Online Appendix to Innovation and the Trade Elasticity

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This Appendix explores the role of exit and free entry and how they affect the results.

Firm Exit

In Melitz models, a drop in tariffs encourages the exit of low productivity firms. This is because there is a fixed cost of production, and firms incur it only when their profits can cover it. Notice that my model includes a selection effect: following a reduction in trade barriers, non exporters become smaller relative to exporters. However, the effects of selection are sharper with firm exit. Especially since Lileeva (2008) finds that some non exporters exited in Canada.

A problem that arises is how to compute exit in a static model. I proceed as follows. There is a pool of monopolists with the knowledge to produce differentiated tradable goods. Production requires a fixed cost κ_F in units of labor. A firm incurs the production cost only when its marginal profits exceed this cost. A change in tariffs change variable profits, and therefore the number of firms incurring this cost. Exit occurs when tariffs reduce the number of operating firms.

The calibration of the parameters common to the benchmark model is as in section 4. The new parameter is the fixed production cost. It turns out that any positive value of this parameter delivers the same trade elasticity or productivity gain. This is because in equilibrium, exit follows a cut-off rule, as in Melitz (2003). Firm types above a certain type choose to produce, while the rest do not. The introduction of the fixed cost of operation shifts the distribution of firm types, with no effects on the trade elasticity or productivity gains. Therefore, the value of the fixed cost of operation is not important, although the existence of it is.[1]

[1]There is one additional element to consider. For the fixed cost to be operative, a firm with the lowest

The fixed production cost has very small quantitative effects. The elasticity of substitution increases by 8.6%, from 9.34 to 10.15. I also study the predictions of a model with no innovation with exit. The resulting elasticity is below the empirical estimates. Without innovation, exit increases the elasticity by 7.9%, from 6.18 to 6.67. Note that the amplification effect of innovation with an exit decision is also close to 50 percent. Thus, introducing firm exit does not change quantitatively the results even with no innovation. The change without innovation is larger because the model with innovation and no exit already includes a selection effect from a drop in trade barriers, while the model with no innovation does not.[2]

Free Entry

Atkeson and Burstein (2010) ("AB") find that, while trade liberalization may have important reallocation of innovation from non exporters to exporters, the aggregate effects are quantitatively small, if any. An important element in their conclusions is the role of free entry. This section studies the role of free entry.

The changes in the model are as follows. There is an unbounded pool of firms in country i, that draw a parameter γ from the distribution $f(\gamma)$ by incurring a fixed entry cost in terms of labor. A firm enters as long as the expected payoff from entry is larger than the fixed cost. Thus, in equilibrium, average variable profits equal the entry cost. After incurring this cost, all the uncertainty disappears, and the model works as before.

Entry costs differ by country, since trade volumes in each country cannot be matched

possible draw ($\gamma = 1$), must choose not to produce. One way to do this is by setting the fixed cost of operation high enough. The problem with doing this is that operating firms might require more units of labor than available, and the equilibrium might not exist. To get around this problem, one can scale up or down the profits of firms by changing the innovation cost function to $c(z) = \delta z^{\alpha}$. It turns out that a change in δ has no effect on the productivity gains from trade or the response of trade volumes. Thus, set δ so that the profits are low enough such that firms with $\gamma = 1$ choose not to produce given the fixed cost of operation, and the solution is feasible.

[2]A difference between the extensions in the Appendix and the main model is that the set of goods produced in each country changes, so one must take a stand on what the bundle of goods used to compute the price deflator is. This bundle is the goods that are produced in both periods.

under a common fixed entry cost. Entry costs are such that the equilibrium with high tariffs is the same as the equilibrium with high tariffs and no entry costs (that is, entry costs equal average profits under high tariffs in the benchmark model).

The results hardly change. First, the productivity increase target can easily be matched, which implies that the effect of tariffs on aggregate productivity depend on α. Second, the trade elasticity is very similar to the model with no free entry, changing from 9.34 to 9.39.

Next, I show that my results are in line with AB's when we run similar exercises. The first step is to measure productivity in the same way as they do. My measure of real productivity is as in the data, that is, real productivity deflates nominal productivity by a price deflator that mimics a price deflator in the data, while AB use an "ideal" price deflator (the Dixit-Stiglitz price index). The second step is to have two symmetric countries, as in section 6.

A percentage point drop in tariffs increases aggregate productivity by 0.4 percentage points. This is close to their increase of 0.2, which they obtain when assuming an endogenous extensive margin of trade and a positive interest rate. Thus, my results are consistent with AB. More importantly, even when the effect of innovation on aggregate productivity may be low, the effect on the elasticity of trade volumes is large.