

## WHY HAS INEQUALITY INCREASED IN CHINA? TOWARD A THEORY OF INTERNATIONAL MATCHING\*

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A theory is outlined for why an expansion of international trade may aggravate inequality in developing countries such as China.

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It seems entirely fitting to discuss the Chinese economy on this occasion of the opening of the Renmin-Monash Advanced Centre of Economic Studies (ACES). One of the most striking features of that economy is the remarkable pace at which it has grown in the past one or two decades. A real challenge for economists is to account for this extraordinary success story.

I think that a potentially significant part of the answer is provided in work by Xiaokai Yang and his coauthors. Yang shows clearly how a finer division of labour, i.e., a higher degree of specialization, can be a powerful engine for economic expansion. Progressive refinement of the division of labour, made possible by reductions in transaction costs (especially, in the Chinese case, reductions in the cost of conducting international trade), creates significant increasing returns, which in turn foster growth.

But the conjunction of economic expansion and international trade seems to result in unfortunate side effects, such as rising inequality of income. Indeed, China has experienced a sharp increase in inequality during its recent boom. Yet, it is not at all clear theoretically why inequality should go together with growth in GNP and trade.

Given his breadth of interests, it is not surprising that Xiaokai Yang should have studied this problem too, as in his work with Dingsheng Zhang. Yang and Zhang (2003) view an increase in income inequality as the consequence of uneven progression in the division of labour. Although expansion of trade provides the opportunity to specialize, not everyone

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can exploit that opportunity immediately. Those who specialize get rich; those who cannot (or will not) do so remain poor. Hence, income inequality rises.

Today I would like to explore a complementary explanation for China's increase in inequality.

## 1. Inequality and the Theory of Comparative Advantage

For my purposes, inequality is just the gap in income between rich and poor. As I mentioned, there is little doubt that China's growth in GNP and trade has been accompanied by an increase of inequality in this sense (and the same has been true in many other countries as well). At first blush, this connection between trade and inequality in China may seem surprising. This is because, despite remarkable strides, China is still a *developing* economy, and the theory of comparative advantage — the most widely accepted explanation for international trade patterns — implies that expansion of international trade (which I will call “globalization”) should *reduce* inequality in developing countries. Indeed, this implication has been widely touted by proponents of and globalization. Let me begin by reviewing the elements of the argument.

Any theory of trade must address the question of why countries trade with one another. The answer, according to the theory of comparative advantage, is that countries trade because of their *differences*; within the confines of the theory, if all countries were identical in preferences and productive capabilities, there would be no reason for them to trade. But the theory goes a step further and posits that the *important* difference across countries is not in *what* people want (their preferences), nor in *how* they produce goods (their techniques of production). Rather, the critical difference lies in their *relative endowments* of factors of production — the inputs into the production process, including labour (which may be further divided into high-skill and low-skill workers), capital (including machinery, equipment, and technology), and land.

Today I will concentrate on *labour*. With its vast population, China most likely has both more high-skill and more low-skill workers than the United States. But what matters for the theory of comparative advantage is the *ratio* of the numbers of high-skill to low-skill workers. And in spite of its economic expansion, that ratio in China is still appreciably lower than in the US. So, China has a comparative advantage relative to the US in goods that are efficient to produce with a relatively low ratio — e.g., clothing. Similarly, the US has a comparative advantage in goods for which the ratio is high, e.g., computer software. Given these differences, it is instructive to compare the production patterns predicted by the theory both before and after globalization (i.e., the great expansion of trade between the US and China).

Imagine first a state of affairs in which there is little trade between the two countries. In this state, Chinese companies must produce *both* software and clothing if consumers in China are to consume both goods, as presumably they want to do (I am ignoring the possibility that China might trade with some third country). But the production of software is relatively inefficient in China because, with proportionately so many low-skill workers, the labour force is better suited to making clothing.

Indeed, a consequence of software being produced in China is that low-skill Chinese workers *suffer*. Low-skill services are in only limited demand for such a high tech product. Thus, to the extent that software is produced instead of clothing, the demand for low-skill workers is depressed, leading to a reduction in low-skill wages. By contrast, high-skill workers in China *benefit* from software production: the high demand for their services drives up their incomes.

Now, suppose that trade between China and the US is opened up (perhaps because transportation costs decline). It is no longer necessary for China to produce so much software, which it can now obtain from the US. With the decrease in software production, China will now produce more clothing than previously (exporting some of this to the US). But because clothing uses low-skill workers more intensively than software does, the change in China's production pattern induces an increase in the demand for low-skill workers and a decrease in that for high-skill services. Thus, in China, the expansion of trade means that low-skill incomes rise while high-skill incomes fall, implying that inequality *declines*.

But there is a serious empirical problem with this story: there is simply very little evidence that globalization has reduced inequality in developing economies (at least so far). In fact, there is a fair amount of evidence to the contrary, particularly in China, which has been noted in particular by the "anti-globalization" movement.

## 2. An Alternative Theory

In view of this failure of the theory of comparative advantage, let me now outline an alternative theory, based on joint work with Michael Kremer, that is complementary to the work of Yang and Zhang (2003).

Assume that globalization amounts to allowing *production processes* to be international. That is, after globalization, different components of a final product potentially can be made in different countries, or a product can be designed in one country but manufactured in another.

Formally, suppose that a production process consists of two different "tasks" and that the workers undertaking these tasks can, post globalization, be located in different countries. One task is "managerial" and highly sensitive to the skill of the person performing it. The other is "subordinate" and less dependent on the skill level.

Output is produced by matching a manager with a subordinate to form a "firm". The quantity of output depends on the skill levels of both manager and subordinate. For simplicity, suppose that,

$$\text{Output} = M^2S,$$

where  $M$  is the skill-level of the manager and  $S$  is the skill-level of the subordinate (if, say,  $M = 4$  and  $S = 2$ , then output =  $4^2 \times 2 = 32$ ). Notice that because  $M$  is squared and  $S$  is not, output is indeed more sensitive to a manager's skill than to a subordinate's.

There are different possible ways that firms might match workers of different skill levels. Suppose, for example, that the labour force consists of two "3-workers" (workers of skill level 3) and two "4-workers" (workers of skill level 4). One possibility is that firms could

employ 4-workers as managers and 3-workers as subordinates (call this “cross-matching”), in which case total output is  $(4^2 \times 3) + (4^2 \times 3) = 96$ . Alternatively, a 4-worker could be matched with the other 4-worker and a 3-worker matched with the other 3-worker (call this “self-matching”) for a total output of  $(3^2 \times 3) + (4^2 \times 4) = 91$ . Now presumably competition will induce firms to employ workers *efficiently*, i.e., to maximize output. So, for the skill levels 3 and 4, *cross-matching* will emerge as the production pattern (there is a third possibility in which 3-workers are managers and 4-workers are subordinates, but this is clearly even less efficient than self-matching).

But suppose instead that there is a labour force of two 2-workers and two 4-workers. In this case, cross-matching results in total output of  $(4^2 \times 2) + (4^2 \times 2) = 64$ , whereas self-matching leads to an output of  $(2^2 \times 2) + (4^2 \times 4) = 72$ . Thus, if the skill levels are 2 and 4, *self-matching* will be the pattern that emerges.

We conclude that the nature of the matching pattern depends on the skill levels of the available workers.

Let us apply this lesson to study the interactions of two countries resembling the US and China. Suppose that one country is “rich” and has a large number of workers of skill levels 13 and 8. The other is “developing” and has many workers of skill levels 6 and 4. The salient property here is that skill levels in the rich country are generally higher than those in the developing country.

If, at first, production across international boundaries is not possible, then efficiency ensures cross-matching in each country: i.e., the 13- and 8- workers will be matched in the rich country and the 6- and 4-workers will be matched in the developing country. But after “globalization” international production becomes possible, and we conclude that the following production pattern then arises: 13-workers self-match, 8-workers cross-match with 6-workers, and 4-workers self-match.

How does globalization affect *incomes* in this example? Competition implies that workers will be paid their marginal products. Before international matching becomes possible, a 4-worker benefits from being matched with a higher-skill 6-worker, whose superior productivity enhances the formers’ marginal product. But after globalization, 4-workers are forced to *self-match*, because 6-workers exploit the opportunity of augmenting their marginal product by matching with the higher-skill 8-workers. As a result, the incomes of 4-workers *fall*, while those of 6-workers *rise*. That is, inequality *increases* in the developing country. I would claim that such a mechanism helps explain what has occurred in China.

### 3. Policy Implication

One way to avoid the outcome in which 4-workers are “left out” is to enhance their skills. Such enhancement could give these workers the opportunity of matching internationally too. Presumably, 4-workers’ skills could be improved through a targeted education policy.

### 4. Conclusion

I have suggested that a model of production across international borders provides an answer to the puzzle of why trade expansion in China has been accompanied by increasing income

inequality. Of course, much work remains to be done to see whether such an explanation holds up empirically. But if it does, it offers at least the partial reassurance that inequality may be a transitional phenomenon: as education and training improve for the lowest-skill workers, we should expect (from the theory, at least) to see their incomes catch up with those of their higher-skill counterparts.

## **Reference**

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