

STRENGTHS AND WEAKNESSES OF THE ANALYSIS OF THE RELATIONSHIP BETWEEN AGRICULTURE AND INDUSTRY

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Introduction

This essay discusses some key studies related with the role of agriculture in the process of industrial accumulation, which have been influential in the debate concerning inter-sectoral linkages in economic growth and development. In this connection, the models of agriculture-savings and agriculture-demand driven industrialisation are compared with the dynamic model. In the dynamic model, the emphasis is put on the leading role of industrialisation in creating the capital, knowledge and markets required for economic growth, as well as in generating the demand for output and surplus labour from agriculture. On the other hand, agriculture removes the wage constraint for industrial accumulation through technical change that enable a sharp increase in labour productivity and crop yields. The dynamic model, it is argued, encompasses the others because of its dynamic dimensions and conceptualisation of global structural change of the economy, rather than a simple transfer of resources from a low productivity to a high productivity sector. This is debated in the first section of this essay.

However, the dynamic model maintains some tensions that ought to be resolved in order not only to improve the conceptualisation of the model, but also to be able to explain why the vast majority of developing countries have failed to embark in a process of dynamic industrial accumulation. This is debated in the second section.

Supply and Demand Forces and Structural Change

The relevance, or otherwise, of the analysis and policy conclusions concerning the debate about the role of agriculture in the process of industrial accumulation depends on how different schools of thought understand the process of overcoming barriers to foster economic growth and development.

In neo-classic economics, all factors of production act simultaneously and continuously as bottlenecks. Given the assumptions about substitution and mobility of factors, shortages are simply removed by adjustments in demand and supply brought about by the operation of the price mechanism. Therefore, as long as barriers to factor mobility and price adjustment are removed, the sectoral allocation of resources is irrelevant, and what matters is that projects are cost-effective and their production functions reflect the factor endowment of any economy at any point in time.

Hence, the debate on inter-sectoral linkages and transfer of resources becomes relevant only within the vast body of structuralist literature. Here, economic growth and development is seen as a process of changing the structure of backward, usually agrarian-based, economies through industrial accumulation. Industrial accumulation, being a process of structural change of the whole economy, is constrained by shortages of specific factors (given historical conditions and levels of development), which cannot be removed by the price mechanism because of the economic, social and institutional rigidities at work. Therefore, economic policy becomes a central element to remove shortages and rigidities to ensure capital accumulation and/or transfer of resources to support industrialisation.

The major shortages and constraints that hamper the process of industrial accumulation are related with the supply of, and demand for, specific factors of production.

Supply-side constraints

The supply-side constraints usually refer to domestic savings, foreign exchange, raw materials and foodstuffs.

The major causes for low levels of *savings* and investment are found on the low levels of income and productivity of agrarian-based economies, as well as in the unproductive expropriation of land-rents by absentee landlords (Dasgupta. 1980:1-3, Hamilton 1983, Kalecki 1976:47, Karshenas 1995:73 and 1993:180-3, 191-2). Generally, models of savings constraints (such as Lewis's surplus labour model) argue that it is the shortage of capital and the diminishing marginal productivity of labour that hampers industrial accumulation. Therefore, the propensity to save and invest should be increased up to a point where the marginal product of capital is zero. Savings will either have to be extracted from agriculture or be provided by the external sector (aid and foreign investment). In this process, the backward sector (the traditional agricultural sector) will be absorbed by the leading, or modernising, sector - the manufacturing industry.

On the assumptions that the possibility of massive flows of foreign investment into backward economies is very small (Lucas 1990), and the significance of the benefits of dependence on foreign investment and aid for capital accumulation is very questionable (Kalecki 1976 and Wuyts 1997), the issue becomes that net agricultural surplus has to increase to finance industrialisation.

There are three major tensions with these models. On one hand, there is an obvious difficulty to explain how additional savings can be extracted from the backward, low productivity, sector without transforming its technology, social and technical organisation and efficiency.

On the other hand, it is the higher productivity sector that generates an increasing proportion of the savings required for investment, because of its higher rate of profits and the dynamic impact of productivity gains in expanding investment incentives, capacity and opportunities. Any eventual starting share of traditional agriculture surplus in the overall level of savings tends to decline sharply with industrial accumulation. Therefore, in the long run it is the process of industrialisation, itself, that has to generate the savings required for it to continue (Amsden 1997, Dasgupta 1980, Kalecki 1976 and Karshenas 1995 and 1993).

Finally, the idea that development is simply a process of transfer of resources (and that resources are freely available and transferable) from the backward to the modern sector seems rather peculiar. As Amsden (1997) argues, development is more like a process of social creation of new competitive assets.

On the whole, the analytical framework of these models is rather static and short-term oriented. Such a framework is not the most adequate to analyse a process of industrial accumulation, which is dynamic in its very nature.

Nonetheless, this is not to deny the short-run impact of agricultural savings in the initial stages of industrialisation, which can be enhanced by improving the efficiency of allocation of agricultural surplus. For example, in Japan, South Korea and Taiwan, the combination of land reform, which removed absentee landlordism, and the introduction of land taxes as a substitute for unproductive rents, increased the financial surplus available for public investment. Although the overall flow of financial resources from agriculture may not have increased significantly in the short-run, the substantial improvement in the efficiency of resource appropriation and allocation, from the industrial capital point of view, played a crucial role in the financing of the initial stages of industrialisation (Dasgupta 1980:4-5 and Karshenas 1995:73).

The role of agriculture in the provision of *foreign exchange* earnings for industrial accumulation can be analysed within the framework discussed above. Whereas agricultural exports may be crucial in the provision of foreign currency to sustain the initial stages of

industrialisation, in the long run it is successful industrialisation that generates most of the foreign exchange earnings necessary to foster industrial investment.

The supply of cheap *raw materials and foodstuffs*, in line with the increasing aggregate demand, is considered the crucial supply-side contribution of agriculture for industrial accumulation in a process of balanced growth (Kalecki 1976:44-51, Sawyer 1985:213-9 and Wuyts 1997:15-20).¹ As Kalecki emphasises, "*Investment finances itself...*" (1976:43), but "*The real problem is whether this financing of investment does, or does not, create inflationary pressures.*" (1976:44). As investment in industry increases, so does the demand for wage goods (mainly food) and raw materials. In balance of payments constrained economies, there might be an inverse relationship between expansion of industrial capacity and employment, and the ability to ensure that unit labour costs fall and the rate of capacity utilisation increases, in the short run. This conflict results from the incapacity of the agricultural sector to supply food and raw materials in line with the increasing demand, and leads to a spiral of inflation which forces the collapse of real wages, together with an increase in average nominal wages², in unit labour cost and costs of raw materials.³ Thus, the low level of agricultural productivity and the resulting wage constraints may hinder the expansion of industrial employment.

This argument raises a crucial question for the industrial transformation of backward, agrarian-based, economies: how can the expansion of employment in industry be matched by the expansion of agricultural supply of food and raw materials? In balance of payments constrained economies, there are two answers for this question: either industrial production expands very slowly - which is undesirable for the goal of industrial transformation; or agricultural productivity and yields expand very rapidly.⁴ This second path of development ensures that labour can be transferred to industry⁵ and yet the supply of cheap agricultural marketed surplus can increase in line with demand. It also involves the structural transformation of the economy as a whole, including the industrialisation of agriculture (Amsden 1997 and 1994, Dasgupta 1980, Kalecki 1976 and Karshenas 1995 and 1993).

This argument, taken as a whole, represents a fundamental change of emphasis and nature in the study of the relationship between agriculture and industry. It is industrial accumulation that creates capital, enables technical change, creates its own markets and provides the demand for agricultural output and surplus labour; whereas agriculture resolves the wage constraint for expansion of industry.

¹ The role of agricultural raw materials might be more important in the initial stages of industrialisation of agrarian-based economies. This role also depends on the structure of the industry developed, namely the relative size of the resource-based sub-sectors, such as food, beverages and tobacco, and textiles based on natural fibres. These industries are usually labour-intensive and may more easily be developed in the rural areas, closer to the source of raw materials and of surplus labour.

² Not only marginal nominal wages will increase, but the nominal wages for the whole labour force in industry. The magnitude of the rise of nominal wages depends on labour relations and level of labour organisation, as well as on the level of demand for labour.

³ Assuming that, in the short run, the time span of the learning curve prevents productivity from increasing significantly, and balance of payment constraints are not removed, which are reasonable assumptions for many developing countries.

⁴ There might also be an *interim* period where external aid compensates for growth imbalances. But as Kalecki (1976) and Wuyts (1997) emphasise, this cannot be a substitute for a sharp increase in the productivity of the economy.

⁵ Assuming that industry expands at a rate necessary to absorb surplus labour from agriculture.

Demand-side constraints

The demand-side constraints usually refer to the small size of aggregate demand that characterises backward, agrarian-based economies (Adelman 1984, Harriss 1992 and Mundle 1985). However, Kalecki (1976), Sawyer (1985) and Wuyts (1997) consider, instead, the impact of the nature and structure of demand on the shaping of the path of capital accumulation.

The *aggregate demand-size* constraint is due to low levels of agricultural surplus and income accruing to the vast majority of the population in the rural areas. In view of this constraint, there is no outlet for the products of the newly built factories, unless industrialisation is oriented towards external markets or agricultural incomes are raised. This argument has been used to criticise import substitution industrialisation (ISI)⁶, to link successful industrialisation with outward (export) oriented strategies and to emphasise the need for an *interim* period in the process of industrial accumulation, in which agriculture should be the major target for a positive net inflow of resources (Adelman 1984, Mundle 1985 and World Bank 1994 and 1989).

Each of the points of this argument is, simultaneously, a strength and weakness, depending on very specific conditions. Therefore, this argument does not establish a sufficiently solid framework for a more general analysis.

In agrarian-based economies the income in agriculture is a crucial determinant of aggregate demand in the short-run, particularly in the initial stages of industrialisation. However, two points are worth noting. First, the aggregate demand that depends on income accruing to a low productivity sector cannot be high - either that sector is transformed in a process of industrialisation where productivity and yields increase sharply, or it will never provide the demand required for successful industrialisation. Second, industrial expansion has been the major engine to increase the demand for both industrial and agricultural consumer and investment goods in all successful industrialising economies, and it is recognised that the share of agricultural demand in aggregate demand diminishes sharply with industrialisation (Kuznets, as mentioned in Karshenas 1993:182).

In many Asian, Latin American and African countries, experiences of ISI have failed to develop an efficient industrial structure, and have created, instead, huge external and internal imbalances, and hindered the development of the whole economy. However, ISI has played an important role, in different stages of capital accumulation, in successfully industrialising economies. Additionally, where industrial accumulation has been more successful (and every case of success has been linked with some level of selective protectionism), productivity gains in ISI combined with increasing demand for agricultural goods have been reflected in improved terms of trade for agriculture, as well as more investment in infra-structures and other output raising and waste reducing agrarian technologies.

The ability to export is crucial for capital accumulation in general, and for industrialisation in particular. But this ability depends not only, and not even primarily, on the structure of relative prices or on trade orientation, but mostly on how competitive production capacities are created (Amsdem 1997 and 1994 and Wuyts 1997). On the other hand, as noticed earlier, the expansion of industrial capacity and employment creates internal demand for consumer and investment goods from industry, as well as from agriculture. As Kalecki (1976) and Wuyts (1997) clarified, the ability to satisfy this dynamic domestic aggregate demand is central for both balanced growth and structural change.

⁶ ISI is criticised from two points of view. First, ISI represents over-taxation on agriculture because it worsens the terms of trade of agriculture *vis-à-vis* industry (consumer and investment goods) and appreciates the exchange rate. As a result, the growth of agricultural marketed output is hindered, rural incomes fall and the domestic demand for manufacturing consumer and investment goods does not increase. Second, ISI deviates the economy from its natural growth path based on its factor endowments, and creates a rent-seeking urban elite.

Certainly, investment in agriculture is required to increase its productivity and yields, to remove the wage constraint to expansion of industrial employment and to change the structure of the economy as a whole. Nonetheless, without changing the structure of employment and income (which involves industrial expansion), surplus labour in agriculture would not be absorbed, consumer and investment goods for agriculture would not be cheaply available,⁷ nor would there be the wage and investment pressure to increase the supply of agricultural goods and improve agricultural technology.⁸

On the whole, the major problems with the demand-size argument are its static analytical framework and its concentration on exchange, rather than production, relationships

There is, however, a totally different dimension in the relationship between domestic demand and industrial accumulation. Kalecki (1976:47-8) and Wuyts (1997:19-22) analyse specifically the *nature of internal demand* and its impact on the choices available for successful economic transformation. Here, the point is not the size of aggregate demand, but whether the demand is for mass consumption and investment goods, in which case industrialisation is encouraged in a large scale and continuous productivity increase is required; or luxuries, in which case Kalecki's '*perverse development*' will prevail.⁹ There is a final point worth noting. Kalecki and Wuyts are not trying to explain how industrialisation may or may not occur and succeed; they are simply discussing how the nature of resource flows and structure of the market and demand may influence and shape the set of choices and the path of development.

Concluding remarks

The central point to retain from the above debate is the fundamental shift of emphasis and nature in the relationship between agricultural development and industrialisation. Rather than looking at how to absorb a backward sector into a modern one, this dynamic model looks at how '*...the patterns and processes of resource flows intertwine with the transformation in the structure of employment and income to bring about a sustained process of balanced growth*' (Karshenas 1993:230). The role of agriculture changes from the provision of savings and demand for industrial goods, to the solution of the wage constraint to industrial accumulation - this requires the dynamic technical and social transformation of agriculture. Industrial accumulation becomes a dynamic process, in which the creation of capital (savings and foreign exchange) and demand are made endogenous.

The transformation of the structure of employment and income through industrialisation and transformation of agriculture requires that industrial and agricultural policies are well co-ordinated. Otherwise, imbalances will reinforce the wage constraint to industrial expansion and reduce the ability of industry to absorb surplus labour. On the whole, economic growth and structural change will be hampered.

⁷ The assumption of balance of payments constrained economies is maintained. As Wuyts (1997) points out, official external grants and aid may relieve the pressure on industry to supply cheap consumer and investment goods for agriculture. However, Wuyts also notice that if the productivity of industry does not increase sharply, the whole economic process of accumulation becomes increasingly dependent on aid and its constraints.

⁸ Assuming that the demand for the country's exports is not infinitely elastic, which is a reasonable assumption to make for backward, agrarian-based economies.

⁹ Wuyts refers to the two tier market, where the lower comprises the vast majority of workers in the formal and informal sector who need access to basic mass consumption goods. The higher comprises the higher income groups - national and international - whose demand is for higher quality, more expensive and higher import component goods. Whereas Kalecki criticised the lopsided nature of development driven by demand for luxuries, Wuyts focused his analysis on the perverse effects of aid dependency for capital accumulation, as opposed to a path that accelerates productivity increase in the domestic economy.

Finally, the social structure of appropriation and utilisation of income influences the efficiency of resource use, as well as the path of development. These are particularly the cases of agricultural reform (where a one-off change in the pattern of resource appropriation may have a far-reaching impact on investment in the initial stages of industrialisation); and of the social structure of demand, which may either foster mass consumption or '*perverse development*.'

Tensions with the Dynamic Model

The dynamic model of inter-sectoral relations in the process of industrial accumulation calls the attention to the fact that successful industrialisation depends on both successful technical change and sharp productivity increase in agriculture, as well as on the ability of industrial policy to endogenously create capital, knowledge and markets, and absorb surplus labour. By focusing on the structural change of the whole economy, this model has gone beyond the limits of inter-sectoral transfer of resources. These strong conclusions are valid, in general, for the understanding of dynamic industrialisation. Therefore, they form a general analytical framework for the study of industrialisation and agriculture transformation.

However, despite its considerable theoretical and analytical strengths, the dynamic model maintains some tensions that ought to be resolved.

The analysis of inter-sectoral relations tends to *fail to desegregate the social relations* involved in the process of production. Often, it is not the relationship between agricultural and industry that matters the most, but the relationship between specific classes within and across sectors. These class relations may determine the shape of structural change that takes place, the choice of technique, the outcome of policies, and the pattern of appropriation and use of surplus. Although classes and class relations change with the development of productive forces, they also shape the development of productive forces.

Karshenas (1995:72-5 and 1993:189-90 and 226-7) refers to the impact of institutions and of social organisation of production on the efficiency of technological development and resource use. In particular, he discusses the conditions under which governments may have more possibilities to intervene in order to accelerate flows of resources to support industrialisation. For example, when population pressure on land increases and technology is stagnant and independent of population growth, the law of diminishing marginal returns to labour apply and governments may not be capable and willing to control the growth of consumption in agriculture. In economies experiencing high growth of labour productivity in agriculture, governments have ample possibilities to increase the outflow of surplus by controlling the growth of agricultural consumption (Karshenas 1993:189-90). These aspects are very important to understand the government's *room for manoeuvre* in policy formulation. However, in this analysis there is little about class relations that could explain why governments would intervene in one or another direction, and how the actual shape of capital accumulation is determined. Agriculture is treated as a homogeneous sector, with little attention being paid to process of differentiation and patterns of capital accumulation within the sector.

Dasgupta (1980:38-66) presents a more detailed analysis of class structures and relations in the case of India. She shows that labour relations have influenced landlords' decision with respect to the choice of labour saving techniques in a labour abundant agricultural sector. This was due to the increase in the demand for labour that resulted from the introduction of land-saving techniques, and to the impact of state policies and trade unions on the operation of the labour market. However, she fails to provide a clear analysis of the process of capital accumulation within agriculture and how it affects the relationship agriculture-industry, as well as she does not incorporate class interest and relations not specific to the rural-agricultural sector but relevant to the understanding of the process of agricultural transformation.

The analysis of *intra-sectoral patterns of accumulation* is neglected, in part because of the failure to fully study social, rather than sectoral, relationships. This may constrain the ability

to fully understand cross-sectoral relationships and conflicts, in particular the conflicts which arise from competition between economic agents for control of scarce factors (Wuyts 1997:21-2, discusses this point with respect to the formal-informal sector relationship in Tanzania).

With respect to the *choice of technology*, Karshenas (1993:190-91 and 228-30) emphasises that the success of agriculture transformation depends on genuine technological innovation, in particular with respect to the absorption of new biotechnology inputs made available by the '*Green Revolution*'. These productivity and yield improving inputs reduce the capital/output ratio and increase the efficiency of investment. The central point in this analysis, that the choice of technique should enable sharp and continuous improvements in productivity and yields in agriculture, is very important

However, as Dasgupta has noticed, both biotechnology and tractors are capital-intensive factors from the economic point of view, because of the capital requirements to produce those factors (Dasgupta 1980:33-5). Therefore, even if biotechnology inputs reduce the capital/output ratio in agriculture - on the assumption that they are efficiently used in combination with all the necessary complementary factors - they are not capital-saving from the point of view of the economy as a whole. The very fact that new seeds, to be productive, require fertilisers, pesticides, irrigation, conservation, etc., may raise some doubts on whether biotechnology, *per se*, is capital-saving at all. Finally, the choice of technique in agriculture is determined by many factors such as labour relations, labour and managerial skills, farm management systems, climate, soil, the type of crop, the availability of water, the stage of operation in the chain of production and marketing, amongst many others. These choices may also be flexible and vary over time, as one problem is resolved - for example, the scarcity of land - and another created - for example, the scarcity of labour (Dasgupta 1980:27-33). Therefore, the problem is not whether one particular technological package has natural advantages over another, but which problems have to be addressed, which choices are available and which forces determine which problems are addressed in first place and which choices of technique are made.

Finally, the dynamic analysis *says little about industrial policy* and the forces that determine and shape such policy, although the expansion of industrial employment, together with technological change in agriculture, are the central points for the operation of the model. Industrial policy is not only about the factor proportions, the size of the firms and market-orientation. More complicated, still, is how to transform surplus labour in a backward agricultural sector into efficient workers in the manufacturing sector; and landowners, moneylenders and traders into industrial capitalists and managers. This requires specific technological policies, targeting of specific skills and knowledge, a significant amount of learning-by-doing, and so on, all of which may prevent industrial accumulation to peak up at the speed required to absorb labour made redundant in agriculture as a result of technical change. More attention has to be put into the study of the problems of co-ordination of agricultural and industrial policies.

If these tensions are addressed and resolved, it may help not only the improvement of the theoretical model, but also to develop a better understanding of why the vast majority of developing countries have failed to embark in such dynamic processes of capital accumulation, and which opportunities they may need to take advantage of.

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