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Estimating Employment Adjustment Costs of Trade Liberalization

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Abstract

This paper reviews methods used to estimate and account for labor adjustment costs from trade changes. While there is conflicting evidence from ex-post studies as to how difficult it is for labor to adjust to changes in trade, ex-ante studies find that adjustment costs may be large and they may vary widely depending on several factors, e.g., skill, experience, sector. For example, Autor, Dorn, and Hanson (2013) find that the increase in U.S. imports from China during 1992 to 2007 lowered earnings and employment of workers in competing industries and increased the use of social security disability insurance. They also find that high-wage workers tended to move outside the industrial sector during this period and therefore had less noticeable declines in earnings. Stone, Sourdin, and Legendre (2013), however, find that there is no consistent evidence of large or systematically difficult adjustment by labor for trade, by examining labor force surveys for Brazil, Canada, Israel, South Africa, UK, and the United States. They find that occupational effects are greater than industry effects and that workers may benefit or be hurt by the increased trade. We first review results from ex-post studies of labor adjustment. Then we examine how labor adjustments are typically measured in ex-ante simulations. Next, we review several approaches estimating labor adjustment costs. Lastly, we use a GTAP model which utilizes expanded statistics for U.S. labor markets to analyze various trade scenarios and under different labor market conditions.

We find that reducing substitutability between labor in different occupations and different sectors leads to a decline in export growth, but a larger welfare gain from global trade liberalization. We also plan to analyze worker movements across occupations and sectors in the alternative scenarios and will also examine two to three additional scenarios.

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Introduction

We examine methods used to estimate and account for labor adjustment costs. While there is conflicting evidence from ex-post studies as to how difficult it is for labor to adjust to changes in trade, ex-ante simulations find that adjustment costs may be large and widely vary, are larger when capital is mobile, and vary for workers with different skill levels and experience. Some of features of this literature are measuring interindustry job churning, estimating the gap between actual and desired employment, accounting for unemployment and training, introducing job moving costs in labor supply, accounting for the "option value" or new opportunities in protected sector, accounting for heterogeneous workers with sector specific experience, and employment matching models with finitely lived workers.

We first review results from ex-post studies of labor adjustment. Then we examine how labor adjustments are typically measured in ex-ante simulations. Next, we review several approaches estimating labor adjustment costs. Lastly, examine an economywide analysis of the response of occupational and sector specific employment to infer the labor adjustment costs of global trade liberalization. We examine the impact of changes in the substitutability of labor between different occupations and sectors to get a sense of the degree to which labor adjustment costs vary with the substitutability of different types of labor.

Ex-post evidence of labor adjustment

There is conflicting evidence from ex-post studies of labor adjustment costs of trade as to how difficult it is for labor to adjust to changes in trade. Autor, Dorn, and Hanson (2013) find that the increase in U.S. imports from China during 1992 to 2007 lowered earnings and employment of workers in competing industries and increased the use of social security disability insurance. They also find that high-wage workers tended to move outside the industrial sector during this period and therefore had less noticeable declines in earnings.

However, Stone, Sourdin, and Legendre (2013) find that there is no consistent evidence of large or systematically difficult adjustment by labor for trade, by examining labor force surveys for Brazil, Canada, Israel, South Africa, UK, and the United States. They find that occupational effects are greater than industry effects and that workers may benefit or be hurt by the increased trade.

Metrics of labor adjustment

The primary metrics used in ex-ante simulations measuring the labor adjustments costs of trade policy are the value of adjustment costs as a share of the gains to trade and wages and the length of the adjustment. The value of employment adjustments costs can be a sizable share of the gains from trade. Davidson and Matusz (2010) estimate that the training costs by U.S. workers of adjusting to trade liberalization is a little more than a third of the gains from trade when an additional month of training is needed and increase to about three-fourths of the gains if 15 months of training are needed.

Adjustment costs as a share of wages are estimated to be high on average, but a highly variable share of wages. Artuç, Chaudhuri, and McLaren (2010) find that adjustment costs for U.S. workers average about six and half times annual wages. However, the standard deviation of the share is about five times the annual wage suggesting that that costs could be much smaller or much higher. They find that the large variability is not specific to particular sectors and is at least four times the annual wage in each sector.

Worker heterogeneity can affect the labor adjustment cost share of wages. Artuç, Chaudhuri, and McLaren (2010) find that "not so old" workers in the import-competing sector benefit from better wages in other sectors because they have the option of eventually moving. They indicate that these workers' lower moving costs lead to a higher "option-value" and that trade is Pareto-improving for many workers in the import-competing sector. Applying the same methodology as Artuç, Chaudhuri, and McLaren (2010) as to Brazilian workers, Dix-Carneiro (2011) finds average mobility cost to be on the

order of 50 times annual wages. However, he finds smaller adjustment costs for formal sector workers in Brazil when accounting for sector specific experience and selection. He finds that median adjustment costs are 1.4 to 2.7 times the annual wage in the formal sector when accounting for these differences. Dix-Carneiro (2011) finds that the median value of the adjustment costs for the residual sector increases to 12 to 14 times the annual wage.

Capital mobility also can affect trade adjustment costs. Dix-Carneiro (2011) finds that employment adjustment costs are lowest when capital is fixed (and there is no change in capital for labor to adjust to), but higher when capital is imperfectly mobile than perfectly mobile. However, even when capital is imperfectly mobile, he finds that the gains from trade increase by much greater proportion than labor adjustment cost compared to when capital is fixed.

The adjustment time for labor may be lengthy and more than a few years in duration. Estimating the impact of eliminating a 30 percent tariff in the U.S. market, Artuç, Chaudhuri, and McLaren (2010) find that 95% of labor reallocation is completed within 8 years. For Brazilian workers, Dix-Carneiro (2011) estimates adjustment times of between 3 to 16 years for 80% of reallocation, depending upon capital mobility and the size of the shock.

Approaches for ex-ante calculation and accounting for labor adjustment costs

The various ex-ante simulations used a variety of methodologies to estimate labor adjustment costs. The most common method is to modify labor supply. Artuç, Chaudhuri, and McLaren (2010) and Dix-Carneiro (2011) introduce moving costs into labor supply where high idiosyncratic costs lead to a slow responsiveness to wages. Davidson and Matusz (2010) specify rates of transition between employment, unemployment, and training in a “high tech” sector in a Poisson process.

Francois, Jansen, and Peters (2011) indicate that calculating the standard or absolute deviations of changes in sectorial employment is a useful way to measure employment adjustment costs.

However, they point out that this since it does not include all workers who change jobs, but not just net employment flow between sectors, it will underestimate the amount of job churning going on. When applied to recent free trade agreements, this calculation tends to be less than one percent for employment for the U.S. and the EU, but larger for partner countries in Central and South America. They report calculations indicating that an EU-Andean FT would generate less than 0.03 percent labor displacement for the EU and a 1 to 3 percent labor displacement of the Andean countries. They also report that estimates for the labor displacement resulting from and EU-Central American FTA would be between 0.2 to 0.3 percent for the EU, but that it would be 15 to 17 percent for Panama and range from 2 to 11 percent for other Central American countries.

Casacuberta and Gandelman (2010) estimate the labor cost of adjustment as the share of the employment gap closed during adjustment. Estimating frictional employment from a counterfactual profit maximization, they assume desired and frictional employment are proportional and that actual and desired levels of employment are equal during the year of median values for investment and employment growth. Using data for Uruguay, they find that labor shortages lead to less responsiveness in creation of other factors and to larger adjustment in the destructive side and that trade policy can shift adjustment functions.

Estimating the duration of underemployment and training that result from a change in trade policy is another way of measuring adjustment costs. Davidson and Matusz (2001, 2010) use a model where low ability workers with guaranteed employment can switch to a high tech sector with high wages, required training, and possible unemployment. They find low ability workers will switch to the high tech sector in response to trade liberalization. They find that much of the adjustment costs for these workers are resource costs of training and that these costs may range from 30 to 90 percent of the gains from this policy.

Using a model with a residual sector, Dix-Carneiro (2011) finds that a moving subsidy is better at compensating losers than retraining, but that it generates higher welfare adjustment costs. Their simulation depends on assumptions regarding the job breakup and acquisition rates, the probability of a need for retraining, and the time and resources costs of training. Also using Brazilian data, Coşar (2013) has a two-sector small open economy matching-model with overlapping generations of workers with finite lives, frictional labor markets, and sector-specific human capital that generates endogenous unemployment spells and job-specific rents. Workers accumulate human capital through learning by-doing. He finds that skills are only transferable to jobs in the same sector and that adjustment can take a very long time.

A multiregional, economy-wide analysis of labor adjustments

Lastly, we use a GTAP model which utilizes expanded statistics for U.S. labor markets to analyze a trade scenario under different labor market conditions. Data from the U.S. Bureau of Labor Statistics have been used to disaggregate labor to twenty-two types of labor based on occupational characteristics (Carrico and Tsigas (2014)). Our database has fifty-seven sectors and 6 regions: the United States, rest of NAFTA, EU27, Japan, China, and a rest of the world.

The trade scenario that we examine is a removal of all import duties by all countries in the model. We simulate this scenario under different assumptions about the extent of potential adjustments in U.S. labor markets. In our base case scenario potential adjustments in U.S. labor markets are based on the following assumptions: workers assigned to the twenty-two occupations can move freely from sector to sector; and workers can also change occupations within two groups of occupations. In the first alternative scenario, we restrict the movement of U.S. workers across occupations by lowering the elasticity of transformation which models these worker movements. In the second alternative scenario, we not only restrict the movement of workers across occupations, but we also restrict the reallocation of labor across sectors.

In Table 1 we report selected simulated effects for the U.S. economy from the three simulations. In the base case scenario returns to land, capital, and almost all labor types increase, while returns to natural resources decline. Land rents increase the most, 5.0 percent. The average wage rate for occupations included in group A rise by 1.25 percent, while the average wage rate for group B occupations rises by 0.10 percent. For each one of the labor groups, occupation specific wages increase by similar rates. U.S. GDP expands by 0.04 percent, exports expand by 7.0 percent, and imports expand by 7.56 percent. The U.S. economy gains from the global removal of imports tariffs. U.S. welfare increases by $51.2 billion. Gains in allocative efficiency amount to $6.7 billion, with about $2.2 billion of those gains originating in imports. Most of the U.S. welfare gains, however, arise from improvements in the U.S. terms of trade ($44.5 billion).

In the two alternative scenarios we reduce U.S. labor markets adjustment in response to a global removal of import tariffs. As a result of lesser adjustment in U.S. labor markets, the cost of labor increases by more than in the base case scenario. In the first alternative scenario, group A wages increase by 1.54 percent, while group B wages increase by 0.19 percent. Occupation specific wages change by less similar rates. U.S. exporters are less able to take advantage of the absence of import duties across the world. In the two alternative scenarios, returns to land increase by less than in the base scenario, while returns to other natural resources decline by more.

As a result of lesser adjustment in U.S. labor markets, U.S. exporters are less able to take advantage of free trade. The volume of U.S. exports expands by 6.84 percent in the first alternative scenario and by 6.22 percent in the second alternative scenario.

Despite the smaller degree of adjustment in labor markets, the U.S. economy gains more from the global removal of imports tariffs in the two alternative scenarios than in the base case scenario. U.S.

welfare increases by $54.0 billion in the first alternative scenario with most of the additional welfare gains originating in improved terms of trade.

Conclusion

We find that reducing substitutability between labor in different occupations and different sectors leads to a decline in export growth, but a larger welfare gain from global trade liberalization. However, it is possible despite the lower substitutability of labor, there may be larger changes in employment in the alternative scenarios. In the next month we plan on analyzing worker movements across occupations and sectors in the alternative scenarios and will also examine two to three additional scenarios.

Table 1 Simulated effects for U.S. economy from removal of all import duties by all countries under different assumptions about U.S. labor market adjustments

	Base case scenario	First alternative scenario	Second alternative scenario
Returns to factors of production, percent change			
Land	5.016	4.546	3.405
Other natural resources	-2.542	-3.055	-3.758
Capital	1.568	1.804	1.873
Labor occupations, Group A, average wage rate	1.253	1.548	1.637
Occupation specific wages			
Social services	1.275	1.636	1.732
Protective services	1.248	1.473	1.494
Food preparing and servicing	1.253	1.527	1.653
Building and grounds maintenance	1.254	1.517	1.563
Personal care and services	1.263	1.590	1.690
Sales related	1.245	1.473	1.541
Office and administrative support	1.252	1.509	1.556
Farming, fishing, and forestry occupations	1.280	1.709	1.721
Construction and extraction	1.302	2.266	2.754
Installation, maintenance, and repair	1.265	1.649	1.750
Production related	1.198	1.006	0.922
Transportation and material moving	1.269	1.627	1.643
Labor occupations, Group B, average wage rate	0.104	0.192	0.538
Occupation specific wages			
Management	0.108	0.371	0.738
Business and financial	0.092	-0.052	0.296
Computer, mathematical	0.058	-1.127	-0.606
Architecture, engineering	-0.053	-4.146	-2.388
Sciences	0.349	7.865	6.192
Legal	0.087	-0.356	-0.221
Education, training, and library	0.130	0.754	0.966
Arts, design, entertainment, sports, media	0.085	-0.358	-0.014
Healthcare practitioners and technical	0.128	0.711	0.928
Healthcare support	1.274	1.630	1.724
GDP, percent change in volume	0.048	0.051	0.049
Exports, percent change in volume	7.045	6.842	6.226
Imports, percent change in volume	7.564	7.740	7.512
Private consumption (up), percent change in volume	0.430	0.482	0.516
Welfare effects and components, million U.S. dollars			
Overall welfare (EV)	51,284	54,046	57,652
Allocative efficiency (CNTalleffr)	6,730	7,186	6,822
Alloc. effic., import changes (CNTqimr)	2,277	2,299	2,137
Alloc. effic., import changes (CNTqor)	-1,521	-1,392	-1,162
Alloc. effic., other changes	5,974	6,279	5,846
Terms of trade	44,554	46,860	50,830
Traded goods (CNTtotr)	31,345	32,293	35,866
Savings/investment (CNTcgdsr)	13,208	14,567	14,965

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