



# Import exposure and human capital adjustment: Evidence from the U.S. <sup>☆</sup>



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## ABSTRACT

We exploit variation in exposure to Chinese import competition to identify the effect of trade-induced changes in labor market conditions on human capital accumulation in the U.S. from 1990 to 2007. We document large increases in U.S. high school graduation rates in the labor markets most affected by import competition. After controlling for established predictors of high school completion, demographic shifts, and coincident labor market changes unrelated to trade with China, we estimate that a movement from the 25th to the 75th percentile in Chinese import exposure led to an average increase in the graduation rate of 3.64 percentage points. Consistent with an environment in which students weigh increases in future earnings potential from further education against current labor market opportunities foregone, we find that growth in Chinese imports led to declines in wages for all educational groups, and reductions in employment for individuals without a high school degree both in absolute terms and relative to their more educated peers.

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## 1. Introduction

The labor market effects of international trade have long been a favorite subject of trade economists, with canonical models emphasizing the reallocation of labor across sectors as countries shift production towards comparative advantage industries. Over the past two decades, the subject has received increased attention as scholars have sought to explain the growing wage gap between skilled and unskilled U.S. workers and the decline of the U.S. manufacturing sector.<sup>1</sup>

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<sup>1</sup> On the wage gap between skilled and unskilled workers, see Feenstra and Hanson (1996) and Bernard and Jensen (1997). On the decline of U.S. manufacturing, see Autor et al. (2013) and Pierce and Schott (2015).

This paper focuses on a related but distinct issue. We analyze human capital adjustments in response to trade-driven changes in labor market conditions. In particular, we employ the methodology developed by Autor et al. (2013) to examine changes in U.S. public high school graduation rates in the face of increased competition from Chinese imports between 1990 and 2007. Controlling for a wide range of potentially confounding demographic, economic and educational factors, we find that as import competition increased, labor market opportunities deteriorated for individuals without a high school degree, and local high school graduation rates rose. Our most restrictive estimates imply that moving from the 25th percentile to the 75th percentile in the distribution of changes in import exposure would have increased a local labor market's graduation rate by 3.64 percentage points between 2000 and 2007. To our knowledge, this is the first paper to empirically link the graduation rate to international trade in the U.S.

Our identification strategy is motivated by the asymmetric effect that China's export growth has had on regional labor market conditions in the U.S. Although Chinese exports to the U.S. increased more than tenfold during our sample, the increase was not uniform across industries. For example, while air conditioning and heating equipment imports (SIC 3585) increased by a factor of more than 10, robe and dressing gown imports (SIC 2384) increased by only 70%, and imports in industrial gases (SIC 2813) fell by over 55%.

Autor et al. (2013) use such variation to examine differential effects of Chinese import competition across local labor markets, or “commuting zones,” that differed in their industrial structure. They find that commuting zones in which a large share of initial employment was accounted for by industries that saw large increases in Chinese imports experienced declines in employment and wages, as well as an increase in transfer payments. Importantly for the present paper, Autor et al. (2013) find particularly sharp reductions in employment and labor force participation among individuals with less than a college education, suggesting that the relative returns to education shifted during this period.

Focusing exclusively on individuals ages 25 and under, we provide further evidence of shifting employment opportunities for workers with low levels of education. We find that increased import exposure led to reductions in employment prospects among individuals who had not completed high school, both in absolute terms and relative to individuals with higher levels of educational attainment. Per thousand dollars of import exposure, employment as a share of the population fell 1.2 percentage points for those without a high school degree relative to degree holders. Additionally, we document significant reductions in wages among individuals with and without a high school degree during this period. These same labor markets saw large increases in graduation rates. Our results are thus consistent with a setting in which would-be dropouts weigh increased future earnings potential from further education against the opportunity cost of current labor market opportunities foregone.

The decision to complete high school is of considerable economic interest beyond the field of international economics. As noted by Heckman and LaFontaine (2010), in the United States nearly one quarter of 9th grade students will fail to graduate four years later. For black and Hispanic students, the number rises to one third. The economic costs of such numbers are substantial. Levin et al. (2007) estimate that each additional high school graduate among a cohort of 20-year-olds generates a lifetime net public benefit ranging between \$65,000 and \$150,000.

Because of these large effects, the factors affecting high school graduation rates have received a great deal of attention from scholars. A wide range of potential determinants of the decision to drop out have been analyzed at the level of the student, the family, the school and the community.<sup>2</sup> The primary factor of interest for the present paper is the set of labor market opportunities available to students. As early as Duncan (1965), economists recognized that shifting labor market conditions affected the opportunity cost of continued education. In recent years, scholars have examined changes in high school completion rates in response to changes in unemployment rates, the number of individual hours worked, and minimum wage laws.<sup>3</sup> Consistent with our results, these authors have generally found that improvements in labor market conditions pull students out of school and into the labor market.

Our approach has several advantages relative to the existing literature. First, unlike changes in the policy variables mentioned above, Chinese export growth is exogenous to local policy makers. This allows us to avoid endogeneity concerns that plague studies exploiting changes in state- or local-level policy variables to assess the responsiveness of the graduation rate to economic conditions.<sup>4</sup>

Additionally, as the labor market changes examined here are triggered by long run trends in international markets, they are likely to be viewed as permanent. The decision to dropout or to remain in high school affects not only present income levels, but also the stream of all future income. In choosing to remain in school, forward-looking students weigh the cost of present income foregone against the benefit of increased wages in the future. Labor market changes that are likely to persist are thus particularly relevant for educational outcomes.

Our findings also contribute to the literature on trade and human capital. Individual skill acquisition was famously modeled in a trade setting by Findlay and Kierzkowski (1983) and has since received attention both theoretically and empirically.<sup>5</sup> Recently, Gonzaga et al. (2006) and Dix-Carneiro and Kovak (2015) have provided evidence that regional trade shocks affect local skill premia. We build on these results by showing that Chinese import exposure differentially affected employment opportunities for those with low levels of education and document human capital adjustment consistent with these changing skill premia. As the welfare consequences of trade for low-skilled workers are largely dependent upon the human capital adjustments made in response to trade shocks, our paper provides evidence of a crucial component in analyzing the labor market effects of trade.

Much of the empirical analysis of trade and human capital adjustments focuses on the developing world. A large portion of this literature emphasizes the impact that changing trade conditions have on human capital by examining the trade-off between time spent at school and home production among children. For example, Edmonds and Pavcnik (2005) document that rice market liberalization in Vietnam led to rising incomes for rice producers and reductions in child labor. Examining Indian districts following the nation's 1991 trade reform, Edmonds et al. (2010) find smaller increases in school attendance among students living in districts most affected by reductions in tariffs. Both papers provide evidence that current changes in income are a driving factor in the labor–schooling trade-off. Focusing on changes in human capital decisions in response to the skill requirements of future job prospects, Oster and Steinberg (2013) find that skilled job openings led to increased primary school enrollment in India. Noting the importance of human capital accumulation for economic development at the national level, Blanchard and Olney (2015) employ a panel of more than 100 countries over nearly 50 years to examine the effect of export composition on human capital accumulation. Using a gravity model to isolate exogenous variation in the skill-intensity of exports, Blanchard and Olney (2015) find that increases in a country's skill-intensive exports increase educational attainment, while increases in agricultural or low-skill manufacturing exports decrease educational attainment.

Most closely related to the present paper is a recent work by Atkin (2015), who exploits variation in the timing of manufacturing plant openings across municipalities in Mexico to examine the effect of increased job market opportunities for high school dropouts. Atkin (2015) finds that local plant openings that provide low-skill employment opportunities increase dropout rates among those eligible for employment. His results are analogous to ours, in a setting in which job opportunities for low-skilled individuals are expanding rather than contracting.

Finally, our paper adds to a rapidly growing literature on the effects of trade on local labor markets. Beginning with Topalova (2010) economists have begun taking advantage of regionally

<sup>2</sup> See Rumberger and Lim (2008) for a useful survey of the literature. The authors describe factors affecting the dropout decision as falling into one of two categories: “individual” or “institutional”. Our emphasis will necessarily be on institutional factors.

<sup>3</sup> See Rees and Mocan (1997), McNeal (1997), and Chaplin et al. (2003), respectively.

<sup>4</sup> For example, one may be concerned that state-level minimum wages respond to economic conditions that might simultaneously affect graduation rates. This makes identification of a causal channel difficult.

<sup>5</sup> For theoretical examples, see Kreickemeier (2009), Falvey et al. (2010) and Davidson and Sly (2014). Empirical analysis includes Hickman and Olney (2011), and Hummels et al. (2012).

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