV**

Little Priest Tribal College	**68071**	**Winnebago**	**NE**
Coconino Community College	**86005**	**Flagstaff**	**AZ**
Arkansas State University-Mountain Home	**72653**	**Mountain Home**	**AR**
University of New Mexico-Taos Campus	**87557**	**Ranchos De Taos**	**NM**
Saginaw Chippewa Tribal College	**48858**	**MT Pleasant**	**MI**
Pennsylvania Highlands Community College	**15904**	**Johnston**	**PA**
Texas State Technical College	**76705**	**Waco**	**TX**

Frontier Community College	**62837**	**Fairfield**	**IL**
York County Community College	**4090**	**Wells**	**ME**
Southwest Collegiate Institute for the Deaf	**79720**	**Big Spring**	**TX**
Oregon Coast Community College	**97366**	**Newport**	**OR**
Copper Mountain Community College	**92252**	**Joshua Tree**	**CA**
South Louisiana Community College	**70506**	**Lafayette**	**LA**
Keweenaw Bay Ojibwa Community College	**49908**	**Baraga**	**MI**
Central Georgia Technical College	**31206**	**Macon**	**GA**

Leech Lake Tribal College	**56633**	**Cass Lake**	**MN**
Arkansas State University-Newport	**72112**	**Newport**	**AR**
		Sandersville	
Oconee Fall Line Technical College		**Dublin**	**GA**
	21228		
	21222		
Community College of Baltimore County	**21237**	**Baltimore**	**MD**
Norco College	**92860**	**Norco**	**CA**

Fond du Lac Tribal and Community College	**55720**	**Cloquet**	**MN**
Coastal Pines Technical College	**31503**	**Waycross**	**GA**
New River Community and Technical College	**24901**	**Lewisburg**	**WV**
Northeast Lakeview College	**78148**	**Universal City**	**TX**
Baton Rouge Community College	**70806**	**Baton Rouge**	**LA**
Southern Regional Technical College	**31792**	**Thomasville**	**GA**
Lamar Institute of Technology	**77705**	**Beaumont**	**TX**

Estrella Mountain Community College	**85392**	**Avondale**	**AZ**
Ellsworth Community College	**50126**	**Iowa Falls**	**IA**
Carroll Community College	**21157**	**Westminster**	**MD**
River Parishes Community College	**70737**	**Gonzales**	**LA**
Clovis Community College	**93730**	**Fresno**	**CA**
Klamath Community College	**97603**	**Klamath falls**	**OR**
Wabash Valley College	**62863**	**Mount Carmel**	**IL**

Woodland Community College	**95776**	**Woodland**	**CA**
Red Lake Nation College	**56671**	**Red lake**	**MN**
Hawaii Community College	**96720**	**Hilo**	**HI**
BridgeValley Community & Technical College	**25136**	**Montgomery**	**WV**
West Hills College-Lemoore	**93245**	**Lemoore**	**CA**
Pierpont Community and Technical College	**26554**	**Fairmont**	**WV**
New River Community and Technical College	**24901**	**Lewisburg**	**WV**
Eastern New Mexico University Ruidoso Branch	**88345**	**Ruidoso**	**NM**

Community College

Blue Ridge Community and Technical College	**25403**	**Martinsburg**	**WV**
Pierce College-Puyallup	**98374**	**Puyallup**	**WA**
Northwest Vista College	**78251**	**San Antonio**	**TX**
Lincoln Trail College	**62454**	**Robinson**	**IL**
Folsom Lake College	**95630**	**Folsom**	**CA**
Santiago Canyon College	**92869**	**Orange**	**CA**
Eastern West Virginia Community and Technical College	**26836**	**Moorefield**	**WV**

Louisiana Delta Community College	**71203**	**Monroe**	**LA**
Mountwest Community and Technical College	**25701**	**Huntington**	**WV**
Lancaster County Career and Technology Center	**17584**	**Willow street**	**PA**
Columbia Gorge Community College	**97058**	**The Dalles**	**OR**

Section 6.2

Section 6.2 includes three tables of results from the regression models which use the difference in enrollments per capita by commuting zone as the outcome variable. The population data was sourced from IPUMS National Historic Geographic Information Systems (IPUMS NHGIS) which provides US census data from 1790 the present (*DOWNLOAD U.S. CENSUS DATA TABLES & MAPPING FILES*, n.d.).

Table 6: Difference Per Capita in Total Enrollments 1990-2007

Controls	1	2	3	4	5	6
Number of CZs	**358**	**358**	**358**	**358**	**358**	**358**
R^2	**0.0009**	**0.0011**	**0.0423**	**0.0558**	**0.0591**	**0.066**
F-Statistic	**116.91**	**137.05**	**73.07**	**79.21**	**73.32**	**94.09**
Change in Imports from China to US	**-0.00049**	**-0.00088**	**-0.0011**	**-0.00096**	**-0.0010**	**-0.0012**
	(0.00082)	**(0.0011)**	**(0.0012)**	**(0.0010)**	**(0.0011)**	**(0.0011)**
% of employment in manufacturing	**X**	**1.06E-04**	**0.00020***	**0.000074**	**1.21E-04**	**0.00013**
		(0.00011)	**(0.00012)**	**(0.00015)**	**(0.00012)**	**(0.00015)**
% of college educated population	**X**	**X**	**X**	**-0.00022**	**X**	**-0.00001**
				(0.00015)		**(0.00014)**
% of foreign born population	**X**	**X**	**X**	**-8.10E-06**	**X**	**0.00023***
				(0.00009)		**(0.00013)**
% of Employment among women	**X**	**X**	**X**	**-1.13E-04**	**X**	**0.00019**
				(0.00016)		**(0.0002)**
% of employment in routine occupations	**X**	**X**	**X**	**X**	**-0.00031**	**-0.00043**
					(0.00033)	**0.00033**
Average offshorability index of occupations	**X**	**X**	**X**	**X**	**-0.0029**	**-0.0051****
					(0.0019)	**(0.0020)**
Census Division Dummies	**No**	**No**	**yes**	**yes**	**yes**	**yes**

Note: *** Significant at the 1% level
** Significant at the 5% level
*Significant at the 10% level

Table 7: Difference Per Capita in Female Enrollments 1990-2007

	1	2	3	4	5	6
Number of CZs	**358**	**358**	**358**	**358**	**358**	**358**
R^2	**0.0007**	**0.0016**	**0.0496**	**0.0632**	**0.0677**	**0.0729**
F-Statistic	**116.91**	**137.05**	**73.07**	**79.21**	**73.32**	**94.09**
Change in Imports from China to US	**-0.00019**	**-0.00078**	**-0.0010**	**-0.00078**	**-0.00077**	**-0.0010**
	(0.0011)	**(0.0013)**	**(0.0015)**	**(0.0013)**	**(0.0013)**	**(.0013)**
% of employment in manufacturing	**X**	**1.59E-04**	**0.00027****	**0.00014**	**1.64E-04**	**0.00019**
		(0.00014)	**(0.00014)**	**(0.00016)**	**(0.00015)**	**(0.00017)**
% of college educated population	**X**	**X**	**X**	**-0.00021**	**X**	**-0.00006**
				(0.00016)		**(0.00015)**
% of foreign born population	**X**	**X**	**X**	**-0.00004**	**X**	**0.00023**
				(0.00011)		**(0.00014)**
% of Employment among women	**X**	**X**	**X**	**-1.87E-04**	**X**	**0.00015**
				(0.00019)		**(0.00025)**
% of employment in routine occupations	**X**	**X**	**X**	**X**	**-0.00021**	**-0.00031**
					(0.00040)	**(0.00042)**
Average offshorability index of occupations	**X**	**X**	**X**	**X**	**-0.0042***	**-0.0065*****
					(0.0024)	**(0.0026)**
Census Division Dummies	**No**	**No**	**yes**	**yes**	**yes**	**yes**

Note: *** Significant at the 1% level
** Significant at the 5% level
*Significant at the 10% level

Table 8: Difference Per Capita in Male Enrollments 1990-2007

	1	2	3	4	5	6
Number of CZs	**357**	**357**	**357**	**357**	**357**	**357**
R^2	**0.0127**	**0.0125**	**0.0395**	**0.0545**	**0.0602**	**0.0765**
F-Statistic	**116.91**	**137.05**	**73.07**	**79.21**	**73.32**	**94.09**
Change in Imports from China to US	**0.0000503**	**0.000581**	**0.000513**	**0.000772**	**0.000782**	**0.000524**
	(0.00056)	**(0.00068)**	**(0.00087)**	**(0.00064)**	**(0.00067)**	**(0.00064)**
% of employment in manufacturing	**X**	**-1.43E-04 ** **	**-0.00009**	**-0.00032*** **	**-2.07E-04*** **	**-0.00027** **
		(0.00007)	**(0.00007)**	**(0.00011)**	**(0.00008)**	**(0.00011)**
% of college educated population	**X**	**X**	**X**	**-0.0004*** **	**X**	**-0.00023**
				(0.00014)		**(0.00015)**
% of foreign born population	**X**	**X**	**X**	**-1.56E-05**	**X**	**0.00027*** **
				(0.00009)		**(0.0001)**
% of Employment among women	**X**	**X**	**X**	**1.30E-04**	**X**	**0.00049*** **
				(0.00014)		**(0.00018)**
% of employment in routine occupations	**X**	**X**	**X**	**X**	**-0.00013**	**-0.00031**
					(0.00041)	**(0.00036)**
Average offshorability index of occupations	**X**	**X**	**X**	**X**	**-0.00445** **	**-0.00732*** **
					(0.0022)	**(0.0024)**
Census Division Dummies	**No**	**No**	**yes**	**yes**	**yes**	**yes**

Note: *** Significant at the 1% level
** Significant at the 5% level
*Significant at the 10% level

Section 6.3

Table 9: Effect of Chinese Import Competition on Manufacturing Employment in Commuting Zones with Community Colleges

Controls	1	2	3	4	5	6
Number of Observations	358	358	358	358	358	358
R^2	0.11	0.22	0.32	0.36	0.38	0.38
Change in Imports from China to US	-0.802***	-0.622***	-0.547***	-0.511***	-0.600***	-0.633***
	(0.057)	(0.089)	(0.10)	(0.081)	(0.097)	(0.097)
% of employment in manufacturing	X	-0.0482*	-0.0595***	-0.0684***	-0.0623***	-0.0488***
		(0.025)	(0.022)	(0.018)	(. 016)	(0.013)
% of college educated population	X	X	X	-0.00021	X	0.0140
				(.022)		(0.016)
% of foreign born population	X	X	X	-0.0154*	X	0.0255*
				(0.0092)		(0.016)
% of Employment among women	X	X	X	-0.0686**	X	-0.0133
				(0.031)		(0.035)
% of employment in routine occupations	X	X	X	X	-0.236	-0.244***
					(0.072)	(0.075)
Average offshorability index of occupations	X	X	X	X	0.210	-0.0697
					(0.28)	(0.29)
Census Division Dummies	No	No	yes	yes	yes	yes

Note: *** Significant at the 1% level
** Significant at the 5% level
*Significant at the 10% level

Section 6.4

Section 6.4 includes a list of states without community college data and also a full list of the number of commuting zones per state included in my sample compared to the number of commuting zones per state included in Autor et. al (2013).

Table 10: States Without Community College Data
Alaska
District of Columbia
Nevada

Table 11: Number of CZs per State

State Fip Code	State Name	# of CZs with a Community College per State	# Of CZs Per State in ADH's Sample
1	Alabama	13	14
4	Arizona	5	5
5	Arkansas	12	18
6	California	15	18
8	Colorado	5	17
9	Connecticut	1	1
10	Delaware	1	2
12	Florida	1	16
13	Georgia	15	28
15	Hawaii	4	
16	Idaho	2	9
17	Illinois	15	18
18	Indiana	5	17
19	Iowa	10	22
20	Kansas	16	32
21	Kentucky	10	21
22	Louisiana	6	12
23	Maine	4	4
24	Maryland	4	4
25	Massachusetts	3	5
26	Michigan	9	18
27	Minnesota	14	23
28	Mississippi	11	19
29	Missouri	12	24
30	Montana	8	22
31	Nebraska	6	22
32	Nevada		5
33	New Hampshire	1	2
34	New Jersey	2	2
35	New Mexico	9	14
36	New York	10	12
37	North Carolina	19	21
38	North Dakota	3	20
39	Ohio	12	17
40	Oklahoma	6	16
41	Oregon	8	14
42	Pennsylvania	10	13
44	Rhode Island	1	1
45	South Carolina	7	8
46	South Dakota	4	24
47	Tennessee	11	19
48	Texas	26	64
49	Utah	1	9
50	Vermont	2	3
51	Virginia	14	17

53	**Washington**	**5**	**12**
54	**West Virginia**	**5**	**10**
55	**Wisconsin**	**8**	**15**
56	**Wyoming**	**4**	**13**