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THE CONTRIBUTION OF AGRICULTURE
TO ECONOMIC GROWTH IN ARGENTINA*

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There is a fairly standard proposition in economics to the effect that agriculture contributes to the economic growth of the economy as a whole in five ways: (1) by releasing labor for the expansion of the nonfarm sector; (2) by supplying capital for the expansion of the nonfarm sector; (3) by supplying food for the ever growing nonfarm population; (4) by earning foreign exchange for the expansion of the economy as a whole; and (5) by providing a market for the goods and services produced in the rest of the economy. Almost any standard textbook on agricultural development will have these ideas as a central theme, especially when considering the role of agriculture in the development of the economy as a whole.

This proposition is based on a number of empirical facts about agriculture as an economy experiences economic growth and development. The first of these facts is that an economy typically starts the development process with the bulk of its population in the agricultural sector and the bulk of the consumption made up of food. The second is that the income elasticity of demand for food tends to be lower than the income elasticity of demand for goods and services from the rest of the economy. This is the well-known Engel's Law, and implies that resources - especially labor - will have to be reallocated to nonfarm activities as per capita incomes rise. The third is the universal experience that as an economy tends to grow, labor has to be transferred from agriculture to the non-farm sector if comparable labor in the two sectors is to receive comparable wages or levels of income.

Understanding these five contributions to more general economic development has been the basis of economic development policy in many countries, and for a long period of time. I could effectively use them as my "text" for today and spend my time discussing in some detail how they contribute. However, I prefer to take them as a set of background propositions, and something we accept as the starting point for an analysis that will go more deeply into the specific ways that agriculture can contribute to the economic development of the Argentine economy at its present

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state of economic development. Moreover, I want to try to relate the potential contributions of agriculture to the specific set of macroeconomic policies policy makers are trying to implement in Argentina.

This perspective is useful for a number of reasons. First, Argentina is not a "standard" developing country that is still rather early in the development process. Instead, a great deal of the labor force has already been drained out of the agricultural sector and agriculture accounts for a relatively small share of the Gross Domestic Product of the economy. Second, by most criteria Argentina is classified as a semi-industrialized economy; it already has a rather large manufacturing and nonfarm sector. Finally, policy makers in Argentina are pursuing a rather unique set of macroeconomic policies to bring about the stabilization of the economy and to adjust that economy back into the international economy after a long period of economic isolation.

It is in these contexts that the potential contribution of agriculture to general economic development must be understood. We will see that agriculture still has a great deal to contribute to the development of the Argentine economy, especially if its development is brought about by economically sound means.

Agriculture as a Source of Broadly Distributed Increases in Per Capita Income

The starting point for thinking about an important part of what I will have to say in these remarks is that the development of agriculture has to be based on the production and distribution of new production technology for the sector. The production and distribution of that new technology requires the investment of public funds in agricultural research to assure that the technology is adapted to the local ecological and economic conditions. Investments in agricultural research tend to be cheap sources of economic growth, and that is what policy makers should always be seeking. They also provide important contributions to increases in per capita incomes that are pervasive in the economy. It is probably because they are so pervasive, moreover, that they tend to be neglected.

One of the unfortunate features of the debate around agricultural development these past 20 years is that the modernization of agriculture by the introduction of new production technology has been charged with making the distribution of income within the agricultural sector more unequal. Under certain conditions that may be the case. However, as we will see below, to limit the analysis to what happens in the agricultural sector alone is to miss most of what happens as a consequence of agricultural modernization, and most of what is important. To fully understand the potential of

agricultural modernization, one has to consider what economists tend to refer to as general equilibrium effects. That is, one has to consider the broader effects of that modernization in the economy as a whole.

Consider the introduction of a stream of new production technology (produced by agricultural research) into the agricultural sector. Let's first assume that that new technology is for what we choose to call a subsistence commodity - one that is widely consumed by the population. The effects of this technology will be to lower the cost of production for the commodity, largely through increases in productivity. Those who adopt the technology will therefore receive an increase in their net income. The price of the commodity will be the same and their costs of production will have been lowered.

It was on this basis that the early analyses of the Green Revolution in Asia was sharply criticized. It tends to be the larger farmers who first adopt the new technology. They tend to receive relatively large increases in income from adopting the new technology, and with this income they tend to buy out their less competitive colleagues in the sector. They may also use this increase in income to mechanize their production processes and thus to expel large numbers of workers from employment in the sector. Thus, one sees that in the first instance the introduction of the new technology tends to make the distribution of income within the sector more unequal, and to create unemployment.

The important point about this process, however, is that it doesn't stop there. The ultimate effects of introducing the new technology are far wider in the economy, and they tend to be much more positive. For example, as the new technology spreads more widely, the output of this commodity will increase. If the new technology leads to a substantial increase in yields or productivity, the incentive to adopt it will be strong. Thus, there will be powerful economic forces driving the adoption of the new technology and it can lead to substantial increases in output.

It is here that the process begins to be more interesting. If the commodity is a nontraded subsistence good, its price elasticity of demand will tend to be low. That means that as the supply of this commodity increases, other things being equal, the price of the commodity will decline. This will compete away the increase in incomes for those who have adopted the new technology. More importantly, it will spread the benefits of the new technology widely in the economy. Consumers of the commodity will in effect receive an increase in their real incomes. The nominal income they receive will purchase more real goods and services, both from agriculture and from the nonfarm sector.

The important point about this process is that the increase in per capita income for the individual consumer may be relatively small. However, if the commodity is widely consumed, the sum of those increases in real income may be relatively large when added across the whole economy. That is why researchers who have investigated the social rate of return to investments in agricultural research have found those rates of return to be very high - on the order of from 30-35 percent to as high as 100 percent or more. Those are indeed high rates of return; policy makers can hardly afford to not make them. Moreover, this illustrates why we say that investments in agricultural research are a cheap source of economic growth. Large numbers of income streams are created from relatively small investments.

The benefits from developing or modernizing agriculture in this way don't stop there, however. Low income consumers tend to spend a larger share of their income on food than do middle and upper income consumers. Thus, low income consumers tend to benefit in a relative sense from the modernization of agriculture. Not only are the benefits of the new technology widely spread in the economy, their ultimate benefits tend to be distributed in favor of the poor so long as the poor consume these particular subsistence commodities.

This is a very felicitous situation. The benefits of the investments in agricultural research tend to be both widely spread in the economy, and in favor of the poor. It is difficult to find investments that will promote economic growth in a more desirable way. Consider investments in the modernization of the automobile sector to persuade yourself of this proposition. Again, the important point is that these benefits will not be appreciated if one considers only the narrow partial equilibrium effects of the new technology. Instead, they are appreciated only if one takes into account the secondary effects - the impact of the technology in lowering the price of the commodity.

There is an important corollary here. Clearly, the importance of agriculture as the basis for economic development has little to do with the number of workers employed in the sector, or with the share of the labor force employed in agriculture. It has almost everything to do with the fact that everybody consumes food. That is why even in a country such as Argentina, investments in agricultural research can contribute importantly to the development of the economy.

Let's consider a different kind of commodity as the means of extending the analysis. Suppose the commodity is a tradeable good - one that is either imported, exported, or that has export potential. That is important in the case of Argentina since not only is a significant share of agricultural output exported, but a large share of export earnings for the country comes from its agricultural exports.

With a tradeable commodity, the process described above is somewhat different, as is the distribution of the benefits. With a tradeable commodity, there will be little decline in the price of the commodity so long as the country is relatively unimportant in the international market for it. Thus, the adopters of the technology will tend to receive an important share of the benefits of the technology. But the benefits still don't stop there. The adoption of the new technology, and the increase in productivity it brings about, makes producers more competitive in international markets. Thus, the country will tend to earn more foreign exchange from its exports, and this increase in foreign exchange earnings can be used to finance a higher rate of economic growth. This provides the means of servicing whatever international debt the country holds, and of paying for the imports of raw materials and capital goods it needs for the development of the economy.

New technology which enables domestic producers to compete more effectively with foreign producers and thus to reduce imports will save foreign exchange. This eventually has the same effects in terms of servicing the foreign debt and enabling the country to increase its imports of goods and services for the development of its economy.

It should be noted that although in these cases the farmers tend to capture a significant share of the benefits of the new technology, the benefits are not limited to the farm sector. Instead, the increase in foreign exchange earnings (or savings) finances a higher rate of economic growth, and thus the benefits are also widely distributed in the economy. More employment is created and ultimately real wages will tend to rise. In the final analysis, the distribution of the benefits in this case will not be so progressively distributed in favor of the poor, but they will still be rather widely diffused. A higher rate of economic growth will tend to benefit a large share of the labor force in the economy.

Other Second Order Effects

There are other second order or secondary effects that should be taken into account from modernizing agriculture by the introduction of new production technology. Refer back to the increases in real per capita incomes consumers receive as a consequence of the spread in adoption of the new technology. With these increases in real income, consumer will tend to increase their demand for other goods and services. This can be an important stimulus to the expansion of the nonfarm sector of the economy. In effect, the impact of the development process will spread in the form of ripple effects to the rest of the economy. If the technological breakthrough represented by the new technology is substantial, these induced effects on the development process can be quite substantial.

Again, it is important to note that these spillover effects are not limited to the increases in real income realized within the farm sector. They are pervasive in the economy, and thus potentially very large and broad based. Moreover, this is an effect in the domestic economy that in a very real sense complements that associated with the effects of the increase in foreign exchange earnings when the commodity experiencing the technical change is an exportable (or a substitute for an importable).

Food as a Wage Good

The benefits of modernizing agriculture by investing in agricultural research is even more widespread than those outlined above. In this and the following sectors I want to consider some of these other contributions.

An important characteristic of food is that it is a wage good. That means that it is an important consumption item for the members of the labor force. This provides an additional means by which the production and distribution of new production technology can contribute to the development of the economy as a whole.

The point here is that the decline in the price of the subsistence commodity makes it possible for there to be an increase in real wages without there being an increase in nominal wages. Alternatively, the nominal wage can actually decline and the real wage remain constant, or there even be an increase in the real wage. These effects help to make a country such as Argentina more competitive in international markets. Thus, we see a dual effect from the modernization of agriculture. The introduction of new technology in the production of tradeable commodities makes the country more competitive in the markets for those commodities and thus able to earn more foreign exchange. But the introduction of new technology in the production of subsistence goods has a similar effect, and on a much wider basis in the economy. We thus see that the modernization of agriculture by the investment in agricultural research can be an important component of promoting international competitiveness, and of general economic development policy.

Dealing with Declines in the Terms of Trade

A common complaint of the developing countries is that they are handicapped in their development efforts because the external terms of trade are always shifting against them. Although that argument tends to be overdone, it is still an issue to be addressed because there can in fact be secular or long term shifts in the external terms of trade faced by a country.

The issue here is to identify the source of the decline in

the external terms of trade and to identify what can be done about it. An important part of the decline in the terms of trade faced by most developing countries is the spread of new production technology in agriculture in other countries. Clearly, the dumping of exports by the European Economic Community and by the United States has had some important short-term effects in international markets. However, over the longer term the important issue is the rate of technological change in the global agricultural sector.

This decline in the external terms of trade reduces the foreign exchange a country like Argentina can earn, and thus becomes an impediment to economic growth. The solution to this problem in many, if not most, countries is readily at hand, and there is a great deal policy makers can do about it. The key is to keep the rate of technical change in the domestic economy going at at least the same pace as it is progressing in the international economy. If that is done, the country will remain competitive in the foreign markets, and the increase in productivity will mean that the same amount of foreign exchange will be acquired from the same investment of domestic resources. Thus, the country will continue to earn the same amount of foreign exchange, and will not suffer losses in national welfare.

In fact, with proper investments in agricultural research, a country such as Argentina may be able to do even better. If by means of such investments the rate of technical change in the domestic economy should be greater than in the international economy, Argentina may be able to benefit even though the external terms of trade are shifting against. Such investments should be an important part of international competitiveness policy.

The contributions of agricultural research on this issue can go even further. One way of escaping the negative consequences of negative shifts in the external terms of trade is to develop new sources of foreign exchange. The key here is that investments in new production technology are an important way to change the comparative advantage of a country. Increases in productivity will make it possible for the country to win new markets. There is no reason a country has to accept a static concept of its comparative advantage. The right strategy can enable it to shift its comparative advantage, develop new markets, and thus not only to diversify its foreign exchange earnings but to increase them. Science and technology policy can play an important role in this strategy.

Finally, it is also important to consider the contributions of new production technology in another dimension. The availability of new production technology, and the increases in productivity it makes possible, can make agriculture an attractive place for investment on the part of foreign investors.

This inflow of capital can be an important source of economic growth in its own right. It can also have some very positive effects on the nation's exchange rate, making it possible for the country to acquire its needed imports with a smaller sacrifice of domestic resources.

Agricultural Modernization and Argentina's Macroeconomic Policy

Argentina is conducting what is almost a unique economic experiment. It has fixed its exchange rate in terms of the dollar by law, and used this as a central part of its stabilization policy. So far, that policy seems to have had considerable success. Inflation has been reduced significantly, and the economy is growing at a moderate rate.

This is not the place, nor the occasion, to make a detailed analysis of that policy. However, there is one important sense in which the technology policy for agriculture can help to make that policy sustainable. I do want to discuss that component of the policy.

What is a longer term consequence of the current Argentine policy? If the rate of domestic inflation is not constrained to be the same as in the United States, the tendency will be for the Argentine peso to become overvalued on a purchasing power basis. This will cause the important export sectors to lose their competitive edge in international markets, and cause imports to come in at ever increasing rates to compete with domestic producers. Eventually, this will lead to increasing demands for protection, and for interventions of other kinds. In fact, these pressures are already building.

Policy makers have responded to these pressures in part by what was in effect a partial devaluation for the important agricultural sector. The explicit export taxes on agriculture were eliminated. That will not be the end of the problem, however.

A more general solution to the problem is to accelerate the rate of technological change in the agricultural sector, especially among the export commodities and among the commodities that have strong import competition. This acceleration in the rate of productivity growth is ultimately the only solution to the problem so long as policy maker stick to their present policies. In fact, it is my understanding that one of the reasons policy makers are committed to the present policy is that it will accelerate this rate of productivity growth more generally in the economy.

Without addressing the many larger issues of this policy, the main point I want to make is that if that is the goal,

investments in agricultural research to produce new technology to raise productivity in the trade sectors should be an important part of the broader policy. This will help policy makers to sustain the present policy without sacrificing economic growth. In fact, to the extent that keeping the exchange rate fixed will help attract investment funds from abroad, it may even help accelerate the rate of economic growth through what must eventually be a transition period.

It should be noted that although the above implies a concentration of agricultural research on tradeable commodities, the potential benefits are not limited to agricultural tradeable. Keep in mind the role of food as a wage good. Investments in agricultural research for subsistence commodities will help keep nominal wage rates low even though real wages may be rising. This will help improve competitiveness not only in the agricultural sector, but in the nonfarm sector as well. Thus the benefits of a sound technology policy for agriculture can be quite widespread in the economy.

In conclusion, investments in agricultural research have a great deal to offer in terms of enabling policy makers to sustain their present macroeconomic policies. A nation's technology and wage policies have a great deal to do with the kind of foreign exchange policy policymakers can sustain. That is the main lesson from this part of the analysis.

Some Concluding Comments

A sound technology policy for agriculture is not, of course, the only issue in promoting efficient and equitable economic growth. It is certainly an important part of it, however, and the part we are assembled here today and tomorrow to discuss.

The remaining agenda is rather far reaching, and needs to be addressed in similar conferences. One issue that is certain to surface in our discussions here is the relative role of the public and private sectors in producing the new technology for agriculture. Clearly, the private sector can play an important role. But we also know that an important share of the biological innovations for agriculture must come from public investments. Private firms cannot capture all the benefits from their investments in producing the improved varieties and other biological innovations.

A related problem is how to deal with the adjustment problems technological change ultimately causes. These can be important, especially if the product mix changes as the new technology is introduced. The solution to this problem is to provide retraining programs, keep the investment in general education of the rural population at a high level, and help to facilitate mobility.

There are a number of issues associated directly with developing and expanding the agricultural research and extension system. There is another whole set of issues associated with modern inputs such as commercial fertilizers and pesticides that are essential for a modern agriculture. These, too, will have to wait for another day.

Finally, let me conclude by emphasizing that a sound science and technology policy for agriculture is the key to an efficient and equitable economic development policy for Argentina. The investments required in this sector are not large. But they promise to have a very high social payoff, and to be a critical factor in the future growth of the Argentine economy.