Replication of Allen & Arkolakis 2014[*]

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Abstract

In this note, we replicate the results of Table 2 and Figure 19 in Allen & Arkolakis 2014, correcting for several mistakes in how we cleaned the raw Commodity Flow Survey data. After correcting these issues, we estimate that removing the U.S. Interstate Highway System would result in a decline in welfare between 1.1 - 1.6%, instead of the previously estimated 1.1 - 1.4%. We provide full details of the replication process, as well as associated data and code.

1 Previous Issues

There were several issues in how we cleaned the raw Commodity Flow Survey bilateral trade flow data, and a separate issue in creating Table 2 in the paper, which we have now fixed. These issues are:

1. The raw CFS data includes both aggregated values by mode and subcategories in that mode as separate entries in the data. When calculating the value of bilateral flow of each mode, we aggregated across all entries within mode, which led to double counting of some values. For example, when getting the value of truck, we added up the subcategories of "Truck (3)", "For-hire truck", and "Private truck". Because "Truck (3)" already aggregated "For-hire truck" and "Private truck," this ended up double counting the value of trade flow since the subcategories are a breakdown of the main category.

2. The raw CFS data inconsistently capitalized the name of some CFS areas. Because the algorithm we used to identify CFS areas was based on the name of the location, these CFS areas were treated as being distinct locations. For example, in the raw CFS data, there's a CFS area called "Atlanta-Sandy Springs-Gainesville, GA-AL, CFS Area (GA Part)". In the destination CFS, the equivalent CFS area is coded as "Atlanta-Sandy Springs-Gainesville, GA-AL, CFS Area (GA part)". The letter p for "part" is capitalized in the origin CFS while not capitalized in the destination CFS, which led the matching algorithm we used to the two spellings as distinct CFS areas.

3. The raw CFS data includes duplicate entries for the DC and Rhode Island CFS areas, as "Data for the metropolitan area of Washington-Arlington-Alexandria, DC-VA-MD-WV (DC Part) is identical to data for District of Columbia, and data for Boston-Worcester-Manchester, MA-RI-NH (RI Part) is identical to data for Rhode Island. Each metropolitan area covers the same geography as its respective state." We originally did not remove these duplicate entries.

4. There seems to be a slight error in the MSA only calculation when creating Table 2 where the method of moments is matching the full CFS data moments (fractions of trade by mode) not the subset (MSA only data).

1.1 Implication of Correcting the Issues

We have fully replicated the results of the original paper after correcting the issues described above, which are reported below. As you can see in Table 1 in this document, the estimation of transportation cost is slightly different from the original values as is the implied Frechet elasticity of substitution across transportation modes. Figure 1 shows that this change results in the different estimate of welfare change after removing the interstate highway system (the differences insignificant for small externalities but are non negligible when significant agglomeration externalities are present). With the new results, we estimate that removing the IHS would result in a decline in welfare between 1.1 - 1.6% while we previously estimated 1.1 - 1.4% (Table 2). Lastly, if we assume that removing the IHS would decrease (static) welfare by $1.1 - 1.6\%$, the model implies the monetary value of the IHS is between \$150 and \$230 billion 2007 dollars whereas the previous estimate of the monetary value of the IHS was between \$150 and \$200 billion.

2 Replication Flow

To assist in others replicating our results in the future, we now also include a comprehensive replication directory with all necessary data and programs. Please run the scripts in the order shown below when replicating. Please also change the file paths in all the scripts.

2.1 Step 1 (Construction of the trade flow data)

Create the bilateral trade flow data using the CFS bilateral trade flow data. We fixed the double counting issue by only using four major categories (Truck (3), Rail, Water, and Air) instead of adding up the subcategories to the corresponding main category (line 49 in the do file "bilateral_trade_flow.do").

In this step, we also fixed the inconsistent capitalization issue by lowering letter p of the word "part" for some CFA areas in the list of the origin CFS and the destination CFS (line 41 and 42 in the do file "bilateral_trade_flow.do"). We also fixed Issue 3 by removing Rhode Island and DC from the origin CFS list and the destination CFS list (line 52-63 and line 70-81 in the do file "bilateral_trade_flow.do").

Code:

1. replication 2014 paper allen arkolakis/Data Construction/CFS Trade/bilateral_trade_flow.do

2.2 Step 2 (Construction of the demographic data)

Create the demographic data for all of the CFS areas. We first create the crosswalk between counties and CFSs and then extract the demographic data for each CFS area using the crosswalk.

Code:

1. replication 2014 paper allen arkolakis/Data Construction/Demographic data/tomatlab_112513.do

2. replication 2014 paper allen arkolakis/Data Construction/cfs_county_crosswalk.do

3. replication 2014 paper allen arkolakis/Data Construction/demographic_data_construction.m

4. replication 2014 paper allen arkolakis/Data Construction/demographic_data_construction.do

2.3 Step 3 (Recreation of Table 2)

Create Table 2 in the paper using the new datasets created in Step 1 and Step 2. In this step, we fixed Issue 4 (line 256-257 in "cfs_est.m").

Code:

1. replication 2014 paper allen arkolakis/Analysis/AA-Replication/cfs_est.m

2.4 Step 4 (Recreation of Figure 19)

Create Figure 19 in the paper using the new result/new coefficients that we got in Step 3.

Code:

1. replication 2014 paper allen arkolakis/Analysis/Counterfactual/estimatedAandu.m

2. replication 2014 paper allen arkolakis/Analysis/Counterfactual/counterfactual_nohighway.m

3 Replication Results

Below are the results after fixing the issues describing above.

3.1 Table 2

	Original Results								Revised Results							
	All CFS Areas				Only MSAs				All CFS Areas				Only MSAs			
Geographic trade costs	Road	Rail	Water	Air	Road	Rail	Water	Air	Road	Rail	Water	Air	Road	Rail	Water	Air
Variable cost	0.5636***	0.1434***	0.0779***	0.0026	0.4542***	0.1156	0.0628***	0.0021	0.5904***	0.1400***	0.0689***	0.0029	0.4932***	0.0149	0.0789***	0.0091
	(0.0120)	(0.0063)	(0.0199)	(0.0085)	(0.0235)	(0.0210)	(0.0265)	(0.0176)	(0.0130)	(0.0060)	(0.0177)	(0.0081)	(0.0237)	(0.0076)	(0.0214)	(0.0088)
Fixed cost	0	0.4219***	0.5407***	0.5734***	0	0.3400***	0.4358***	0.4621***	0	0.4133***	0.5612***	0.5682***	0	0.4200***	0.4095***	0.4331***
	N/A	(0.0097)	(0.0236)	(0.0129)	N/A	(0.0235)	(0.0375)	(0.0264)	N/A	(0.0094)	(0.0243)	(0.0130)	N/A	(0.0204)	(0.0242)	(0.0210)
Estimated shape parameter (θ)		14.225***				17.6509***				14.5201***				19.0516***		
		(0.3375)				(1.4194)				(0.3399)				(0.9698)		
Non-geographic trade costs																
Similar ethnicity		-0.0888***				-0.0803***				-0.0504				-0.0127		
		(0.0153)				(0.0275)				(0.0265)				(0.0908)		
Similar language		0.063***				0.0286				0.0120				-0.0567		
		(0.0223)				(0.0359)				(0.0392)				(0.0777)		
Similar migrants		0.0191				-0.0135				0.0163				-0.0035		
		(0.0119)				(0.0203)				(0.0156)				(0.0448)		
Same state		-0.2984***				-0.3104***				-0.2088***				-0.1830***		
		(0.0101)				(0.0176)				(0.0111)				(0.0189)		
R-squared (within)		0.4487				0.4113				0.4199				0.3466		
R-squared (overall)		0.6456				0.5995				0.6593				0.6128		
Obs. with positive bilateral flows		9601				3266				9099				3091		
Obs. with the mode specific bilateral flows	9311	1499	78	1016	3144	340	26	471	8763	1437	58	994	2952	310	13	458

Table 1: Estimated mode-specific relative cost of travel

3.2 Figure 19
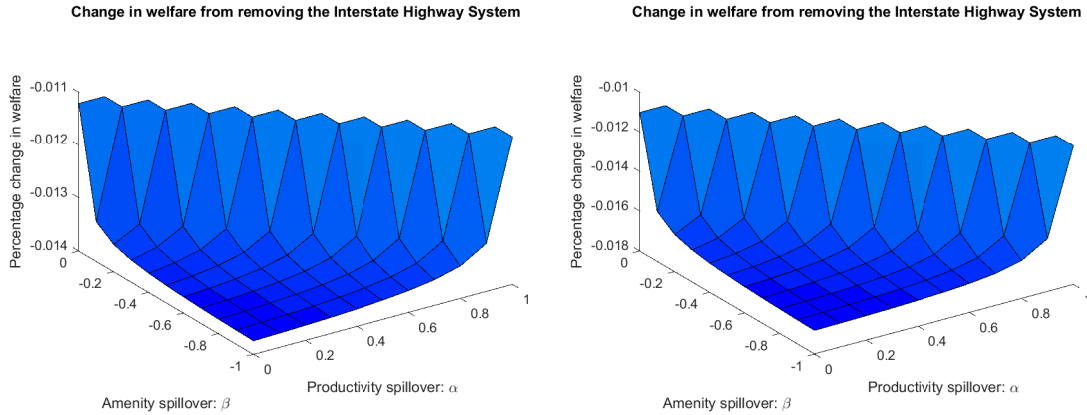
Note: The original Figure 19 on the left. The revised Figure 19 on the right.

Figure 1: Estimated decline in welfare from removing the Interstate Highway System

3.3   Welfare Comparison

	Original	Revised
$\alpha = 0,\ \beta = 0$	-0.0112	-0.0110
$\alpha = 0.1,\ \beta = -0.3$	-0.0135	-0.0161

Table 2: Welfare Change