

Comments on
“Borders, Trade and Welfare”

by

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Anderson and van Wincoop (AvW) have made an important contribution by analyzing border barriers in the context of Anderson's (1979) gravity model. AvW (2001) shows how border effects should be estimated in the context of the gravity model. In the present study, the authors take parameters estimated from the empirical work and use them in the gravity model to measure the welfare effects of borders.

This is truly excellent work: a perfect example of economics as a science. AvW (2001) clarifies exactly what is meant by a "border effect" in the context of a theoretical model. The theoretical model is used as a guide to quantifying the border effect. Because AvW have estimated a structural model, they can tell us the effects on welfare and on trade volumes of changes in trade policy or other border barriers, as they do in this study.

The paper is also ingenious because of a number of specific points it makes about border barriers. At some level these points must be obvious to a trade economist, but these are the types of observations that only become obvious once they are pointed out. AvW note that (a) much of the border effect must arise from barriers that do not create rents, so that their welfare impact is much greater than rent-producing barriers such as tariffs; (b) the impact of a border barrier on trade between two countries does not depend so much on the size of the barrier, but the size of the barrier relative to "multilateral" barriers; and, (c), the welfare costs of these barriers are not directly related to the amount of trade that is diverted.

I do believe that the work of AvW is a starting point, and there are many avenues that lead from their recent papers. In this paper, AvW point to the relative simplicity and clarity of their gravity model as compared to computable general equilibrium models, which they say "are simulated rather than estimated, and ... are almost always based on a very large black box consisting of dozens to hundreds of equations." But I shall argue that in some ways the model of

AvW is surely too simple, and the quantitative answers provided by AvW are too rough at this stage to be useful as a guide to policy makers.

I shall also make some comments specific to AvW's calculations of the benefits of a currency union. My concerns there are with the interpretation of the empirical work of Rose and van Wincoop (2001).

Policy Implications

As I have indicated, the paper is a major step in the literature because of its conceptualization. AvW show how we can estimate a border effect, and how to translate those estimates into structural parameters of the theoretical gravity model – and they do a beautiful job of it.

As AvW discuss, border effects may arise from policies that erect trade barriers. Policies such as tariffs or quotas are easily observable and quantifiable, and generally create rents. But AvW make a good case that many border barriers do not create rents in any obvious ways. Barriers due to language, customs or product standards, for example, may contribute to border effects but do not generate rents. The deadweight loss from these barriers is much greater, they show, than from rent-creating barriers.

On the one hand, policy aimed at removing these barriers is likely to generate much higher welfare gains than reduction of rent-producing barriers. But on the other hand, these barriers are not so easily eliminated by policy choices. AvW focus on one perfect example of a non-rent barrier that policy can influence – the choice of currency. One of the greatest perceived economic advantages for Europe of the adoption of the euro is the increased ease of international transactions within Europe. Money's role is to coordinate buyers with sellers, and that role is more beneficial the larger the club that uses the money. Another area where policy might reduce

non-rent barriers is the coordination of safety regulations. If AvW have accurately measured the size of the non-rent barriers, it seems that trade policy-makers should surely pay greater attention to ways in which these barriers can be reduced.

I will turn to some criticisms of the specific model that AvW use to quantify the effects of border barriers. But one of the major contributions of this paper is the set of general insights into how border barriers affect trade qualitatively. The five properties of the model that AvW highlight help sharpen our intuition of how border barriers affect trade, and what the possible impact of policy changes might be.

Questions about the Model

The model can be described easily. It is a model of trade among regions. Some countries have more than one region, while others are comprised of only one region. (As will become apparent shortly, a major reservation I have about the AvW model is the seeming arbitrariness with which nations are carved into regions.) Each region is endowed with a single unit of a good that is distinct from goods created in other regions. All agents in the world have identical CES preferences. There are iceberg transportation costs between regions, and iceberg border barriers. (That is, trade across distance and borders have a cost that is manifested in the destruction of some of the traded good.)

The reservations about the usefulness of taking this model to the data that I shall discuss below revolve around the following features that are not included in the model: (1) Goods are not produced using factors of production. (2) There are no import-competing industries or nontraded industries in each region. (3) The CES assumption may not be appropriate. (4) The model provides no guidance as to how many regions a country should be divided into. The measured

welfare and trade volume effects of border barriers depend on the number of regions in a country. As I shall explain shortly, this point is not separate from point (3).

TradeHome-Bias Puzzle

The chief aim of AvW (2001), and a secondary goal of this study, is to resolve the puzzle raised by the work of McCallum (1995) and others. McCallum found that trade between a pair of Canadian provinces was much greater than trade between a Canadian province and a U.S. state, even accounting for distance and size. The difference was so large – a factor of 20 – that it throws into doubt the view that international markets have become relatively well integrated.

AvW claim that relatively modest trade barriers can lead to a large home bias in trade for a small country. Suppose we model Canada as being comprised of 10 equal-size regions (call them “provinces”), and the U.S. as 50 equal-sized regions (call them “states”.) These are the only two countries in this simplified world. In the AvW model, essentially all output of a region is exported. That is, under free trade, households in each region would consume $1/60$ of their output and export $59/60$. Under completely free trade each region in the U.S. or Canada exports exactly $1/60$ of its output to each of the other 59 regions.

What is the effect of a border barrier that cuts trade in half between the U.S. and Canada but not between regions in each country? Suppose each region produces 60 units. Under free trade, each Canadian province exports 50 units to the U.S., and 9 units to other Canadian provinces. (Each region exports one unit to each other region in the U.S. and Canada.) If Canadian exports to the U.S. were cut to 25, which would leave 35 units to be consumed within the 10 provinces of Canada. That is, each Canadian province would export 3.5 units to each other Canadian region and only .5 units to each U.S. state. Even though the barrier only cut off half of trade, it appears that the home bias is greater because trade between Canadian provinces

is seven times greater than between a Canadian province and a U.S. state. The bias looks much smaller if we look at U.S. states. The 60 units produced by each U.S. state are consumed by 50 U.S. states, so the state-to-state export is 1.2 units.

But this model is constructed in such a way as to maximize the trade diversion effects of a border barrier and minimize the trade destruction effects. Total exports of each Canadian province drop only from 59 units to 56.5 when the border barrier is introduced, and exports for each U.S. state drop only from 59 units to 58.8. When a region cannot export its good across national borders, it almost exclusively redirects that output toward exports to regions within the country in the AvW model. We can think of the trade barrier between the U.S. and Canada as creating two customs unions when before there was free trade. But in the AvW model, there is very little trade destruction and a lot of trade diversion.

This means the AvW solution to the home bias puzzle is not entirely convincing. Their model implies that a relatively small trade barrier between the U.S. and Canada can generate the huge disparities observed empirically. But their model gets there because the small trade barrier does not destroy any trade (or, hardly any), but instead redirects it internally.

Each region might have an import competing industry. Then a trade barrier between the U.S. and Canada would lead to an increase in output of the import-competing industries in each region. That is, if there were some ability for resources to move between industries within a province, then the border barrier would not simply redirect trade internally. Instead, production of the export industry would decline as resources moved to the import-competing industries. In such a model, it might take a much larger border barrier (than in the AvW calculation) to generate the amount of home bias in trade that we observe. Of course, not each province in Canada will have an industry that competes with the imports from the U.S. So, a border barrier

might induce some trade within Canada as one province imports goods from another province that are close substitutes for goods it previously imported from the U.S.

A realistic estimate of the size of trade barrier needed to generate the home bias we observe in trade might require a fairly sophisticated model – perhaps one that is not unlike the CGE models that AvW criticize. Such a model would include import-competing industries. The CES assumption would have to be jettisoned because the import-competing goods are, by definition, closer substitutes for imported goods than are the goods produced for export. The endowment model would have to be sacrificed for a model in which goods are produced by factors in order to capture the resource-shifting effects of border barriers. If factors were supplied with some elasticity, then some of the effect of trade barriers would be to reduce production as workers shifted toward leisure. And perhaps factors would shift toward nontradeable output as well. At the very least, it would be helpful to have a model in which the export/output ratio is not so unreasonably high as it is in the AvW model under free trade.

Welfare Calculations

How many regions should a country be broken into? There are two ways that one country could be ten times as large as another – it could have ten times as many regions, or each region could be ten times as large. In the AvW analysis, such a distinction makes a big difference to the measured welfare effects of border barriers. The reason is that they do not estimate the elasticity of substitution between products from different regions, but instead borrow estimates from empirical trade models that have quite different structures than the AvW model. Let me explain by way of a simple numerical example.

Suppose we have two countries in the AvW framework. The large country is ten times the size of the small country. Suppose the small country produces 11 units of output. (There is only one region in the small country, so it produces a single type of good.)

I will illustrate the problem by examining the welfare effects of a border barrier that completely eliminates trade between the small country and the large country. Under autarky, each household in the small country consumes only the 11 units of the good it produces. AvW take a measure of the elasticity of substitution of 5, which they imply is a reasonable value (since they say that 10 is “high”.) Under symmetric CES preferences, their utility is given by:

$$U_{FreeTrade} = (11^8)^{1/.8} = 11.$$

Under the symmetric preferences, the small country exports 10 units, and imports 10 units from the large country. Suppose the large country is comprised of 10 regions, each of which is equal in size to the small country. Under free trade, households in the small country can consume one unit of each of eleven goods. Utility is given by:

$$U = (1^8 + 1^8 + 1^8 + 1^8 + 1^8 + 1^8 + 1^8 + 1^8 + 1^8 + 1^8 + 1^8)^{1/.8} = 11^{1/.8} = 20.03.$$

An alternative model is one in which the large country also has only one region, and produces 110 units of a single good. Under free trade it exports 10 units to the small country. Utility in the small country in this case is given by:

$$U = (1^8 + 10^8)^{1/.8} = 12.02$$

The gains from free trade (versus autarky) in the first model are 82.1%, but in the second model only 9.3%. Clearly it matters how many regions the big country has, but the AvW model tells us nothing about how to divide a country into regions.

Why should the welfare calculation depend so much on how many regions a country is divided into? What matters is the elasticity of substitution for goods produced in the regions.

We can think of both of the models above as ones in which the large country has 10 regions. In the first model, the elasticity of substitution between goods produced in each region in the large country is five. In the second model, the elasticity of substitution is infinity.

Which is the correct elasticity? I don't know. But how do AvW know? When they use 5 as the elasticity, they are drawing that number from estimates of some aggregate elasticity of substitution for internationally traded goods. Those models typically do not subdivide each country into regions. Most importantly, they certainly do not provide us with estimates of the elasticity of substitution for goods produced in different regions of a country.

Such a number seems critical. The difference between a welfare gain of 82.1% and 9.3% is pretty substantial. I am afraid that what we need to help us with this problem is a more detailed – and therefore less transparent – model. Such a model would allow the elasticity of substitution for goods produced within a country to be different than the elasticity of substitution between goods produced internationally. We need to recognize that as we divide a country into more and more regions, we should allow the elasticity of substitution for goods produced within those regions to increase. If we insisted on treating that elasticity as unchanging no matter how finely we divide a country into regions (as AvW do), then we can drive the welfare gains from free trade almost arbitrarily high by defining each and every household as a separate region.

Currency Unions

I am a skeptic about applying the estimates of Rose and van Wincoop (2001) to calculate the gains from the euro-zone or from a potential North American currency union.

The first concern is that their data set contains almost exclusively very small countries that have joined currency unions. It is reasonable to interpret their evidence as showing that very small countries in Africa or the Caribbean can benefit substantially from currency unions. But their data just is not capable of telling us how much large countries can gain. The trade

regressions in Rose (2000) use 33,903 bilateral observations on trade volume. (These are from a panel with trade data for five different years.) Of these, 330 observations are for pairs of countries that are in a currency union. Of those, only three country pairs: U.S./Panama, U.S./Puerto Rico, and U.K./Ireland (for part of the sample), for a total of 12 observations, are pairs in which both countries have over 1 million population and GDP per capita greater than \$1000. The data simply is not informative about how a currency union could affect trade among large, rich countries.

Even for small countries, we cannot be sure of the direction of causality. If I were to come up with a model for predicting what factors would lead two countries to form a currency union, the amount of bilateral trade would be at the very top of my list of explanatory variables. It is not true, as AvW claim, that Rose (2000) uses instrumental variables techniques that deal with this reverse causality problem. In fact, Rose finds that the estimated equations behave badly and provide unbelievable parameter estimates when instruments are used for currency unions. Rose argues that it is indeed very difficult to find appropriate instruments for currency union formation, given that so few unions have been formed. And that is the nub of the problem.

I should admit at this point that I have also written a paper with Rose using the same data (Rose and Engel (2001).) Our aim was to see if actual currency unions were optimal in terms defined by Mundell – high levels of trade, stable real exchange rates, etc. But we remained neutral on the direction of causality. If currency unions have high levels of trade, for example, it might be because the trade volumes led the countries to join a currency union or the currency union stimulated trade.

Concluding Thoughts

This paper is interesting, innovative, and a significant step in our understanding of border effects. It is also thought-provoking, and it has provoked this final thought: My reading of the empirical literature is that the evidence from the studies on consumer prices (for example, Engel and Rogers (1996)) is that the border effects appear even larger when examining deviations from the law of one price than they do from trade flows. One explanation is that consumer prices include the cost of marketing and distribution, and that for some reason those costs are greater for producers trying to sell their goods in foreign markets. In this case, the cost of border barriers might be much larger than the trade regressions suggest. This is but one of the many avenues of research that the AvW papers are likely to open.

References

(All of my references except the following appear in the list of references in Anderson and van Wincoop's paper.)

Rose, Andrew K., and Charles Engel, 2001, Currency unions and international integration, mimeo, Haas School of Business, UC-Berkeley.