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Unpublished Appendix for Sequencing in Customs Union Formation: Theory and Application to Eurasian Customs Union

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ABSTRACT

This appendix contains non-published materials which support the arguments of our main paper.

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Appendix 3: The Effect of Customs Union Formation on Latecomers

In this section we estimate the differential impact of customs union on exports for CIS countries whose entry to the customs union has been delayed compared to those who are expected to remain outside of the core customs union. A negative effect of the customs union indicates an externality[4] and weakly supports the AAH model in the sense that it is consistent with an interpretation that externalities play a role in sequencing. The finding that the actual composition of the core customs union also maximizes overall external effects would strongly support the AAH model: It would be compatible with a strategic choice in core customs union formation. Yet such a statement would require observing or simulating external effects for different compositions of core customs unions among the candidates.

As a proxy for a country's welfare we construct an index of its annual exports into the CIS region for the period 2001 – 2014 using data from the cisstat.org website. In order to deal with problems from serial correlation (see Marianne Bertrand, Esther Duflo, Sendhil Mullainathan, 2004) we collapse our time series into two parts by calculating average exports into the CIS region before and after the introduction of the Customs Union in 2010, so we are dealing with a panel of length two. The equation which we estimate is:

$$\overline{EXP}_{it} = \beta_0 + \beta_1 CU + \sum\nolimits_{s=2,..,6} \beta_s CD_i + \beta_7 CU \times I_i$$

where $\overline{EXP}_{it}$ is the average value of the export index for country *i* in the pre- and the post customs union period (t=1,2), CU is a dummy variable for customs union which takes the value 1 for the subsample starting in 2010, CD_i is the country fixed effect and I_i is a dummy which is 1 if the country is a latecomer in the customs union (i.e. Tajikistan (TAD), Kyrgyzstan (KY) or Armenia(ARM)) and 0 if the country as of now is not expected to join the customs union (i.e.

[4] Measuring the proper effect would require a comparison between actual performance and performance without the core customs union which is a counterfactual.

Ukraine, Azerbaijan, Moldova). The parameter β_7 is a difference-in-difference estimator for expected customs union membership. We do not estimate the effect on customs union members because their situation as insiders is fundamentally different from the situation of an outsider.

Table 1 reports our results:

Table 1: Results of our Empirical Test

Dependent Variable: $\overline{EXP}_{it}$
Method: Least Squares
Date: 05/03/15 Time: 17:39
Sample: 1 12
Included observations: 12
$\overline{EXP}_{it}$ =β_0+ β_1*CU+ β_2*TAD+ β_3*KY+ β_4*ARM+ β_5*MOL+ β_6*AZ + β_7*(KY+TAD+ARM)*CU

	Coefficient	Std. Error	t-Statistic	Prob.
β_0	238.1018	96.99498	2.454785	0.0701
β_1	289.1980	96.99498	2.981577	0.0407
β_2	-166.0115	137.1716	-1.210246	0.2928
β_3	0.672807	137.1716	0.004905	0.9963
β_4	49.87698	137.1716	0.363610	0.7346
β_5	-179.2669	118.7941	-1.509056	0.2058
β_6	383.8645	118.7941	3.231343	0.0319
β_7	-235.6465	137.1716	-1.717896	0.1609

R-squared	0.921567	Mean dependent var	338.6452
Adjusted R-squared	0.784308	S.D. dependent var	255.7868
S.E. of regression	118.7941	Akaike info criterion	12.62738
Sum squared resid	56448.15	Schwarz criterion	12.95065
Log likelihood	-67.76429	Hannan-Quinn criter.	12.50770
F-statistic	6.714100	Durbin-Watson stat	2.690579
Prob(F-statistic)	0.042389		

The coefficient β_1 of the CU variable is positive and significant at the 5% level. The coefficient of the difference-in-difference term for the latecomers, β_7, is negative although not significant.[5] We can show that for the latecomers the value of the export index before CU formation is

[5] We also ran the difference-in-difference estimation for each country separately. The coefficients for Tajikistan, Kyrgyzstan, Armenia and Moldova are negative, the coefficients for Ukraine and Azerbaidshan positive, and for the latter significant at the 10% level.

not statistically different from the index after CU formation, so they lost out on the positive experience of the region after the customs union was formed in 2010.

Appendix 4, Illustration of Our Argument in Footnote 7

Sen and Biswas‘ (2015) analysis of the case with negative externalities appears to rest on the assumption that after receiving an offer both responders believe with probabilility one that the other responder will accept the offer although it remains unclear how these beliefs can be supported in equilibrium. This appendix illustrates our point.

Players *1*, *2* and *3* negotiate over setting up a free-trade agreement with *1* as the agenda-setter (*c* in the notation of Sen and Biswas). Assume that *2* and *3* receive an offer to form the grand coalition. In Sen and Biswas's scenario, the grand coalition forms if both accept but if only one of them accepts, the accepting agent forms a coalition with the agenda-setter and the other agent stays a singleton. Only if both reject do they continue with the status quo. Sen and Biswas argue that in equilibrium a player accepts the offer to join the free-trade agreement if she is promised at least the pay-off she receives as a singleton when the other players sign a free-trade agreement.

To analyse this claim, denominate the pay-off for the outsider $w_i^F = w_i(\Gamma = \{i,\{j,k\}\})$, a player's pay-off with the status quo $w_i(I^0)$ and $w_N(\Gamma^N) = \sum_i w_i(\Gamma^N)$ the total pay-off for the grand coalition. *P(i)* is the pay-off offered to responder *i* and the agenda-setter's pay-off if the grand coalition is accepted is $P_{acceept}(1) = w_N(I^N) - P(2) - P(3)$. In particular we assume negative externalities, that is $w_i^F < w_i(\Gamma^0)$, *i = 2,3*.

Assume *3* accepts. If *2* also accepts, the outcome is $\{I^N\}$ with pay-offs for the responders (*P(2), P(3)*) while if 2 rejects the outcome is $\Gamma = \{2,\{1,3\}\}$ with pay-offs $(w_2^F, P(3))$. Assume *3*

rejects. If *2* accepts, the outcome is $\Gamma = \{2, \{1,3\}\}$ with pay-offs for the responders $(w_2^F, P(3))$ while if *2* rejects the outcome is $\{\Gamma^0\}$ with pay-offs $(w_2(\Gamma^0), w_3(\Gamma^0))$.

Sen and Biswas claim that in equilibrium, pay-offs offered by *1* are P(2) = w_2^F and P(3) = w_3^F. So assume this is the offer received. Each responder has to assess this offer and to decide on whether to accept or reject. This gives rise to the following acceptance game:

	3 accepts	*3* rejects
2 accepts	*P(2), P(3)*	*P(2),* w_3^F
2 rejects	w_2^F *, P(3)*	$w_2(\Gamma^0), w_3(\Gamma^0)$

The acceptance game has two Nash-equilibria: (*2* accepts, *3* accepts) and (*2* rejects, *3* rejects). Which one will be played?

Assume *2* believes that *3* accepts with Prob(3) and 2 believes that a accepts with Prob(2). So *2* will accept if

$$P(2) \geq Prob(3)\ w_2^F + (1 - Prob(3))\ w_2(\Gamma^0)$$

and *b* will accept if

$$P(3) \geq Prob(2)\ w_3^F + (1 - Prob(2))\ w_3(\Gamma^0)$$

Because *P(i)* = w_i^F and $w_i^F < w_i(\Gamma^0)$ for i = *2*, *3*, *2* and *3* will only be willing to accept if they assign a probability of 1 to the event that the other agent accepts. Thus, (reject, reject) Pareto-dominates and also risk-dominates (accept, accept).

Now consider 1's problem. If 1's offer is rejected by both agents, she ends up with $w_1(\Gamma^0) < P_{accept}(1)$. Assume that 1 thinks that *2*'s and *3*'s subjective beliefs are equally distributed

on [0,1]. In this case, her subjective probability of having her offer of *P(2), P(3)* rejected is one, so clearly the offer is not compatible with equilibrium.

References

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