“Fencing off silicon valley: Cross-border venture capital and technology spillovers”

Samuel Kortum *

Yale University, USA

ARTICLE INFO

Keywords: N/A

ABSTRACT

None.

This paper concerns technology escaping from the United States and how much we should be concerned about it. This topic appears frequently in news articles, with the presumption that we should be very concerned. Since technology is non-rival, maybe we shouldn’t be too concerned. Even after it’s escaped, we still have it. But, given security concerns, maybe we should be concerned about some of these technologies escaping. I applaud the authors for bringing rigorous analysis to this contentious issue.

The authors consider a particular mechanism behind the flow abroad of US technology. It’s the reverse of what we’re used to thinking about. Instead of US multinationals exploiting their technology in a foreign country, here we have foreign corporations investing in US venture capital (VC) in order to get a hand on new technology. The paper illustrates this phenomenon with examples that range from discouraging to disturbing. Why aren’t investors in the United States nurturing these promising new technologies? As the paper points out, there are two sides to the issue: (i) with the help of foreign investment, at least these new technologies aren’t being squandered; yet (ii) maybe we’d rather not have these technologies in foreign hands. Fig. 1 shows that China’s share of all foreign funding of US VC has risen from near zero to 15% in the last decade. Nonetheless, the overall share of foreign funding of US VC, traditionally dominated by European and Japanese investors with China now taking their place, is still only 4%.

These examples and basic facts motivate a serious dynamic two-country model to weigh the pros and cons of foreign-funded VC. The model is used to ask whether policy should be implemented that raises the cost to foreigners of such investments. In my discussion, I want to put this issue into a broader context of the macroeconomics of international technology flows. I’ll therefore approach the analysis of the paper step by step, starting with an essay by Paul Krugman, “Does Third World Growth Hurt First World Prosperity?” While Krugman doesn’t consider technology flows explicitly, they fit naturally within his framework.

I’ll set aside considerations of US security until the end, to focus on the economics for now.

Step 1, from Krugman (1994), has countries A and B producing a single good using labor. Country A is more technologically advanced, with a higher standard of living. Suppose country B catches up a bit by adopting some of A’s technology. Country A is not hurt because technology is non-rival. It can be used in both countries at once. The standard of living rises in B without reducing the standard of living in A.

Step 2, from Krugman (1994) is a Ricardian model with three goods (or industries). Suppose country A has an absolute advantage in all three goods and has a comparative advantage in good 1 vs. good 2 and in good 2 vs. good 3. Restrict the analysis to equilibria in which both countries produce good 2, so that A exports good 1 and imports good 3. If country B adopts some of A’s technology for

* Corresponding author.
E-mail address: samuel.kortum@yale.edu.

https://doi.org/10.1016/j.jmoneco.2023.11.001
Received 2 November 2023; Accepted 2 November 2023
Available online 4 November 2023
0304-3932/© 2023 Elsevier B.V. All rights reserved.
good 3, the standard of living in A rises. The productivity gain in B for good 3 means country A now exchanges less of good 2 for a unit of 3. If country B adopts some of A’s technology for good 2 instead, the standard of living in A falls as more of good 2 must be exchanged for a unit of 3. If country B adopts some of A’s technology for goods 2 and 3, raising B’s productivity by the same proportion in each industry, the standard of living in A is unchanged. Country A still imports good 3 in exchange for the same amount of good 2. With Ricardian trade, whether A’s technology flowing abroad is beneficial or not to country A (it’s always good for B) depends on what happens to A’s terms of trade. The flow of good-3 technology improved country A’s terms of trade while the flow of good-2 technology reduced its terms of trade.

Step 3 is Krugman’s (1979) North-South model with an expanding set of goods. Any good is potentially produced with a unit of labor everywhere. Country A (North) benefits by exogenous technological change that adds to the set of goods it can produce. Country B (South) benefits by gradually imitating A’s technologies, leading to a subset of goods that B knows how to produce. Would it ever benefit A to speed this imitation process by outsourcing production of a good that B has yet to imitate? (In this setting of perfect competition, outsourcing amounts to country A letting country B use the technology.) The answer to this question is “yes”, up to a point. The benefit to A of sharing the technology with B is that A can import another good from B more cheaply than A could produce it for itself. But there’s a cost as well. While sharing technology expands the range of goods A imports, it inadvertently improves B’s terms of trade. As a result, country A pays more for all the goods it was already importing. As B gets richer it becomes less beneficial for A to share additional technologies, since it gains less by importing any given good from B. Eventually sharing more makes country A worse off. Like the three-good Ricardian model of step 2 the cost/benefit ratio of sharing technology can go either way. Without trade sharing technology wouldn’t matter to country A, as the model of step 1 shows. Any losses, to country A from allowing its technology to flow to B, are bounded above by A’s initial gains from trade.¹

The model in this paper has a far richer microeconomic structure than the models of steps 1-3, making it suitable to explore the issue of foreign VC financing. It features a unit continuum of goods, each produced by a dynamic duopoly. A producer in country A competes with a producer in B, both having their own technology and facing an exogenous hazard of being replaced by a startup. The key issue is whether the technologically-lagging firm in the duopoly would want to help finance a foreign startup, at a cost. If it does, it initially falls farther behind its foreign rival, but over time it obtains profits in return for its investment and, crucially, a faster flow of technology from abroad, giving it a chance to catch up to the leader. This tradeoff is more attractive to a foreign competitor that’s further behind the leader.

The macroeconomic structure of the model in this paper, however, is in one sense less rich than the models of steps 2 and 3. The relative wage of A and B is pinned to 1 due to costless trade in an outside good. Thus, the terms-of-trade effect in the Ricardian models disappears. Prices and wages are always the same in the two countries. From simulations of the model, it appears that, absent security concerns, consumers in A would always prefer a policy that places a minimum cost on foreign VC investment, since those investments produce faster technological change by promoting startups. Only security concerns would lead a policy maker to raise the cost to foreign VC investments. These concerns are captured in the model by a domestic output loss that increases with the measure of foreign firms that have investments in domestic firms. Such concerns are undoubtedly real, but they seem extremely hard to quantify.

Perhaps the best policy is one that is open to foreign VC on economic grounds, while weighing terms-of-trade effects, but which puts strong restrictions on technologies related to national defense, as in the CFIUS policy discussed in the introduction.

References


¹ Bai, Jin, Lu (2023) and Bai, Jin, Lu, and Wang (2023) explore the policy implications of multi-country extensions of variants of this step-3 model.