

State-level equity and the demise of the Agreement on Textiles and Clothing

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Abstract:

According to the Agreement on Textiles and Clothing (ATC), a part of the 1995 World Trade Organization (WTO) agreements, all quantitative restrictions on textile and apparel commodities are to be removed on January 1, 2005 completing their integration into the GATT regime. Using newly computed “export-tax equivalents” of those quotas, this paper examines the welfare impacts of the 2005 liberalization at the U.S. state level. The methodology utilizes a regional model of the U.S. economy built up from individually consistent IMPLAN social accounts for each state. The model incorporates forward-looking dynamic responses and equilibrium unemployment. The results are useful in quantifying the geographic distribution of the benefits and costs of the ATC’s expiration on the U.S. economy.

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1. Introduction

As required by the Uruguay Round Agreement on Textiles and Clothing (ATC), the United States, along with the European Union and Canada, will, in 2005, eliminate all their remaining quotas on textile and clothing imports from WTO countries. In the approach of the January 2005 deadline, numerous studies have been produced regarding the likely economic effects of the quota liberalization of different developing country suppliers. Very few papers, however, have looked at the likely impact on the United States.

This paper examines the economic impacts of the 2005 liberalization at the U.S. state level, using newly computed “export tax equivalents” of those quotas. The methodology utilizes a bottom-up regional model of the U.S. economy based on individually consistent IMPLAN social accounts for each state. The model incorporates forward-looking dynamic responses and equilibrium unemployment. The results are useful in quantifying the geographic distribution of the benefits and costs of the ATC’s expiration on the U.S. economy.

The paper has the following structure. Section 2 briefly provides an overview of the Agreement on Textiles and Clothing as well as some measures of the degrees of restrictiveness of the quantitative restraints scheduled to be lifted in 2005. Section 3 presents the analytical framework as well as the simulation design used to study the removal of the quotas. Section 4 presents the simulated state-level impact of the ATC phase-out. Section 5 concludes.

2. The Agreement on Textiles and Clothing

In 1995, the Agreement on Textiles and Clothing (ATC) called for the progressive elimination of the quantitative restraints established under the Multifiber Arrangement (MFA) and which had since 1974 governed international trade in textile and apparel. The quotas were negotiated bilaterally and were administered in the form of “voluntary export restraints” (VERs), so that the product coverage and the degree of restrictiveness vary by supplier.¹ In 2002, the United States had quotas on 45 countries, which accounted for about 78 percent of the total value of U.S. imports of textiles and apparel.

The ATC requires the United States (along with other major importers like Canada, and the European Union) to bring textile and apparel articles under GATT discipline in four stages (1995, 1998, 2002, 2005) over a 10- year transition period ending on January 1, 2005: any quotas on such goods were to be eliminated and new quotas may not be established, except as provided under normal GATT rules. The specific schedule of integration varied greatly among the different importing economies. In the case of the United States, none of the articles integrated in the first stage was under quota, and most of the articles integrated in the second and third stages either were not under quota or had low quota usage. As a result, 89 percent and 47 percent of the U.S. apparel imports and textile imports, respectively, will remain to be integrated in 2005.² This suggests that the scheduled 2005 removal of the remaining quotas would likely to lead to major changes in the textile and apparel sector.

¹ For detailed discussions of the numerous and complex economic implications of the discriminatory nature of VERs see Krishna (1989 and Dean and Gangopadhyay (1991).

² For a detailed discussion on this, see USITC (2004a).

In order to quantify the potential impact of lifting the remaining quotas, one has to determine the degree of restrictiveness of those quotas, which is not a trivial exercise. One common way to measure these is to compute their export tax equivalents (ETEs), which measure the degree to which the quota increases the export price (i.e., the price before entry into the U.S. market).³ In fact, the quota can be viewed as an implicit tax on exports of textiles and apparel from restrained countries to the United States: in order to export, a firm in a quota-constrained country has to obtain or buy the right to use the quota (or an export license). Note that even in countries where quotas are distributed without charge, the system is still costly to exporters who must forgo the opportunity to sell the valuable quotas to other suppliers.

From a slightly different but related perspective, a binding quota effectively limits the supply to the U.S. market of a given product, making its price higher in the United States than in the world market. Given the resulting wedge between the U.S. and world prices, the limited and scarce supply of quotas becomes valuable and benefits accrue to firms (or individuals) that have access to them. In other words, exporters who have licenses to export the products to the United States are able to capture economic rents by increasing the export prices of their products.

In this paper, we use a set of newly estimated ETEs for the year 2002.⁴ These were computed and then averaged across all suppliers. They were also computed for all products that could be subject to binding quota. The ETEs used in this paper are reported in Table 1, along with the ad valorem average tariff rates. The estimated ETEs are relatively high for apparel and finished textile products (e.g., housefurnishings and other made-up textile articles) but are relatively low for textile mill articles, which consist mostly of intermediate inputs such as yarns and fabrics.

Table 1
Estimated ad valorem export tax equivalents and import-weighted average tariffs, for textiles and apparel by sectors, percent, 2002

Sector	Export tax equivalents (ETEs)	Average tariff rates
Broadwoven fabric mills and fabric finishing plants	4.78	7.86
Narrow fabric mills	0.01	4.18
Yarn mills and finishing of textiles, n.e.c.	0.54	4.81
Thread mills	1.97	7.08
Coated fabrics, not rubberized.....	0.05	2.22
Cordage and twine.....	0.28	3.10
Textile goods, n.e.c.	0.01	2.28
Women's hosiery, except socks.....	0.52	6.55
Hosiery, n.e.c.....	0.81	9.38
Apparel made from purchased materials	12.88	10.88
Curtains and draperies	6.03	8.95
Housefurnishings, n.e.c.	12.57	6.26
Fabricated textile products, n.e.c.....	0.96	2.43

¹ Ad valorem equivalent.

Source: USITC (2004, forthcoming).

³ See, for example, Francois and Spinanger (2002).

⁴ These estimates were produced by the staff of the USITC. For detailed description of how they were calculated, see USITC (2004b).

3. Model description and simulation design

The model employed to simulate the impact of eliminating the ATC restrictions represents a multi-region U.S. economy operating on a dynamic growth path. Agents are assumed to be forward looking and invest to support a growing stock of capital. In a given simulation, five regional economies within the U.S. are assumed. These are defined by labor endowments (which grow in each time period) initial capital endowments, and regional consumption patterns and production technologies.

The primary data for calibrating the consumption and production technologies are the 1998 IMPLAN state-level social accounts.⁵ These state-level accounts are aggregated to the desired product and regional level largely using tools developed by Rutherford (2004). Rutherford's tools are modified to allow flexible batch processing of the regional aggregation such that a single state of focus can be designated and modeled relative to the other regions. Four primary regions are designated (Eastern, Great Lakes, Plains, and Western), and the fifth region is any desired state. For example, if South Carolina is the focus of analysis in a particular simulation, the regions are South Carolina, the Eastern region less South Carolina, the Great Lakes region, the Plains region, and the Western region. This structure of automated regional aggregation yields a system that is dimensionally tractable yet flexible enough to generate consistent multi-regional results for any desired state of interest.

The aggregated social accounts are assumed to represent a snapshot of the multi-region multi-sector U.S. economy on an infinite horizon growth path. For simplicity the results presented below assume steady-state growth in the benchmark equilibrium.⁶ We follow Lau, Pahlke, and Rutherford (2002) in approximating the infinite-horizon intertemporal equilibrium as a complementarity problem. The model is simulated for one-year time intervals from 2005 to 2015. The terminal constraint suggested by Lau, Pahlke, and Rutherford (2002) is employed to get an accurate approximation to the intertemporal problem, and infinite-horizon welfare in each region is calculated using the approximation suggested by Harrison and Rutherford (1999). In this case, the finite problem is a good approximation of the infinite horizon, because the relatively small macroeconomic impacts of the simulated removal of the ATC restrictions generate consumption growth paths very close to the new steady state even with our relatively short horizon.

A representative household in each region is assumed to maximize intertemporal utility subject to income derived from each year's endowment of labor and the first period's endowment of capital. Aggregate regional savings (equal to investment) is chosen such that capital stocks react optimally to the future set of equilibrium prices. The model is completely deterministic; all periods of the modeled horizon are solved simultaneously and no consideration is given to uncertainty.

⁵ Data purchased from the Minnesota IMPLAN Group Inc., 1725 Tower Drive West, Suite 140, Stillwater, MN 55082 (<http://www.implan.com>).

⁶ The relative sizes of the textile and apparel sectors of the U.S. economy have fallen in the recent years. The current results presented here do not consider this important structural trend. We intend to develop the model further to incorporate differential growth rates across sectors in the medium run. Because the textile and apparel sectors are growing relatively slowly, one might expect the quantitative impacts presented here to have an upward bias (i.e., we probably overstate the size of the impacts).

The household utility function in each region is assumed to exhibit constant relative risk aversion with an intertemporal elasticity of substitution of 0.5 and a discount rate of 5%. In each time period the household is assumed to get utility from a constant-elasticity-of-substitution (CES) composite of leisure and goods and services. From a static perspective the labor-leisure calibration is chosen such that the uncompensated-labor-supply elasticity is 0.1 and the compensated-labor-supply elasticity is 0.35. This indicates an elasticity of substitution between leisure and the composite consumption of other goods and services close to unity and a labor-endowment to labor-supply ratio of about 1.4 to 1.5 (the exact values of these calibrated statistics depend on the particular state's or region's labor share of total income). See Ballard (1999) for a detailed analysis of the relationship between the calibration parameters and the compensated- and uncompensated-labor-supply elasticities. Utility over goods and services is assumed to be Cobb-Douglas, with the value shares determined by the social accounts. Thus, the Cobb-Douglas aggregate of goods and services is combined with leisure to generate total utility in a given time period. This instantaneous utility is then aggregated according to a CES of 0.5 and discounting at 5% per year.

Production technologies for the goods and services produced in each region are assumed to exhibit constant returns to scale and perfect competition. The 528 industries available in the IMPLAN data are aggregated to the following 17 focus industries:

- Broadwoven Fabric Mills And Finishing
- Narrow Fabric Mills
- Yarn Mills And Finishing Of Textiles N.E.C.
- Thread Mills
- Coated Fabrics (Not Rubberized)
- Cordage And Twine
- Other Textile Goods
- Womens Hosiery Except Socks
- Hosiery N.E.C.
- Apparel Made from Purchased Material
- Curtains And Draperies
- Housefurnishings N.E.C
- Other Fabricated Textile Products
- Agriculture and Food
- Manufacturing
- Services (Private)
- Services (Public)

The detailed textile and apparel industries were chosen to match the products with estimated ATC related distortions. The other industries were aggregated (into four broad categories) to reduce the overall dimensions of the model.

Following Lau, Pahlke, and Rutherford's (2002) formulation of partial putty-clay adjustment dynamics, production in each regional industry is assumed to be the sum of two distinct processes. In the first process, installed first-period sector-specific capital is combined in fixed proportions (Leontief) with other inputs to produce output. Over time the quantity of extant capital diminishes due to geometric depreciation. Thus output from the first process approaches zero as time approaches infinity. In contrast, the second process, which replaces the first over time, is characterized by a general CES production function in which new vintage capital is

combined with other inputs to produce output. The CES technology is assumed to include a Cobb-Douglas value-added nest in which labor and capital substitute with each other, and subsequently the value added composite is combined with intermediate commodity inputs in fixed proportions. The putty-clay production technology is an intuitively appealing formulation that slows adjustment dynamics by limiting short-run factor substitution possibilities.

The other major feature of the model that incorporates short-run adjustment frictions is a formulation of aggregate equilibrium unemployment. Following Balistreri (2002) unemployment is incorporated through an aggregate labor market matching technology. Changes in the demand for labor and income changes, which affects labor supply, indicate changes in the matching opportunities of unemployed workers. Currently the model only considers matching in each region's market for homogeneous labor. An important extension of the model might examine the impact of the ATC on labor matching in multiple markets that delineate workers of different skills.

The formulation of international and interregional trade within the model relies on products differentiated by geographic origin. From the perspective of each region there are potentially three distinct sources (or sinks) for each commodity consumed (or produced). There is a domestic variety, a national (U.S. market) variety, and a foreign variety. For all products the elasticity of substitution between the foreign and national variety is assumed to equal 8, and the elasticity of substitution between the domestic and foreign-national composite is assumed to equal 4. The elasticity of transformation between producing output for the different markets is assumed to equal 3. The foreign import-supply and export-demand elasticities are assumed to be infinite. That is, the U.S. is a price taker on world markets. This is probably a reasonable assumption for the relatively limited scope of the ATC experiment, but it is noted that terms-of-trade effects might mitigate some of the impacts shown. The overall trade equilibrium is closed by specifying no change in net capital flows for the modeled horizon. This allows regions to borrow or lend in capital markets within the horizon, but any net accumulation of debt (or loans) must be paid off by the terminal period.

Simulation of the removal of ATC restrictions involves reducing the world price for textile and apparel products by the amount of the export-tax equivalent shown in Table 1. This is consistent with the rents from the quantitative restrictions accruing to the exporting countries. It is assumed that the existing import tariffs on textile and apparel will remain at their existing levels.

4. Simulation Results

Our primary goal is to examine the simulated impacts of the removal of ATC restrictions across the U.S. states. Figure 1 presents these results. The costs of ATC liberalization are concentrated in a limited number of states. These include a number of southern states and New York. To understand this distribution it is useful to isolate income and demand influences. Table 2 presents the simulated welfare impacts and some data features that indicate the source of the impacts. Column (3) of table 2 reports the share of total state value-added attributed to the textile and apparel industries. The correlation coefficient between column (2) and (3) is -0.81. As one might expect there is a strong negative relationship between the concentration of a state's income in the import-competing industry and the welfare impact of liberalization.

Figure 1.

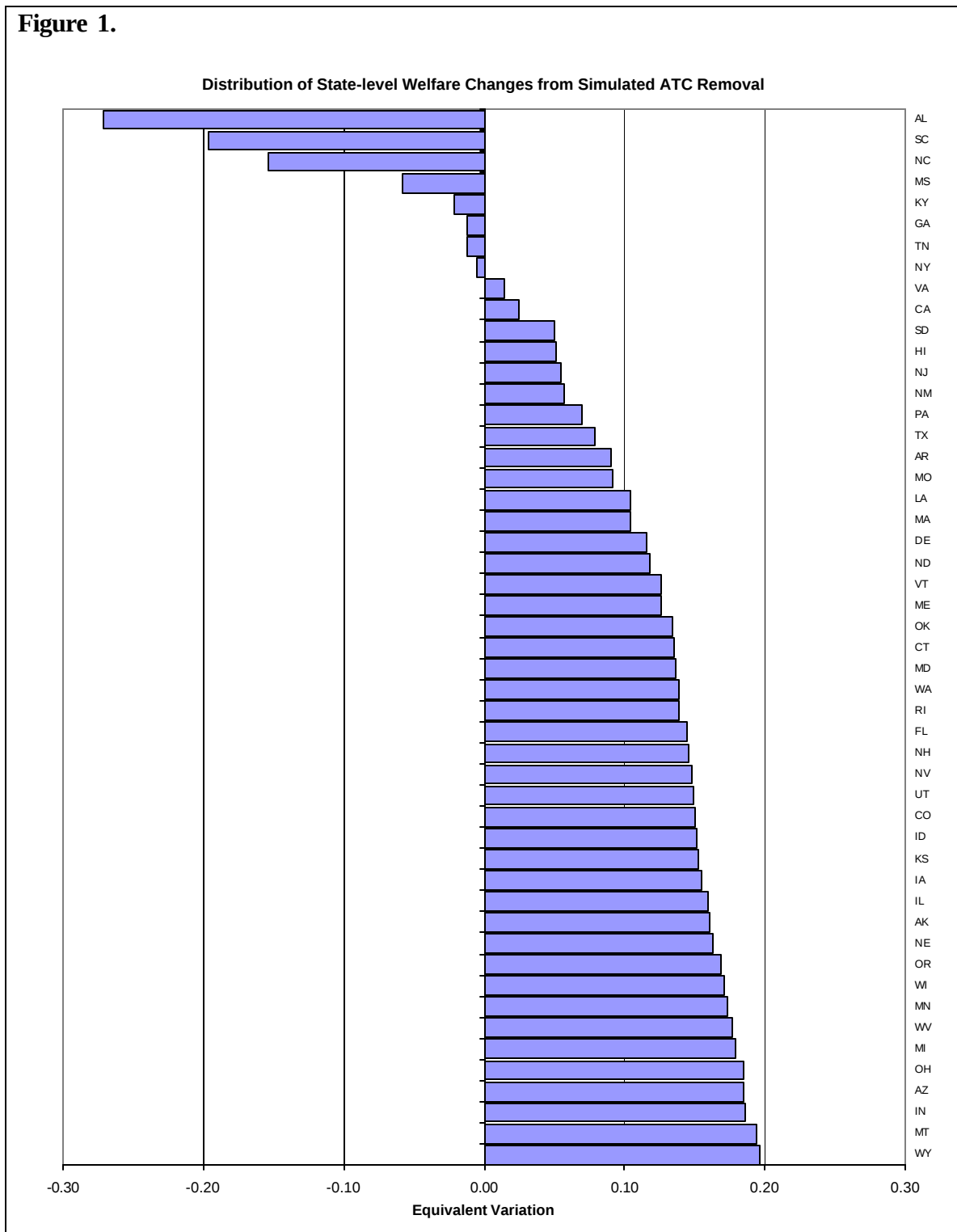


Table 2
State-level changes in Welfare and Unemployment Rates, and selected benchmark data

State	Welfare Change (%)	Benchmark Gross-product Share (%)	Benchmark Foreign-import Share (%)	Unemployment Rate Change in 2005 (%)
(1)	(2)	(3)	(4)	(5)
AL	-0.27	1.90	2.35	0.14
SC	-0.20	4.00	4.61	0.35
NC	-0.15	3.24	0.38	0.19
MS	-0.06	1.16	11.18	0.04
KY	-0.02	1.01	11.51	0.00
GA	-0.01	2.20	9.32	0.07
TN	-0.01	0.99	8.98	0.01
NY	-0.01	0.59	21.61	0.02
VA	0.01	0.69	22.49	0.05
CA	0.02	0.49	26.06	0.01
SD	0.05	0.20	56.52	-0.02
HI	0.05	0.17	55.44	-0.04
NJ	0.05	0.43	41.45	0.01
NM	0.06	0.13	63.48	-0.01
PA	0.07	0.56	27.40	0.04
TX	0.08	0.27	42.46	0.03
AR	0.09	0.59	32.57	0.05
MO	0.09	0.33	41.00	0.01
LA	0.10	0.24	50.68	0.03
MA	0.10	0.49	46.94	-0.02
DE	0.12	0.42	50.98	-0.04
ND	0.12	0.07	73.10	-0.03
VT	0.13	0.35	46.61	0.00
ME	0.13	0.79	44.24	0.00
OK	0.13	0.22	46.99	0.04
CT	0.13	0.24	59.37	-0.03
MD	0.14	0.17	64.15	-0.01
WA	0.14	0.17	60.20	-0.01
RI	0.14	1.19	42.20	0.05
FL	0.14	0.20	59.15	0.03
NH	0.15	0.75	50.40	0.01
NV	0.15	0.06	72.65	-0.03
UT	0.15	0.19	60.63	-0.02
CO	0.15	0.10	66.25	-0.02
ID	0.15	0.05	73.78	0.00
KS	0.15	0.15	60.91	0.00
IA	0.15	0.19	56.98	0.02
IL	0.16	0.15	64.41	-0.01
AK	0.16	0.02	79.92	-0.06
NE	0.16	0.11	66.51	0.00
OR	0.17	0.16	61.98	0.00
WI	0.17	0.25	57.64	-0.01
MN	0.17	0.16	65.15	-0.02
WV	0.18	0.19	63.17	0.05
MI	0.18	0.32	59.58	-0.04
OH	0.18	0.21	62.00	-0.02
AZ	0.18	0.11	70.13	0.00
IN	0.19	0.20	61.48	-0.02
MT	0.19	0.10	73.91	0.03
WY	0.20	0.05	75.63	0.03

In addition to the degree of textile and apparel production concentration, there could be important demand idiosyncrasies that cause states to be affected differently. Column (4) of table 2 reports the state's foreign import share of textile and apparel products. The correlation between columns (2) and (4) is 0.87. The correlation between relatively high foreign demand and welfare changes is very strong. The data seem to be constructed in a way that insures this effect, however, as the foreign import share is very small when textile and apparel production is intense. It seems hard for us to believe that foreign import share is only 2.35% for Alabama, for example, when the simple average import share across all states is over 48%. We feel that a closer examination of the regional purchase coefficients in the IMPLAN data is warranted. Our prior is relatively less variation in the foreign import shares across states, but it is possible that import shares might vary widely for individual textile products used as intermediate inputs (as opposed to apparel products destined for final demand).

The final column in table 2 reports the simulated initial (2005) change in the unemployment rate in each of the states. As one might expect, there is a strong negative relationship between welfare changes and the change in the unemployment rate; the correlation between columns (2) and (5) is -0.71. Although increases in the unemployment rate are found in those states that show a negative impact from the policy, many states that gain are also observed to have increases in their unemployment rates. There are two driving forces that might increase the short-run unemployment rate. First, decreases in the demand for labor may be consistent with welfare increases in a particular state. Decreased demand for labor reduces matching efficiency indicating increased unemployment. At the same time, however, the household's real income is changing and this causes changes in labor supply decisions. Decreases in labor supply, all else equal, also reduce matching efficiency. Overall the change in the short-run unemployment rate will be determined by the influences of both demand and supply shifts on the matching equilibrium. Over time the unemployment rate settles close to the benchmark rate, as there is no significant change in long-run labor payment shares (see Balistreri, 2002).

The model reports many details on how a particular state economy reacts to the liberalization experiment. Figure 2 shows the time paths for changes in consumption, investment, gross output, and labor earnings for South Carolina, one of the most heavily impacted states. Consumption is measured gross of leisure. Given the small nature of the shock on the overall state economy the consumption path is stable over the horizon. Little intertemporal substitution is indicated in the consumption time series. Notice that the drop in gross output shown in figure 2 is slightly higher in the first year of the shock (relative to the new steady-state). This reflects the adjustment costs associated with our formulation of equilibrium unemployment. Figure 3 reports the changes in the unemployment rate for South Carolina. Initially the unemployment rate in South Carolina increases by 0.35 percentage points (the benchmark is 5% unemployment so simulated 2005 unemployment is 5.35% in South Carolina) then settles at a new equilibrium that is about 0.05 percentage points higher than in the benchmark.

Figure 2

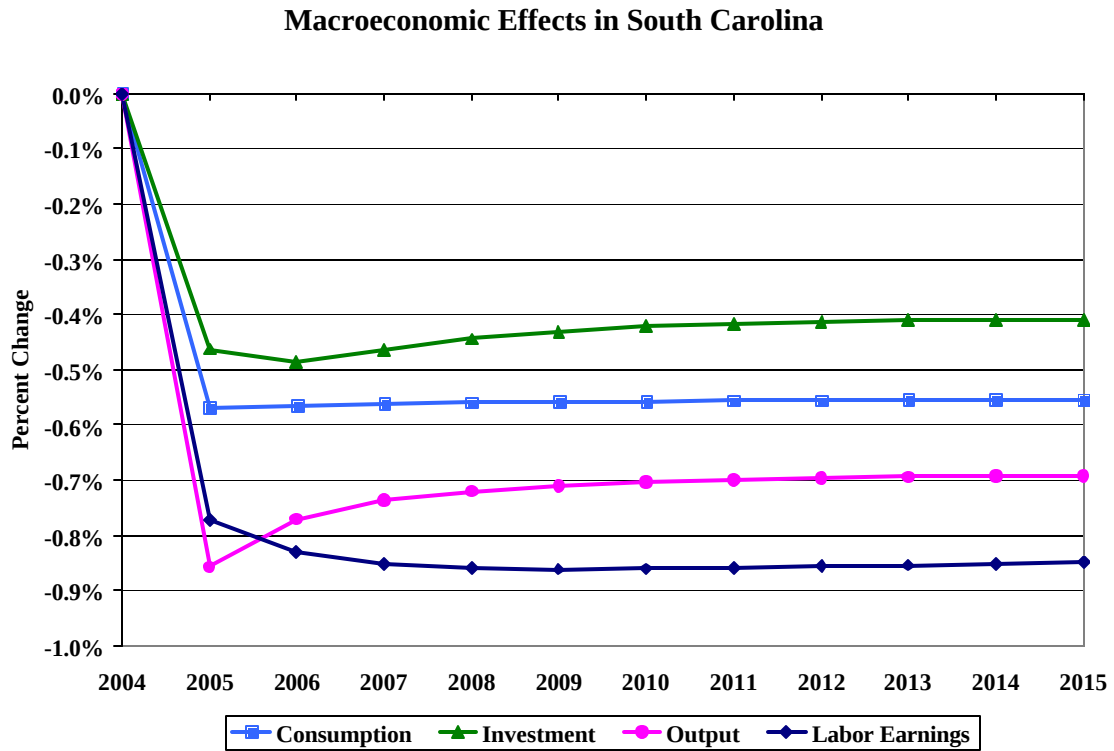
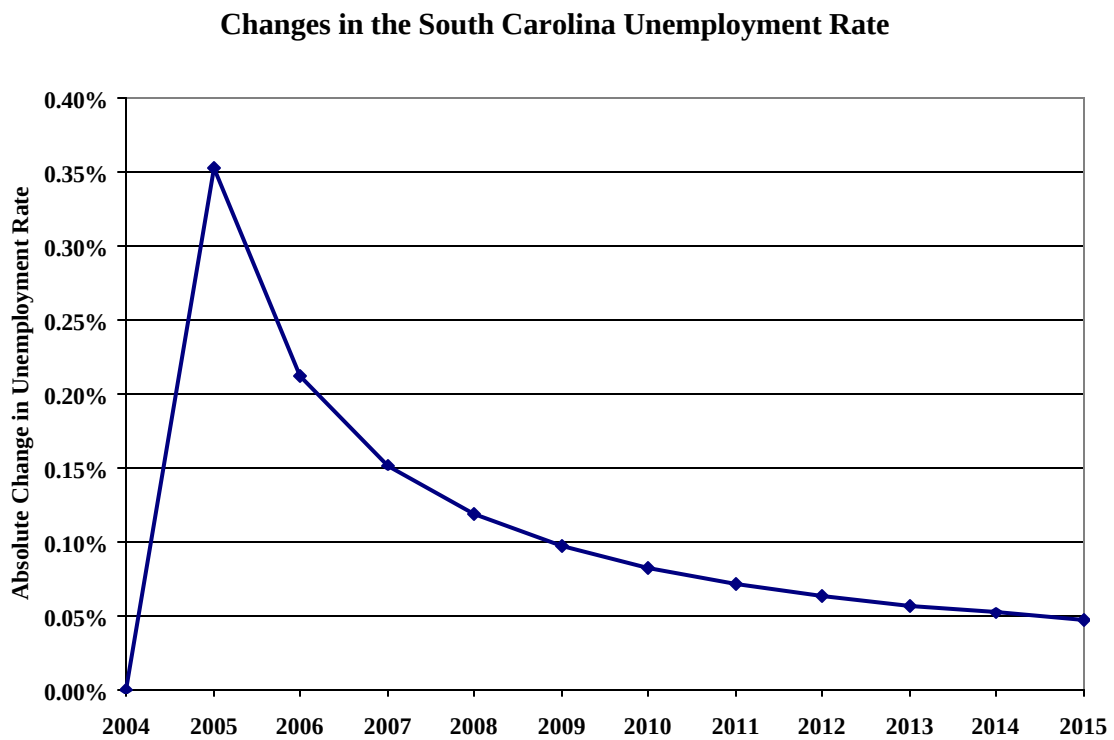
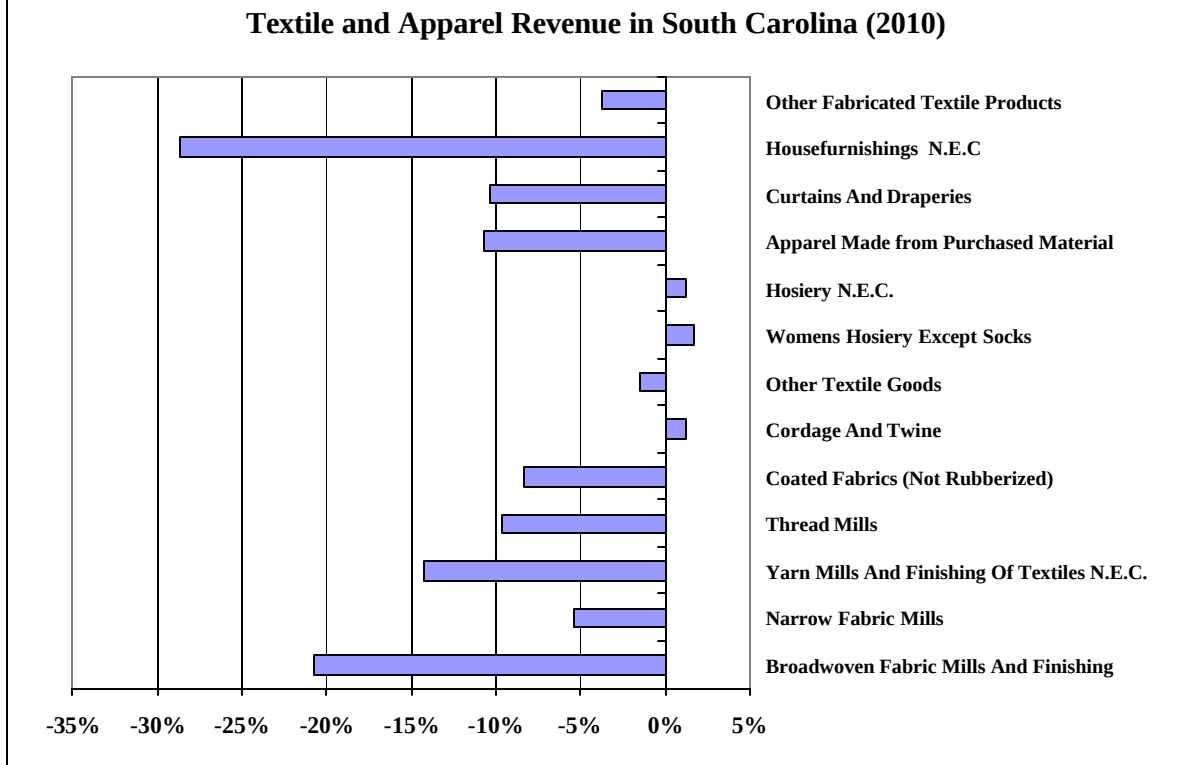


Figure 3



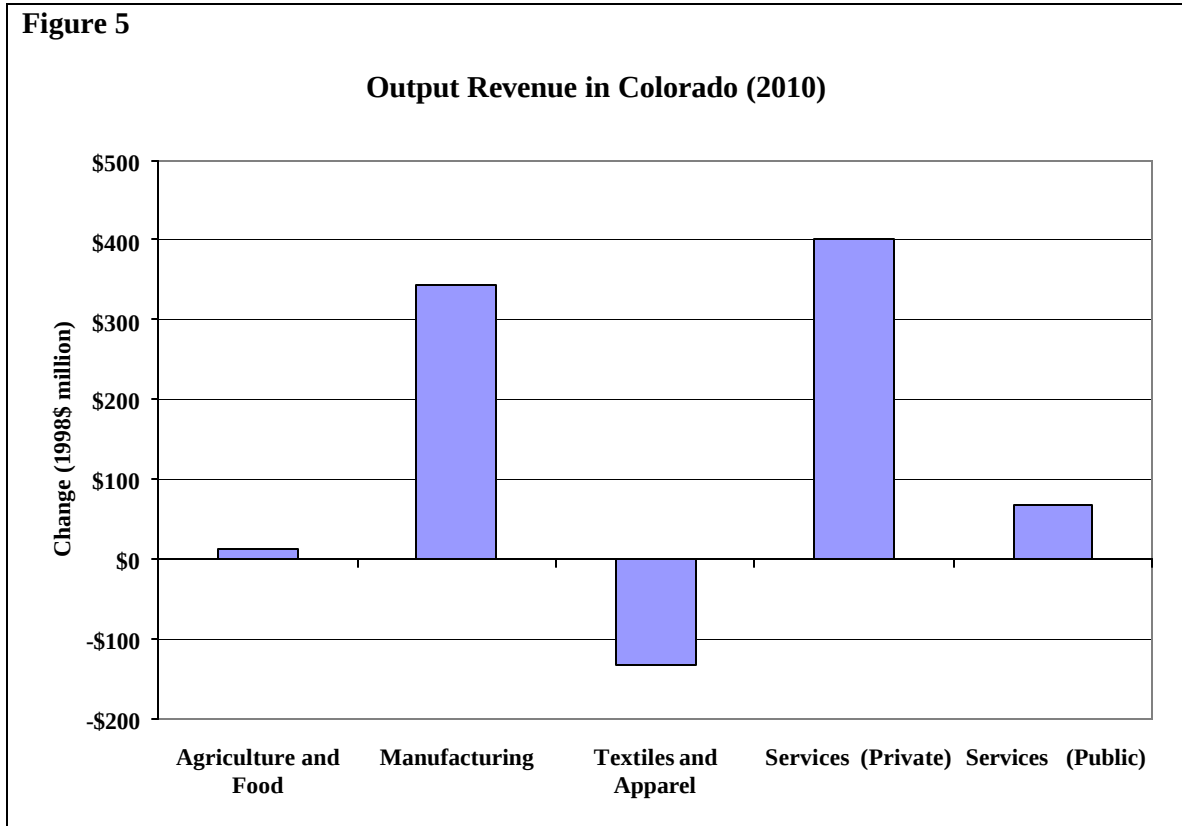
The model also indicates changes in the mix of industries in each state economy. Figure 4 indicates the percent change in revenue for each of the textile and apparel subaggregates five years after the shock (2010). the most heavily impacted sectors are household furnishings n.e.c., broadwoven fabric mills, and yarn mills and finishing of textiles n.e.c. These sectors show a simulated drop in revenue of well over 10%.

Figure 4



Unlike South Carolina, which has a large share of its economy devoted to textiles, many states benefit from the ATC liberalization. Figure 5 shows output revenues for all industries in Colorado, a state with little reliance on textile manufacturing. The 13 textile and apparel industries in the model are combined into a bar in the graph for simplicity, however, 90 percent of the decline in revenue shown in this bar is from a drop in apparel manufacturing from purchased materials, rather than from textiles. All non-textile industries experience an increase in revenues, most notably manufacturing and private services. Although changes in these sectors are small in percentage terms, they more than offset the decrease in apparel manufacturing in dollar terms.

Figure 5



Macroeconomic impacts on Colorado, shown in Figure 6, indicate that households are investing more to take advantage of their improved economic condition, especially in the initial years when their capital stock is below new desired levels. Overall labor earnings rise as production expands due to a slight decline in unemployment and an increase in wage rates. This translates into additional consumption by households that, along with minor changes in leisure time, cause the welfare increase of 0.15 percent shown in Table 2. Figure 7 shows that the changes in the unemployment rate for Colorado are positive, albeit very small. Initially the unemployment rate drops by 0.016 percentage points then settles at a new equilibrium that is about 0.004 percentage points lower than in the benchmark.

Figure 6

Macroeconomic Effects in Colorado

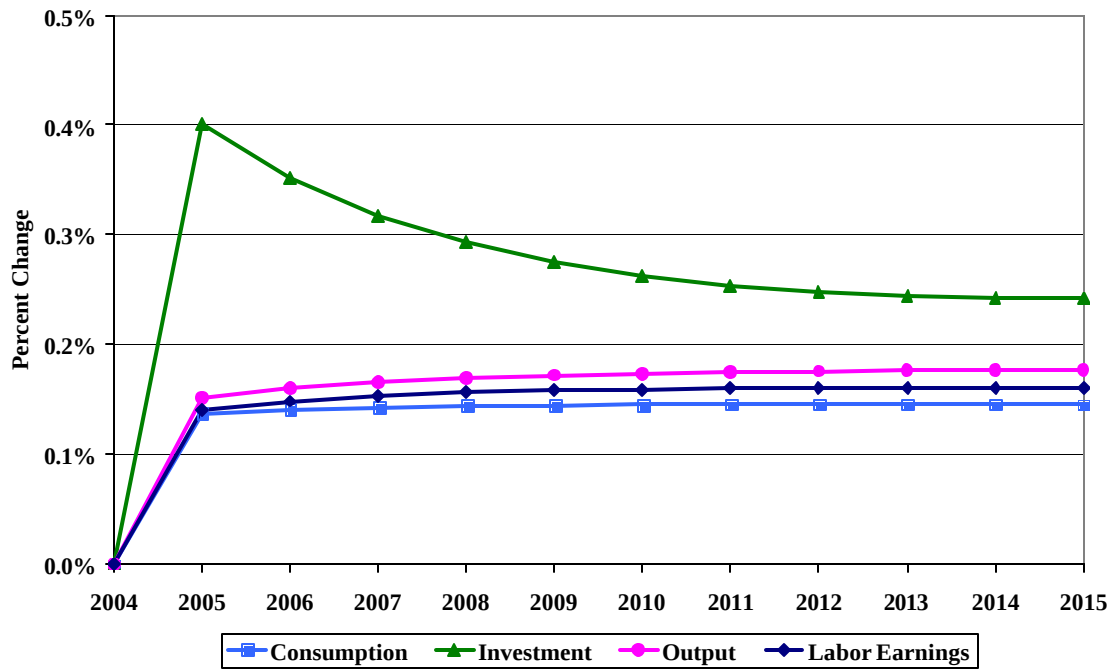
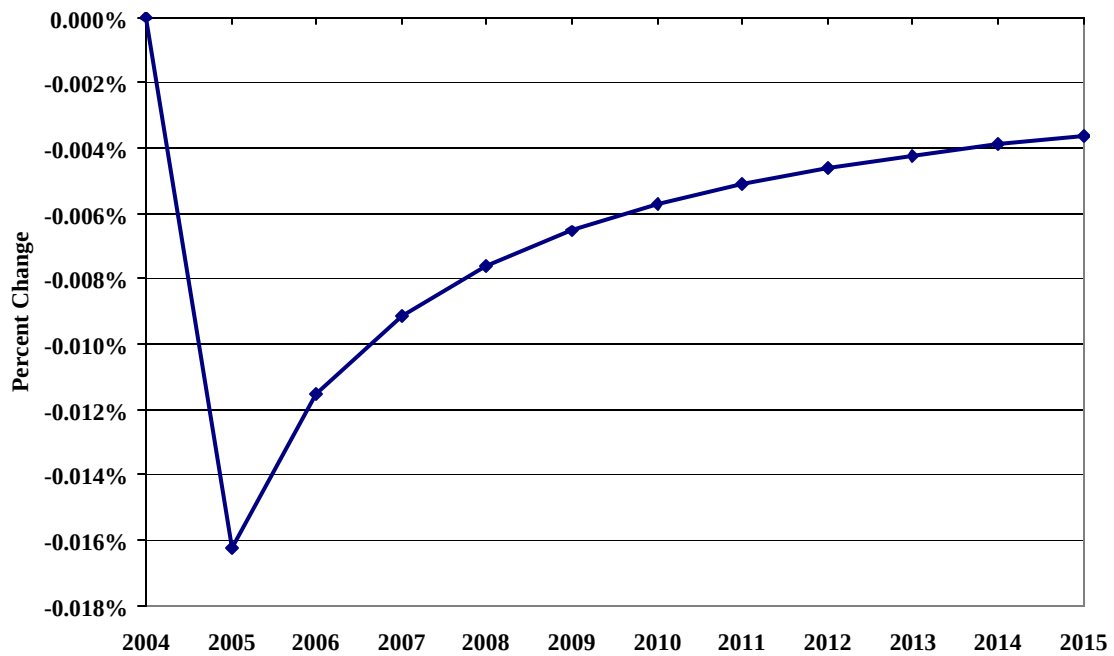


Figure 7

Changes in the Unemployment Rate in Colorado



5. Conclusion

This paper demonstrates a state-level dynamic modeling system useful for policy analysis. To illustrate the model, we examine the elimination of ATC restrictions on textile and apparel trade. Overall the simulated welfare impacts of ATC removal reported in table 2 are modest with a simple average impact across states of a 0.1% increase (the median change is 0.13%). The key advantage that our modeling system offers is a decomposition of the modest aggregate results into heterogeneous state results. We find that the costs of liberalization are concentrated in a few states that rely heavily on the domestic textile and apparel industry, while the benefits of liberalization are spread across many states.

The simulation model incorporates important adjustment dynamic features. The model includes the standard perfect-foresight activities of new capital formation through investment. A partial-putty-clay formulation of production is also included, however, which offers an explicit tracking of captured extant capital. In addition, an equilibrium unemployment formulation is included to capture changes in labor market matching.

There are many areas for future research that might utilize and improve the model presented. Data on interstate trade flows are limited, and the model would benefit from a more refined treatment of bilateral interstate trade. Currently we do not include migration opportunities for households. This is a significant shortcoming in the context of a sub-national model. Furthermore, our assumption of a single household and single labor type within each region masks important equity impacts. Clearly, some skill classes and some income groups are likely to be impacted in a way that is not reflected in the average. To generate more useful statements about the impacts of policy on equity across these additional dimensions there is a great deal of model development warranted. For the current analysis, however, we take a small step toward examining equity across geography within the U.S. economy.

References:

- Ballard, C.L. (1999) "How many hours are in a simulated day? The effects of time endowment on the results of tax-policy simulation models," mimeo: Department of Economics, Michigan State University.
- Balistreri, E.J. (2002) "Operationalizing equilibrium unemployment: a general equilibrium external economies approach," *Journal of Economic Dynamics and Control*, vol. 26/3, 347-374.
- Dean, Judith and Shubhashis Gangopadhyay (1991) "Market Equilibrium under the 'Threat' of a VER," *Journal of International Economics*, vol. 20, 1991, pp. 137-152.
- Francois, Joseph and Dean Spinanger (2002), "ATC Export-tax Equivalents" in Betina V. Dimaranan and Robert A. McDougall, *Global Trade, Assistance, and Production: The GTAP 5 Data Base*, Center for Global Trade Analysis, Purdue University.
- Harrison, G.W., and Rutherford, T.F. (1999) "Burden sharing, joint implementation, and carbon coalitions," in C. Carraro ed., *International Environmental Agreements on Climate Change*, Amsterdam: Kluwer, 77-108.

- Krishna, Kala (1989) "Trade Restrictions as Facilitating Practices," *Journal of International Economics*, vol. 26, 1989, pp. 251-270.
- Lau, M. I., Pahlke A., and Rutherford, T.F. (2002) "Approximating infinite-horizon models in a complementarity format: A primer in dynamic general equilibrium analysis," *Journal of Economic Dynamics and Control*, vol. 26/4, 517-706.
- Rutherford, T.F. (2004) "Tools for Building National Economic Models Using State-level IMPLAN Social Accounts," mimeo University of Colorado,
<http://debreu.colorado.edu/implan98.htm>
- USITC (2004a) *Textiles and Apparel: Assessment of the Competitiveness of Certain Foreign Suppliers to the U.S. Market* (inv. No. 332-448), USITC Publication 3671, Jan. 2004.
- USITC (2004b) *The Economic Effects of Significant U.S. Import Restraints: Fourth Update* , , June 2004