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Impact of Chinese growth and trade on labor in developed countries ☆

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ABSTRACT

This paper examines the impacts of growth in China's economy and trade on the skill premium of labor in developed countries. We utilize a unique global dataset that disaggregates workers by occupations to identify impacts across labor categories with different skill sets, complementing the widely used GTAP Data Base in the CGE framework offered by the GTAP model. To study the impacts of China's fast-paced growth, we model the counterfactual, i.e., what if China grew and opened at a more modest rate; we then compare this baseline with China's actual growth. Results indicate that a strong rise in manufacturing exports from China to the US impacts output and employment in the US. The US shifts its production away from light manufacturing sectors to more service-oriented sectors that also tend to engage higher skilled labor. There is a small decrease in the real wages of unskilled labor and a rise in the real wages of skilled labor. Interestingly, not all categories of unskilled labor lose, rather those that are more directly linked with manufacturing sectors are impacted; unskilled 'service and shop workers' and the unskilled 'agricultural workers, machine operators, assemblers, craft workers, and others' observe a small decline in real wages, while the impact on unskilled 'clerks' is insignificant. For all categories of skilled workers, there is an increase in real wages primarily driven by the shift in production to services and high-skilled labor intensive categories, resulting in the rising skill premium. Hence disaggregating the labor data provides greater depth on the understanding of the differential impacts on domestic workers resulting from trade, and thereby guides policy on how these differential impacts can be smoothed through redistribution of benefits. Consistent with other study findings, there is a positive impact on overall growth and welfare in the US, EU and Australasia.

1. Introduction

There is extensive debate on the causes of growing real wage disparity of skilled and unskilled labor in developed countries since the 1980s (Krugman, 1995; Winchester, 2008; Winchester and Greenaway, 2007; Winchester et al., 2006). This period of rising income inequality also observed large immigration of low-skilled workers from developing countries and a surge of low-priced imports with greater low-skill intensity. While there is general consensus that globalization impacts relative demand for skilled and unskilled labor, there is little agreement on the magnitude of effects on the growing wage disparity. Some authors argue that trade and migration have significant impacts on labor (Feenstra and Hanson, 1996), while others disagree (Krugman and Lawrence, 1994; Lawrence and Slaughter, 1993).

Several factors that have been affecting the demand and supply of labor in the recent years are discussed in the literature. The supply of unskilled labor relative to skilled may have changed due to: i) disproportionate migration of unskilled workers from developing countries (Butcher and Card, 1991); and ii) increase in the number of educated people (Wheeler, 2005), each having opposing effects. The relative demand for unskilled labor may have decreased due to: i) skill-biased technological changes (Card and DiNardo, 2002); ii) larger imports and outsourcing of unskilled-labor intensive products from the developed countries to developing countries (Leamer, 1996); and iii) changes in specialization towards greater skill-intensity (Wood, 1998).

This paper studies impacts of China's growth on skill premium in the USA. China's economic reform in the late 1970s and 1980s transformed China from a small, agricultural-based economy to a large player in the global market. Market-oriented outlook and rapid liberalization contributed to significant growth in output. In 1978 China's exports were only 0.75% of total world exports, which increased to 3% in the mid-1990s and to more than 6% by 2004[1]. The ratio of total trade to GDP increased from 0.15 to 0.70[2]. At this time China also observed substantial growth in resources. Rapid population growth (3%) during the 1960s

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[1] Authors' calculation using WDI.
[2] Authors' calculation using the Penn World Tables indicator on Openness.

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(before the adoption of China's one-child policy) resulted in large increase of the workforce during the 1980s and 1990s. In addition, increased capital investments through foreign inflows as well as public investments expanded the resource base facilitating sustained growth in output.

Economic reforms made China a leading exporter of manufacturing goods, and the US the leading importing counterpart. Of China's total exports in manufacturing 30% goes to the US. Correspondingly, 10% of US's total imports are from China, of which 95% comprises of manufacturing goods[3]. Using detailed data on 131 manufacturing categories, Sachs et al. (1994) find that increases in Chinese imports result in employment loss by 7% in production jobs in manufacturing. Mankiw (2003) in his advisory note to the administration points out that trade with China is a significant reason for increase in US exports and economic growth; however, he acknowledges directly affected workers who suffer job loss. Bronfenbrenner et al. (2001) provide a detailed overview of industries that have engaged in offshoring production in China, and the large negative impacts on manufacturing employment in the USA. The question we seek in this paper is to what extent the growth and liberalization of China may have contributed to the growing wage disparity in the US. We aim to investigate impacts on overall production, trade, changes in specialization, and detailed impacts on real returns to workers across various skill types.

The goal of this paper is to develop an integrated framework that can analyze impacts on international trade on domestic changes in relative factor returns. This requires a global analytical tool that integrates information on production, trade and employment. Given such requirements, the Global Trade Analysis Project's (GTAP) CGE (Computable General Equilibrium) model (Hertel, 1997) becomes ideal for our analysis. The model is complemented with GTAP's global dataset version 7.1 (Narayanan and Walmsley, 2008) derived from national input–output tables as well as macroeconomic, trade and protection data from international sources. We complement this with a special dataset constructed by Weingarden and Tsigas (2010) from the International Labor Organization (ILO) data that further disaggregates wages and employment across five skill-types of labor for 48 countries and 16 aggregated commodities. This dataset forms the basis to split total expenditure on labor obtained from country IO tables into expenditure on each occupation type for each industry. This unique dataset facilitates the rare opportunity to analyze data at a detailed occupational level and distinguish differential impacts across workers at different levels of the skill chain. Our results document a welfare gain in the US despite a fall in demand for unskilled labor due to the large influx of unskilled labor-intensive imports from growing China.

The rest of the paper is organized in the following way. Section 2 describes the database and the model that is used for the analysis. This includes details on a specialized labor database that provides more insights into impacts on labor markets across various skill types. Section 3 develops the experimental design with the baseline and projected scenarios. Section 4 analyzes the simulation results in context of the impacts in the labor market in the US as a result of China's growth and trade openness. The last section summarizes the research findings and concludes.

2. Data and methodology

2.1. GTAP model

For the simulations, we use the standard GTAP model (Hertel, 1997), which is a Computable General Equilibrium (CGE) framework widely used for trade policy analysis. In this section we provide a brief description of the model. In this model aggregate demand equals supply in all markets which implies that market prices equal marginal costs. By imposing ad valorem taxes and subsidies on commodities and primary factors, governments can drive wedges between prices paid by consumers and that received by producers. International trade is linked through Armington substitution among goods differentiated by countries of origin. Production uses intermediate inputs and primary factors. Each sector is assumed to mix the inputs to minimize total cost at a given output level, constrained by a three-level nested production technology: Leontief nest between intermediate inputs and primary-factor; constant elasticity of substitution (CES) nest between imported and domestic intermediate goods and between primary-factors (labor, capital, and land); and CES nest among the imported inputs from each region.

Regional income is exhausted through constant share to private household consumption, government expenditures and national savings. The private household buys bundles of commodities to maximize utility subject to its expenditure constraint, by Constant Difference Elasticity (CDE) demand system. The share of aggregate government expenditure to income is fixed and is allocated across commodities by a Cobb-Douglas distribution. The allocation of total expenditure on each good to domestically produced and imported versions is based on the same nesting scheme used to allocate total household expenditure on each good. Investment is financed from a global pool of savings, and each region contributes a fixed proportion of its income to this global bank.

In the standard model, there are five types of factors of production: labor (Skilled and Unskilled), homogenous capital good, land and other natural resources. In our model extension, however, we define five labor types discussed in Section 2.3. In the typical closure of the model, total supplies of labor and land are fixed, but capital can cross regional borders to equalize changes in rates of return. In other words, there is clear distinction between those factors that are perfectly mobile and those that are sluggish to adjust. In the case of the mobile factors, they earn the same market return regardless of the use location. As for the sluggish factors, returns in equilibrium may be different across sectors.

We further extend this model to accommodate five labor categories instead of two, based on their varying skill types. For the purposes of our research question, we define a new variable that reflects openness, which is defined as the ratio of total trade (exports plus imports) to GDP. This is linked with the rest of the model through the equations that affect exports, imports and GDP.

2.2. GTAP Data Base

GTAP Data Base (Narayanan and Walmsley, 2008) is a global dataset that contains international information on trade, protection, input–output data, production, consumption and domestic assistance. This is assembled from various data sources such as ITC (International Trade Commission: Protection data), UN COMTRADES (United Nations Commodity Trade data), IMF (International Monetary Fund: Services trade and government expenditure data), OECD (Organization for Economic Co-operation and Development: Agricultural production and domestic support data), IEA (International Energy Agency: Energy data), World Bank (Macro-economic data) and various country input–output tables. We use GTAP Data Base version 7.1, which comes with a base year of 2004 and contains data for 112 regions and 57 sectors. We further extend this data to have five labor skill categories, based on the data sources discussed in Section 2.3.

2.3. Labor split data

The database documented in Weingarden and Tsigas (2010) includes calculated labor payment split across five occupational categories: (i) senior officials, manager, and professionals (SkMNG); (ii) technicians and associate professionals (SkPROF); (iii) clerks (UnskCL); (iv) service and shop workers (UnskWRK); and (v) skilled agricultural workers, machine

[3] Authors' calculation using GTAP Database v7.