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Growth, Income Distribution and Poverty Analysis

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Dual Economy Models: A Primer for...Growth, Income Distribution and Poverty Analysis

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Abstract

In this paper we review a recent literature on dual economy models which adopts a more modern view of dualism integrating the basic features of those models with the advancements made by the new growth theories. By paying specific attention to the role of agents heterogeneity, market imperfections (financial, human capital and so forth), non-convexities in preference and production structure, we show that the classical conclusions of the dual settings are enriched and often modified by adding more microeconomic structure to the supply and the demand side of the economy. We extend the Temple's research (2005a) showing in details the sources of the yet relevant usefulness of the dual economy models in answering questions related to the growth-inequality-poverty linkages and the long-run development of the societies. We show how dual economy environments are suitable to evaluate who benefits, and how much, from economic growth, or yet whether and the extent to which income distribution does matter for shaping the impact of economic growth on individual poverty and hence to properly analyse the theoretical channels driving pro-poor growth.

JEL: D31, I32, J24, O15, O17, O18

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1 Introduction

Dual economy models, or small general equilibrium models with a large agricultural sector, do deserve a powerful role in explaining the connections, if any, between growth, income or wealth distribution and the long-run development of an economy, as process of structural transformations, as well as in the analysis of the individual well-being.

In “*DUAL ECONOMY MODELS: A PRIMER FOR GROWTH ECONOMISTS*” Temple (2005a) maintains that “...above all, small-scale general equilibrium models can be used...to shed new light on the origins of pro-poor growth and to explore the role of the informal sector”. In this paper, we take seriously up this claim by extending the Temple’s research on the microeconomic ground and exploring the new channels offered by a recent literature that may explain how the benefits from growth processes are distributed across the population and the implication for the growth-poverty nexus. We show how the basic dual economy framework may produce new interesting insights on these issues, once integrated with the advances of the branch of the new growth theories, based on the role of non-convexities in production and preferences, and on market imperfections and agents heterogeneity (see also Capasso, Carillo and Vinci, 2008). These models, in turn, may allow to question whether and under what conditions the process of structural transformation of a society is either more inclusive or more exclusive, supplying remarkable insights on the theoretical channels of pro-poor growth.

The traditional dual economy structure is due to the seminal Lewis’s work (1954) which analyzes the long-run development of an economy with two specific sectors, a large agricultural and an industrial or modern one, exploring the path through which a poor economy does convert itself into an industrial one. The agricultural sector is characterized for abundant endowments of labour and land. Given the unlimited labour supply at the subsistence wage, the marginal product of labour in this sector is very low (if not zero or negative), producing an horizontal curve of the marginal product at the level of subsistence wage for a considerable period. On the other side there exists an industrial sector, in which the exogenous wage is institutionally fixed at a level higher than the one in the rural sector; since at subsistence level there is a large excess supply, the “labour surplus”, the capitalists in the industrial sector do not have to worry when deciding the amount of workers to employ. Further, it

is assumed that only capitalists in the industrial sector do save, while agricultural and urban workers and agricultural landlords do not as they consume their entire budget. Dynamically, this model predicts that over time the marginal product of labour increases as the capital stock increases, while wages in the urban sector remain institutionally fixed until they are equalized to the agricultural ones. At this point - “the turning point” - the economy ceases to be a poor, underdeveloped, economy and looks very like an industrial one. This idea has undergone several critiques. One of the most important deals with the notion of institutional wage in the modern sector and of labour surplus at a subsistence level in the rural sector; this idea has been criticized from the neoclassical school, since this wage is not determined as equilibrium value of a general equilibrium model. Dual economists do maintains that in fact the dual economy assumption is that agricultural wage are related to, but not necessarily equal to, the average product of agricultural workers; this should imply that the supply curve is horizontal only over short periods of time, while being *gently* rising over time (Ranis, 2006).

Most of the attention of this survey is paid to a more recent view of dualism rather than to its traditional approach. Rather than assuming a wage exceeding the marginal product in the rural sector or independent of the labour demand in the modern one, the modern approach to dualism focuses on more commonly labour markets imperfections or on broadly market imperfections which carry over labour markets (for instance human capital market imperfections due to financial markets imperfections which carry over labour markets).

On this ground, the framework of the dual economy models ceases to be consistent only with the characteristics of the developing economies, and it becomes suitable to properly analyse the structural transformation of the developed societies, in which there are large areas of marginalized poor (The Economist, 2007). The relevance of this framework for the interplay of growth and income distribution appears yet evident once considered that the persistence of economic dualism is an important explanatory factor of cross-country differences in inequality (Bourguignon and Morrisson, 1998; Temple, 2005a). Bourguignon and Morrisson (1998) show that even if the relative labour productivity between agricultural and the rest of the economy is not correlated with the rural-urban income gap, the observed effect of economic dualism on income inequality is still very strong. This is an important result since had income inequality been explained only by productivity gap between

the sectors, there would have been little room to sustain that dual economies structure are source of income inequality; otherwise, the fact that the effect of economic dualism on income inequality is proved to be still huge when the relative productivity gap effect is isolated does confirm that dual economy models are actually very powerful tools in explaining structural transformation processes and their consequences on individual well-being. Another source of their relevance is that the features of the economic development of a society, which is mainly a transitional process, are better captured by unbalanced models (Baumol, 1967; Kongsamut et al., 2001) than by long-run steady state neoclassical ones, since “...the stylized apparatus of balanced growth paths might have little to say about many events that are central to this transition” (Temple, 2005a).

In the second section we review the basic set-up of the dual economy models as formalized by the classic and the neoclassic schools. In the third section we extend on a microeconomic ground these literatures, by reviewing the role of a) agents heterogeneity, b) informal sector, c) human capital and market imperfections, d) the demand side of the economy and the speed of urbanization. In the fourth section we show how this framework is yet useful in the analysis of the growth, inequality and poverty linkages by reviewing a further theoretical methodology which reveals the usefulness of the dual economy framework to assess the implications of that interplay for the study of pro-poor growth. The last section concludes.

2 The basic model and the neoclassical reformulation

One of the most popular reformulation of the Lewis’s ideas is due to Harris and Todaro (1970) who study, in a 2-sectors framework, the migration process from a rural to an urban centre. In the economy there are L workers, of which L_R are employed in the rural sector and L_M in the urban one, with $L_R + L_M \leq L$ and $L_R, L_M \geq 0$. The urban wage is exogenously fixed at w , due to – for instance – institutional bargaining, while the rural wage, under the assumption of competitive labour market in the rural sector, equals the rural marginal product of labour and is given by w_R . Further, there exists a fixed number of jobs in the urban sector L_M , so that if there are more workers in the urban centres some of them must be unemployed, being trapped in an “unproductive informal sector”; the total labour force (employed plus unemployed) is hence given by $L - L_R$, with an $(L - L_R) - L_M$

unemployed. Let the rate of urban employed be $u = L_M / (L - L_R)$, Harris and Todaro assume that individuals base their migration decision on the expected income obtainable in the urban market, so that it is the rate of urban employment that does equalize the wages in the rural and urban centres

$$w \frac{L_M}{L - L_R} = w_R \quad (1)$$

When the left hand side in (1) is higher than the right hand side, individuals have incentive to migrate and the migration continues until condition in (1) is verified, when the migration equilibrium condition is reached. A famous caveat, the Todaro's paradox, arises from this equilibrium condition; let re-write (1) as

$$L_R = L - \frac{w}{w_R} L_M \quad (2)$$

It follows that

$$\frac{\partial L_R}{\partial L_M} = - \frac{w}{w_R} \quad (3)$$

Raising the number of urban jobs induces an increment in the migration from the rural to the urban sector by the amount in (3), as the incentives of agricultural workers improve, so that increasing the number of urban jobs implies an increasing in the unemployment in the urban sector - the so-called Todaro's paradox. Ultimately, this result explains why rural-urban migration may persist in the presence of high urban unemployment, inducing either long delay or the impossibility to reach the "turning point" which Lewis did refer to in the development of a society which might be trapped in a dual system. Another important insight stemming from the assumed frictions on the labour market, which produce a fixed exogenously wage rate in the urban centres, is that all the unemployed in the urban sector is not voluntary, or else stated disguised unemployment.

Against this last view, Lucas (2004), based on neoclassical principles, develops a model of urban-rural migration, in which all individuals do perfectly foresee the consequence of their migration. This model describes three empirically recognized facts, namely: a) the process of migration from rural to urban sector continues until the rural one does not disappear, letting the agriculture sector in developed economies being completely integrated in that technological system; b) this process

is not instantaneous but it does take long time; c) this process produces, finally, equalization of incomes of the individuals who migrate. The author shows under what conditions, in presence of perfectly competitive structure, those empirical facts may be observed. The economy is inhabited by identically individual families, infinitely living, normalized to one, and endowed with a fixed amount of time, which is divided between working at a wage, which depends on the current skill level, and accumulating human capital; each individual family has preference

$$\int_0^{\infty} e^{-\rho t} U(c(t)) dt \quad (4)$$

with

$$U(c) = \frac{c^{1-\sigma}}{1-\sigma}$$

This structure is modelled upon a two-sector economy (rural and urban). In the rural sector, the production function is very simple, with human capital having no effect, namely

$$F(x(t)) = Ax(t)^\alpha \quad (5)$$

The farm production $F(x(t))$ is represented by a Cobb-Douglas, with the unique input being the farm employment, $x(t)$. In this economy the competitive equilibrium ensures that the wage equals the marginal product and all its whole value as well as land rents are consumed and not saved; $w = F'(1)$, $c = F(1)$, land rents are given by $F(1) - F'(1)$ and finally $r = \rho$. In the urban centres, production function depends on the accumulated skills as well, so that human capital accumulation is given by

$$\frac{\partial h(t)}{\partial t} = \delta h(t) [1 - u(t)] \quad (6)$$

where the skill level $h(t)$ is reached employing $1 - u(t)$ time to that activity, while $u(t)$ is the time devoted to the goods production. Each family will maximize over $u(t)$ and $h(t)$ such to optimize the stream of profits from its two main activities, production and human capital accumulation, so that the problem of the representative family is stated as

$$\max \int_0^{\infty} \exp \left[- \int_0^t r(s) ds \right] h(t) u(t) dt \quad (7)$$

s.t. (6), with $u(t) \in (0, 1)$

whose solution gives the optimal path for human capital and interest rate as

$$h(t) = \delta \int_t^{\infty} \exp \left[- \int_t^{\tau} r(s) ds \right] h(\tau) u(\tau) d\tau \quad (8)$$

$$r(t) = \delta \quad (9)$$

Condition (8) reveals that each family will accumulate human capital up to the point where the benefits – the right hand side – equals the cost opportunity of devoting one unit of time to skill acquisition, instead of employing it in goods production. Solving a similar problem in order to maximize consumption, as given in (4), under a budget constraints, each family find out its optimal path of consumption $c(t)$. In equilibrium these two choices yield that

$$\frac{1}{c(t)} \frac{dc(t)}{dt} = \frac{1}{h(t)} \frac{dh(t)}{dt} = \delta [1 - u(t)] = \frac{\delta - \rho}{\sigma} \quad (10)$$

with a constant time employed to goods production given by

$$v = 1 - \frac{\delta - \rho}{\delta \sigma} \quad (11)$$

The migrating decision is based upon the evaluation, over the entire life time, of the earnings accruing in the rural and in the modern sector; while in the rural sector family earnings are given by $F'(x(t))$, in the urban centres they are given in any earlier date τ by

$$h(\tau) u(\tau) = h_0 \exp \left\{ \delta \int_t^{\tau} [1 - u(s)] ds \right\} u(\tau) \quad (12)$$

where new migrants will gain h_0 times the time employed working, with h_0 being the initial conditions for human capital accumulation path. The migration process

will stop when equality between the two earning streams is reached such that

$$\int_t^{\infty} \exp[-\delta(\tau - t)] F'(x(t)) d\tau = h_0 \int_t^{\infty} \exp\left[-\delta(\tau - t) \exp\left\{\delta \int_t^{\tau} [1 - u(s)] ds\right\}\right] u(\tau) d\tau \quad (13)$$

which, given that the right hand side is equal to h_0/δ , can be re-written as

$$F'(x(t)) = h_0 \quad (14)$$

The result in (14) implies that in equilibrium the value of farm employment $x(t)$ is constant and, more importantly, the whole migration process takes place at time $t = 0$. Finally, under goods market clearing condition, a constant labour force employed in both sectors does imply that condition (10) is satisfied for $t \rightarrow \infty$.

In order to overcome the shortcoming, which implies a full migration process at time zero, the model is modified by assuming the presence of an externality in human capital accumulation, which extent depends on a parameter θ , such that its production becomes

$$\frac{\partial h(s, t)}{\partial t} = \delta \left[\frac{H(t)}{h(s, t)} \right]^{\theta} h(s, t) [1 - u(s, t)] \quad (15)$$

with $H(t)$ denoting the highest level of human capital that it has been reached in the economy, and $h(s, t)$ is the human capital level of a person who decides to migrate at time $s \leq t$. Now migration ceases to be instantaneous, while being increasingly attractive, as people who migrate earlier accumulate better and better skills. As in the above formalization, convergence toward the steady state given in (10) is reached along a balanced path. Several conclusions are offered by this specification. Firstly, larger is the externality (i.e. higher θ), faster is the process of migration. Secondly, the time path of this process entails that at time zero there is an initial migration to the city of $1 - x_0$ migrants, which are all immediately employed in the modern sector. These migrants start accumulating human capital, and once this accumulation does reach a level at which external effects are strong enough to increase the incentives of

rural workers to migrate toward city, other flows of migrants come to the city. This process follows until all the rural workers are exhausted in the agricultural sector. Finally, the strongest contribution of this model deals with the Todaro's paradox and the unemployment caused by the migration process. It is shown that higher is the externality, earlier does unemployment start rising, and higher the level it will reach in equilibrium; as people are perfectly aware of the consequences of their migration decision, the unemployment, which Todaro's model implies as a consequence of the increasing number of jobs in the urban sector, is completely voluntary.

3 Informal sector, human capital and social interactions

Based on the Harris and Todaro model, several extensions have been proposed in the literature. In this section, we will review them with particular attention at the role of the urban informal sector and at the implications of the insights furnished by the new growth theories literature on market imperfections and agents heterogeneity. Relevant consideration is attached to the role played by the human capital accumulation for the interplay between growth and inequality and for its effect on individual well-being. As pointed out by several authors (among others [Rauch, 1993](#); [Temple, 2005b](#)) a distinguishing and surprising feature of the basic Harris and Todaro analysis is that no insights are offered with regard to the effect of dualism on inequality, even if the aim of that work is to investigate the structural process leading an underdeveloped economy toward a developed one; more specifically, the basic Harris and Todaro formalization appears to produce no inequality within the urban sector and between this and the rural one.

3.1 Agents heterogeneity and endogenous unemployment rate

One of the main questioned points of the original dual economy models is the hypothesis of downward rigidity of the urban wage, which does carry over the exogenously fixed unemployment rate assumption. In order to overcome this weakness, [Bencivenga and Smith \(1997\)](#) offer a neoclassical growth model to study the migration process from a rural to a modern sector, with an informal sector and heterogeneous agents. They replace the frictions on labour markets with the hypothesis of agents heterogeneity. Instead of assuming downward wage rigidity in the urban labour mar-

ket they assume that agent heterogeneity is the source of asymmetric information problems; agents differ for their skill levels and this, in turn, produces the information asymmetry, under the required assumption that the type of the agent is private information. Ultimately, it is this latter feature that allows them to endogenize the unemployment rate rather than assuming it exogenously. The model resembles the basic Harris and Todaro structure, with the unemployment rate in the formal sector being a positive function of the wage rate in that sector (i.e. the Todaro's paradox); yet seemingly, this unemployment rate equilibrates the expected incomes that low skilled agents obtain in the urban and rural sectors. As both the wage rate and the unemployment rate in the urban sector are now endogenous, the model is evaluated also to assess whether it is dynamically consistent. It results that either one or two nontrivial steady-state equilibria may arise; in the case of unique steady state, this is also asymptotically stable, while in the case of two steady-states equilibria usual "trap" phenomena are manifest. In this latter case, an high capital stock asymptotically stable equilibrium is coupled with a low capital stock equilibrium, which may be asymptotically either stable or unstable, displaying, in the former case, strong fluctuations, which derive from the adjustment nature of the endogenous unemployment rate. Underemployment makes the rural-urban wage differential varies over time until equalization is reached through the presence of unemployed workers in the urban sector. While in the benchmark model *a la* Harris and Todaro this process toward wage equalization follows a monotonic path, in this endogenous framework it is well likely that intervals of high growth and intensive migration are followed by low ones with migration slowdown or yet backmigration toward rural sectors. This may happen since high capital/labour ratios in the urban formal sector imply high average income levels and, in turn, high levels of savings and future aggregate capital stock; however, if the high average incomes in the city increase excessively the incentives of rural workers to migrate there, the capital/labour ratio may fall in successive periods, producing the non-monotonic path, which is ultimately the likely source of multiple equilibria.

3.2 The informal sector

In the original Lewis ideas as well as in its later formalizations, the urban informal sector is proposed as an unproductive one which would only serve as source

of a seemingly “reserve army of labour” of Marxian memory. Further advances in theoretical and empirical literature highlight, instead, that a productive informal sector couples the formal one in urban centres. This issue is accurately analysed in Rauch (1993), where the implications for inequality patterns of introducing an urban informal sector in the Harris and Todaro model are studied in a small open overlapping generation economy with three sectors; an urban formal, an urban informal and a rural sector. Correspondingly, three different and productive wage classes do emerge; the rural, the urban formal and the urban informal workers. Given the perfectly competitive structure of the capital markets, this formalization yields interesting results about permanent income inequality, which is evaluated as an intergenerational transmission process of current wage income inequality. More formally, let the two budget constraints for young and old people be

$$p_{at}c_{at}^y + c_{mt}^y + s_t = w_t \quad (16)$$

$$p_{at+1}c_{at+1}^o + c_{mt+1}^o = (1 + r_{t+1}) s_t \quad (17)$$

The wage w_t earned when young is shared between consumption of agricultural, c_{at}^y , and manufactured goods c_{mt}^y , with the latter being the numeraire, and savings s_t ; when retired the old agent shares savings accumulated in the previous period between agricultural, c_{at+1}^o , and manufactured goods c_{mt+1}^o . Each risk-averse individual maximizes its own lifetime utility under these two budget constraints, yielding an indirect utility function $v(w_t, r_{t+1}, p_{at}, p_{at+1})$, on which also savings $s(w_t, r_{t+1}, p_{at}, p_{at+1})$ depend. Production is assumed to be performed under constant return to scale conditions, so that

$$Q_{mt} = F_m(K_t, N_{mt})$$

and

$$Q_{at} = F_a(L, N_{at})$$

may be re-written in their intensive forms as

$$q_{mt} = \frac{Q_{mt}}{N_{mt}} = f_m(K_t/N_{mt}) \quad (18)$$

and

$$q_{at} = \frac{Q_{at}}{N_{at}} = f_a(L, N_{at}) \quad (19)$$

with the neoclassical properties satisfied. Production in the modern sector (Q_{mt}) employs both capital K and workers N_m , while in the rural sector only land L and workers N_a are employed in the production (Q_{at}).

Two cases are distinguished depending on the relevance of the agricultural sector in the economy. When it is very large with respect to the urban one, a labour surplus makes the urban minimum wage to be binding at a level determined by the unique capital-labour ratio k , so that the urban minimum wage is given by

$$\bar{w}_m = f_m - \bar{k}f'_m \quad (20)$$

and the interest rate by

$$f'_m(\bar{k}) = \bar{r} \quad (21)$$

This situation is opposed to the one when the informal sector disappears because the economy has fully completed its development path, so that $N_{at} = 1 - N_{mt}$, and the wage rate is determined by equality with respect to its marginal product. The informal sector is characterised for a capital intensity lower than in the formal sector; it is, further, assumed that the informal sector produces a manufactured good without employing capital, but only labour. Let \underline{w} be the wage in the informal sector, so that $\underline{w} \leq \bar{w}_m$; in equilibrium given diminishing return to labour and given that the capital-labour ratio increases over time due to the migration process, it must be the case that $w_{at} \geq \underline{w}$, so that no limits are imposed to the individual possibility to reach the urban centres and installing an informal activity, which does require any capital investment. In order to avoid that at time zero no one would have incentive to migrate, it is assumed that when all the population is in the agricultural sector $w_a(1) \leq \underline{w}$. Similarly to the original Harris and Todaro, the exogenous probability of getting a job in the formal sector is given by $N_{mt}/(1 - N_{at})$ so that the probability to end up underemployed in the informal sector is given by

$$1 - \left[\frac{N_{mt}}{1 - N_{at}} \right] = \frac{(1 - N_{at} - N_{mt})}{1 - N_{at}} \quad (22)$$

The migration decision is based upon the evaluation of the relative benefits of migrating or not; in the initial phases of development, when the urban minimum wage is largely binding a young agent will face with

$$v(w_{at}, r_{t+1}) = \left[\frac{N_{mt}}{1 - N_{at}} \right] v(\bar{w}_m, r_{t+1}) + \left[\frac{1 - N_{at} - N_{mt}}{1 - N_{at}} \right] v(\underline{w}, r_{t+1}) \quad (23)$$

and since also the interest rate is fixed at \bar{r} during this earlier stage, (23) yields

$$v_a = \left[\frac{N_m}{1 - N_a} \right] \bar{v} + \left[\frac{1 - N_a - N_m}{1 - N_a} \right] \underline{v} \quad (24)$$

with $v_a = v(w_a, \bar{r})$, $\bar{v} = (\bar{w}_m, \bar{r})$ and $\underline{v} = (\underline{w}, \bar{r})$. Otherwise, in mature stages, when the urban wage is no longer binding, $N_{at} + N_{mt} = 1$. On this structure, it is proved that a) the agricultural sector share of labour decreases monotonically along a growth path, b) the economy exhibits the Todaro's paradox only under some conditions, and in particular it does not when the labour share in the urban formal sector is large enough. Yet under some specific conditions it is shown that the unemployment rate follow an inverted-U pattern as well as the log-variance of permanent income.

In order to deepen the intrinsic features of the informal sector, Banerjee and Newman (1998) study the implications of community effects for the pattern of migration and for the long-run relationship between development and income distribution. In a standard dual economy with two sectors, rural and modern, different degrees of information asymmetry are introduced such to discriminate between those sectors, depending on the degree of societal cooperation; the rural sector is distinguished by the urban one for its lower level of information asymmetry due to stronger community linkages. The higher quality of information of the rural sector, which implies a credit ration thresholds lower than the one attached to the urban sector, is shown to strikingly shape the migration pattern and the relationship between inequality and development. The other difference between the two sectors is the higher productivity of the urban sector with respect to the rural one. The economy is inhabited by a continuous of agents, the typical of them living for one period, and beginning his life endowed with an amount a of wealth and one unit of labour. This unit of labour is indivisibly used either in the rural or in the urban sector; given the productivity

advantage of the latter, it results that an individual who earn w in the rural areas can earn λw in the urban centres, with $\lambda > 1$. At the beginning of his life, the agent makes a location choice between the two sectors, which does not involve any costs; labour as well as capital are freely mobile. Agents have to choose how much investing in human capital, which entails a cost m such that utility is given by

$$U = y + u \tag{25}$$

with

$$u = \begin{cases} s > 0, & \text{if } m > 0 \\ 0, & \text{otherwise} \end{cases}$$

In a first-best world, without any information asymmetry such that each individual might borrow and lend at market rate r , everyone would eventually migrate to the city earning an utility

$$U = \lambda w + s - (a - m) r \tag{26}$$

In presence of market imperfections of the type described above, instead, borrowers and lenders will face on with two incentive compatible constraints; one ex-ante and one ex-post the realization of the borrower income. More precisely, after obtaining a loan but before the income realization of that loan – i.e. before human capital investment reward is verified – the borrower may escape with a probability ρ , while, if caught, he is punished with his consumption reduced to zero. Since lenders know this probability, and moreover they know that an individual who tries to escape may obtain at maximum $\rho\lambda w$, while in case he decides to respect the contract he can obtain $w - (m - a)r$ (or in the city $\lambda w - (m - a)r$), the ex-ante incentive compatible constraint for not reneging is

$$\rho\lambda w = w - (m - a)r \text{ (or } \lambda w - (m - a)r)$$

which does establish the minimum wealth needed to be ex-ante eligible for a loan, depending on the location; the minimum amount of wealth required as collateral to an individual who is born in the rural sector and agrees to not escaping the contract by staying in the village is

$$a \geq a_A^V \equiv m - \frac{((1 - \rho\lambda)w)}{r} \quad (27)$$

while the same amount for an individual who is born in the village but has agreed to stay in the city is

$$a \geq a_A^C \equiv m - \frac{((1 - \rho)\lambda w)}{r} \quad (28)$$

Similarly, ex-post incentive compatible constraints arise after the realization of the income borrower, when time of repaying the loans arrives; in this case there is a positive probability π that the borrower achieves in escaping the repayment, while otherwise the same punishment is applied. As lenders know also this probability, they require a collateral, which respects the possibility that the borrower will renege on loan repayment; hence, the minimum amount of wealth needed for the lenders to be insured is

$$a \geq a_P \equiv m - \frac{((1 - \pi)y)}{r} \quad (29)$$

The necessary amount of initial wealth required for qualifying for loans is $a \geq a_l = \max\{a_P, a_A^l\}$, with $l = V, C$; this wealth level is a positive function of the interest rate, of the probabilities of escaping and renegeing on loan repayment, and a negative function of the income level. These two conditions show a first result; namely, the wealthiest, the most productive, and possibly the poorest and least productive are the individuals who have the highest incentive to migrate toward the urban centres. The rich migrate since they are not constrained, the most productive as they have much to gain, and the poorest and least productive, as they have nothing to lose¹. As the rate of interest is associated to these wealth levels, an important caveat arises. Conditions (27) to (29) imply that the interest rate is higher in the rural sectors; even though it is apparently a strange result, since the capital markets works relatively well in the rural areas, due to the higher level of social capital, this result may be ascribed to self-selection dynamics active in the urban centres. Since who migrates to city is either the wealthiest or the poorest, lenders know that who asks for a loans must furnish the collateral, and since only the

¹See also Banerjee (2000) who analyses poverty essentially in two distinct views; “poverty as desperation” and “poverty as vulnerability”. Different implications of binding constraints apply, depending on which view of poverty we refer to.

former can afford this collateral, because the poorer does not own that amount, so lenders know also the distribution of the risk which the lending activity entails and the distribution of these agents; given that only good borrowers will ask for a loan in the city, lenders are able to charge a lower interest rate there. This feature leads to an important second result; more people will move to the modern sector when the interest rate is either very low or very high. These results stem from the assumed differences in “social capital” between the two sectors. In order to characterize them formally, it is assumed that for loans originating in the rural areas and directed to people born there and that decide to remain there even after the loans, the condition $\rho = \pi = 0$ applies; that is, it is very difficult both to escape and renege on loans repayment in very cooperative habitats, where the social controls and punishments are very strong. In this case, the threshold level of wealth needed for obtaining a loan is given by

$$a = a_V \equiv m - \frac{w}{r} \quad (30)$$

Otherwise, in the urban centres the probability π of renegeing on loans repayment is large enough that the condition $\lambda(1 - \pi) < 1$ holds; moreover, the ex-ante probability of escaping is either positive and equal to π or equal to zero, depending respectively on whether loans are originating in the urban or rural areas. The minimum wealth level for an individual who locates in the city at any time of his life is given by

$$a = a_C(w, r) = m - \frac{(1 - \pi)\lambda w}{r} \quad (31)$$

with $a_C > a_V$.

In equilibrium, three classes of people migrate from rural to urban sector; firstly, the richest, for whom

$$a \geq a_C(w, r) \quad (32)$$

These migrate as they increase their payoff; while in the rural areas they can gain $w - mr + ar$, they will earn $\lambda w - mr + ar$ in the urban centres, so that they surely migrate. Secondly, the poorest migrate because they have nothing to lose; and for them the following condition is verified

$$a < a_V(w, r) \quad (33)$$

Finally, individuals with wealth $a \in [a_V, a_C]$ will migrate if and only if for them $\lambda w - s + ar \geq w - mr + ar$, that is only if the interest rate is higher than a threshold level

$$r \geq \frac{s}{m} - \frac{(\lambda - 1)w}{m} \equiv \hat{r}(w) \quad (34)$$

As in Mude et al. (2007, see below) information asymmetry due to community effects lead to underinvestment in the rural sector, here information advantage of that areas may lead to inefficient undermigration and undermigration traps both in the static and in the dynamic equilibrium. In the static equilibrium, undermigration or inefficient migration is associated with the possibility that some agent is trapped in the rural sector. This case may arise whenever the equilibrium interest rate is not higher than \hat{r} ; since the lowest level of the interest rate is 1, as its range is given by $r \in [1, s/m]$, the condition of inefficient migration derives from:

$$1 \leq \frac{s}{m} - \frac{(\lambda - 1)w}{m} \quad (35)$$

from which the condition for observing undermigration is given by

$$(s - m) \geq (\lambda - 1)w \quad (36)$$

Higher is the productivity gap between the two sectors, higher is the possibility that everyone chooses to migrate, because the chance to gain a lot is high enough to let people assume the risk of incurring the cost of not obtaining the loans in the city. This leads to the last result of the static equilibrium, following which that inefficiency is coupled with a global inefficiency; in equilibrium the social surplus is lower than the maximum attainable, had the entire resources of society been fully used. When capital markets are complete and perfectly working the interest rate attains its maximum level at $\bar{r} = s/m$, which implies also that the surplus, defined as total output plus the net value of all youthful consumption, attains its maximum at

$$\bar{Y} = \lambda w + \left(\frac{s}{m} - 1\right) \bar{a} \quad (37)$$

where \bar{a} is the aggregate supply of loans. If the equilibrium interest rate r^* is such that $r^* \equiv r^{h^*} \geq \hat{r}$, everyone migrates to the modern sector so that national income is given by

$$Y^{h^*} = \lambda w + (r^{h^*} - 1) \bar{a} \quad (38)$$

which is high but less than \bar{Y} , since the interest rate is yet lower than s/m , that is $r^{h^*} < \bar{r} = s/m$. If the equilibrium interest rate is lower than that threshold level, that is $r^* \equiv r^{l^*} \leq \hat{r}$, not everyone migrates, but the migration decision will depend upon the initial wealth level; in particular, agents born in the traditional sector with initial wealth level between a_V and a_C , that is for $a \in [a_V, a_C]$, do not migrate. Let $R^C(a)$ and $R^V(a)$ be the distribution functions of the inherited wealth respectively in the urban and rural sector at the birth date of the generation; $R^C(a)$ and $R^V(a)$ represent the share of population born in the urban and rural sector with wealth $a_i < a$. For $r^* \equiv r^{l^*} \leq \hat{r}$, national income is $Y^{l^*} < Y^{h^*}$ and given by

$$Y^{l^*} = \left\{ 1 - p(r^{l^*}) \right\} \lambda w + p(r^{l^*}) w + (r^{l^*} - 1) \bar{a} \quad (39)$$

where $p(r^{l^*}) \equiv R^V(a_C(r^{l^*})) - R^V(a_V(r^{l^*}))$. From (32) to (34) it follows that the share of population born in the rural sector, who holds, at the interest rate r^{l^*} , a wealth level higher than the required in the city for qualifying for a loan, $a_C(r^{l^*})$, and the share of that population who, otherwise, holds an initial wealth lower than $a_V(r^{l^*})$ will migrate to the city earning an income λw , while the rest will remain in the rural sector earning the income w . This is the dual character of this economy; in this last equilibrium those individuals who do not migrate are better off than they would have been in the urban sector, since they are able to get loans which they would have not got in the city. However, the national income is lower, as had they been forcibly moved to the urban sector, the aggregate output would have been higher. Although membership in the rural sector helps those disadvantaged, it entails a cost for the society, in terms of lower aggregate output. In any case, even if the poor were forced to move to the city, a Pareto improvement would be not possible, since lenders would face on with a loss, necessary to compensate the increased benefits of the urban poor. This conclusion resembles the long-established one obtained by Stiglitz (1969) in a different theoretical environment; societies with

a large share of very poor people would ultimately converge, if any, toward a low steady state equilibrium. Finally, it is worthwhile to notice that the degree of undermigration depends not only upon the first moment of the wealth distribution, but also on its higher moments; it is the whole wealth distributions within the two sectors that works as state variable and determines how many people migrate in equilibrium. On the former side, it may likely be an actual issue only if the rural economy has an aggregate wealth sufficiently high, such that a lot of poor individuals had something to lose in migrating. On the latter side, the degree of undermigration depends also on the variance and skewness of the wealth distribution; for instance, undermigration or “dual traps” are more likely to be observed if the distribution is quite unegalitarian and the mean is reasonably high, so that $R^V(a_C(\hat{r}))$ is likely to be large. Coupling this condition with the ones stated above, it is easily explainable why “dual traps” may be observed not only in developing countries, but also in developed ones, as, for instance, in the case of Italy or more generally in the case of middle-high income countries with strong degrees of inequality; these are situations in which poverty does persist over time because backward areas, due to a highly uneven distribution, may not be able to reach the famous Lewis “turning point”. The equilibrium is analysed also dynamically to assess whether the undermigration is an actual possibility also in the very long-run and to evaluate the implications of the interplay between growth and inequality on the development process. The dynamics are very complex. On a side the rate of growth depends on the extent to which people achieve to pass on into the urban sector and then on the institutional differences between the sectors; conversely, in the long run, these institutional differences contribute to shape the economic growth pattern. Despite these difficulties, it is shown that, for instance, even if under some specific parameterizations of the model Kuznets patterns are possible, it may very likely be the case that U-shaped patterns are observed, with inequality rising during the development process.

3.3 Human capital

Large parts of the new growth theories literature have shown that heterogeneity in skill levels (Alesina and Rodrik, 1994; Benabou, 1996c; Glomm and Ravikumar, 1992), constraints on human capital accumulation (Galor and Moav, 2004, 2006; Galor and Tsiddon, 1997a) and capital markets imperfections (Galor and Zeira, 1993)

are able to explain the sources of the growth-inequality correlation and are powerful predictors of adverse effects on individual poverty (Azariadis, 1996; Durlauf, 1996). Masson (2001) applies these issues in a dual economy model, where heterogeneous individuals internalize the cost of acquisition of the skills that are required and may be used in the formal urban sector. Individuals are distinct on the basis of differences in innate abilities and in initially inherited wealth, which is the only source for investing in human capital. Human capital acquisition is necessary for working in the formal urban sector at an institutionally fixed wage above the market clearing condition, while a large share of the population – the poor – may be blocked in passing into the formal urban sector due to capital market imperfections which are modelled assuming that people are not able to borrow any amount of wealth. Acquiring necessary skills to be employed at higher wage in the formal sector involves a cost, which take the form of an indivisible investment in human capital accumulation and of an opportunity cost for the family of children who would be, otherwise, employed in farm or informal income generating activities. Individuals take their migration decision depending on its implied benefits so that in equilibrium the rate of unemployment equalizes rural wage to urban expected income; the expected income streams of the urban sector take into account those costs such that the urban wage necessary for equilibrium must exceed the rural one not only to reflect the probability of unemployment but also the costs of skill acquisition. People in the urban sector, were they migrants from rural sector or people born in the formal one, face on with the chance of backmigration to the agricultural region, which entails a cost as well. Under this formalization wealth distribution plays an important role in determining the sort of several dynasties; rural as well as urban poverty may arise as consequence of an initial wealth level low enough to impede poor people to acquire the necessary skills to enter the formal sector. Migration option is chosen only by the wealthier and the higher ability individuals, while the poorer and the lower skilled, who would require a larger investment in human capital, decide to remain in the rural regions. Several possible steady-states may arise, depending on whether the wealth level of urban unskilled individuals is higher or lower than the cost of accumulating human capital and depending on the extent of the backmigrating costs. The dynamics, as in Banerjee and Newman (1993), are very complex due to the connection between wealth distribution, aggregate unemployment and agricultural wage; as these two latter affect individual migration decision and yet wealth accu-

mulation, the dynamical process is described by a non-stationary Markov process, which solution is left to different parameterizations.

The presence of an informal sector may affect educational attainments also through community or neighbourhood effects, which may shed many lights on the intergenerational transmission of inequality (Benabou, 1996b; Durlauf, 2004). Mude et al. (2007) supply a dual economy model with an informal finance sector which, since the presence of imperfections on capital markets due to enforceability problems, must restore the financing gap between poor and rich, task which would be otherwise accomplished by perfectly competitive markets. Community or neighbourhood effects may be essential for the chance to escape the poverty condition; however, community stratifications are the source of asymmetrical information problems which drive financial markets toward enforceability issues as well. In the literature it is quite well recognized a distinguishing feature of the traditional or rural sectors with respect to the more developed ones; the former are built on close associations of its members, such to create cooperative habitats, as it is the case of informal provision of financial services; otherwise, in the urban centres deeply characterised by impersonal relationships among its members, such mutual aid element is ignored. Hence, while acquiring information on the goodness of the borrowers is relatively cheap in rural-traditional society, lenders face on with higher costs in the urban centres (see section 3.2 above); moreover, while in the former centres, escaping or renegeing on contracts is more difficult, since the presence of social sanctions makes punishments to be more credible and enforceable, in urban centres the high probability that the borrowers might escape or renegeing on the loan debt let the lenders to charge higher costs for lending. Under these conditions, migration options may influence educational attainments as well as be affected by spatial differences on educational returns; if educational attainments, which may depend on cooperation among community members, can influence migration decision, this latter is also affected by the former, because lenders in traditional sector will take into account the cost associated to the possibility that an individual, once financed, will migrate to the city, so to induce an increase in the costs to let the contract be strongly enforceable. In this latter case also informal financing market equilibria will depend on educational returns, and not only the reverse; so whether an increase in wage premia in the city is positively correlated to migration incentives in the rural sectors, these latter also amplify the problems of the financing sector, resulting in the likely

underinvestment in rural education. Contrary to the Bencivenga and Smith (1997) results, now rural high-ability individuals may end up penalized for being born intelligent. On a side high innate abilities stimulate migration choices, but, on the other, this higher incentive is conflictingly evaluated from the lenders; more precisely, once lenders recognize that highly skilled individuals will migrate to the city in order to exploit the urban wage premia, the wealth constraints of the rural individual will be strongly tied, due to the higher probability of escaping or reneging on the debt, with a corresponding reduction on educational loans. As a result of the negative correlation between educational loans and innate skills, community-funded schemes ceases to be efficient and must be replaced with individual funding; highly skilled children will depend only or mainly on the initially wealth conditions of their own families for investment in human capital, reproducing the familiar conclusions of the new growth theories. Rich households, independently on the degree of enforceability of the loan contracts and on the innate abilities of their children, will be able to afford their children required investment in human capital; otherwise, poor households will be hardly constrained in supplying the necessary investment in human capital to their children, even though these may own high innate abilities. In turn, this circumstance produces two apparently negative effects on the whole society. On a side, persistent inequality and poverty may be infinitely reproduced, because of the inherently asymmetry between family-funded and community-funded schemes; while families would prefer their children migrating to the city in order to escape poverty, but they are constrained, community-funded schemes predict, on the contrary, that those migration choices are limited, as consequence of the enforceability issues. A direct caveat of this circumstance is that inefficient allocation of educational funds may arise; under the hypothesis of no correlation of innate abilities and family wealth, it is well likely to be that some of the highly skilled children will not obtain their optimal educational level, because of their household low wealth, while, otherwise, some of the low skilled individuals may obtain their fully optimal level, due to the higher financial possibilities of their families. These asymmetries carry over aggregate inefficiencies as well, since poverty may persist over time also because of the adverse effects on the aggregate production of the society. This result couples the ones obtained in Benabou (1996b) and Durlauf (1996), where strong stratification of societies with respect to the productivity or to the income dimension may drive to severely negative consequence for inequality and poverty reduction.

3.4 Speed of urbanization and occupational choice

The dynamics and the speed of the urbanization process in dual economy settings have been analysed by studying the implications of the occupational choice mechanisms (Banerjee and Newman, 1993; Mesnard, 2001; Rapaport, 2002) and by emphasizing the role of the demand side of the economy (Yuki, 2007). Economic growth affects both the extent of urban concentration and the speed at which this does occur; on the former side, the level of urban concentration is positively related to income's level, while on the latter the speed of urbanization follows an inverted-U pattern, initially increasing for low level of income and then decreasing after reaching its maximum when incomes are grown enough. The speed at which this process occurs does not only depend upon income growth, but also on the institutional structure of the society; the presence of an informal sector may imply that higher its extent, higher the chance that a large share of immigrants does not benefit from economic growth. Ravallion (2002) in a very simplified model identifies the conditions under which the poor urbanize faster than the non-poor, showing that the urban share of the poor is an increasing convex function of the urban share of the population. These issues are formally marked by Yuki (Yuki, 2007) in a dual economy model with a productive informal sector; each of the three sectors produces a different good. The goods differ each other for the degree of technological intensity incorporated in their production; the rural sector produces an agricultural tradable good with a diminishing return to scale technology, the urban informal sector produces a non-tradable good (i.e. services) with a constant return scale technology, while the urban formal sector, the more technologically advanced, produces a tradable good always under constant return to scale technology. The choices of a continuum of individuals are structured in a discrete overlapping generation model, in which individuals live for two periods; in the first, when young, they receive transfers in the form of bequests from their parents to be invested either in financial asset or in education which is necessary for acquiring the needed skills to work in the higher wage-urban formal sector. When adult, each agent makes his occupational choice, depending on this accumulated human capital. In the dynamic equilibrium, it is proved that two possible steady states may exist; an equal and unequal opportunity steady states – as the author refers to. In the former, which broadly characterizes a typical developed economy, many people are educated and skilled, much of them

live in the urban centres, and inequality between urban and rural areas is small. In the other equilibrium, the unequal one, which otherwise characterizes a typical developing economy, many people live in the agricultural sector, with a low level of education and skills even amongst the urban resident, with a substantial informal sector and high level of inequalities. The economy approaches one these two states in the long-run, the key determinant eventually being the initial share of the population who is wealthy enough to acquire education. An economy starting with a large fraction of poor will converge towards the unequal opportunity steady state, and during the balanced path it urbanizes without modernization but with the expansion of the informal sector, and increasing both urban and rural poverty and inequality. Conversely, economies starting relatively richer such to accumulate less financial assets and more human capital in the initial phases of the development will converge to the “higher” steady state, producing during the path a marked falling in inequality. Although this result resembles much of the conclusions obtained in the literature, it is worthwhile to spend some words on the channels through which it is obtained. The reason for why, in this model, the key determinant of the long-run outcome is the share of initial “poor”, or better the share of people who can afford educational expenditures, and consequently the wealth distribution, is related to the role of the demand for informal goods. The way in which the economy may end up over the high path is by increasing the number of skilled workers in the formal sector; in turn this depends upon the possibility of the unskilled agents, who are endowed at time zero with low or zero amount of wealth, to accumulate enough wealth to be bequeathed for their children educational investment. This accumulation rate does rise when and whether this class of people achieves to migrate into the informal urban sector, where they can earn a higher wage, as they cannot aspire to the formal sector for lacking of the required educational skills. This migration, in turn, is possible if the price of the good they produce goes up in the formal urban sector, that is if the demand for that good increases. Since an initially greater number of skilled individuals may sustains this price both because higher is the demand and lower the supply, as skilled workers produces another class of goods, the conclusion is confirmed; the key variable for establishing the destiny of a society is the initial proportion of poor. If the economy starts relatively poor, since either wealth is strongly uneven distributed over few rich or the limited amount of wealth is distributed over an high number of poor, skilled labour is insufficient to sustain a

high enough price of the informal sector good such to allow unskilled people to migrate to the informal sector; their children will not be able to obtain education and the economy will develop on a path, with sustained inequality, persistent poverty and strong marginalization. Otherwise if the society starts relatively richer or starts with a more egalitarian wealth distribution.

4 Growth, inequality and poverty in dual settings

In this last section we review a methodology which makes more explicit the usefulness of the dual economy models in the analysis of the linkages between growth, income distribution and poverty and we will show how these theoretical tools may work in practice in the assessment of the pro-poor growth.

In a dual economy model Bourguignon (1990) introduces the use of the whole Lorenz curve to assess whether and under what conditions economic growth is either unambiguously or not conducive for an egalitarian distribution, and how these conditions matter for assessing the pro-poor character of the economic growth (see also chap. 15 in Bardhan and Udry, 1999; Temple, 2005b). The relevance of this approach stems from the fact that although two-sector models are theoretically able to represent the famous inverted-U pattern of development (Kuznets, 1955), they may experience two pitfalls, which derive from using parametric or standard measure of inequality and from assuming that internal terms of trade does not matter. On a former side, it is likely to be that even though a growing proportion of individuals become richer, due to the migration process from a rural to a modern sector, the Lorenz curve of the income distribution does not shift accordingly over its whole support. It may very likely be that despite the fact that the number of poor actually diminishes, the remaining poor becomes relatively poorer with respect to the mean income. In this case standard measures of inequality may represent conflicting views according to which inequality might be either increasing or decreasing, without any certainty. On the other side, Bourguignon (1990) stresses that the basic two-sector models with exogenous prices do not take into account a fundamental feature of development, namely the change in the internal terms of trade; as also shown above in Yuki (2007), this variable may strikingly matter for the potential of the unskilled workers to enter the urban sector and hence an upward path of increasing income and decreasing poverty. These issues are analysed

in a dual economy model, in which a capitalist class is added in the urban sector to evaluate the patterns of inequality within the sectors as well as between them. A rural sector, whose population is employed only in their family farm production, is coupled with an urban one, composed by capitalists and employed workers. Workers are hired from the capitalists for the production undertaken in the urban centres and the former have a wage lower than the profits made by the latter but higher than their opportunity income in the farm production. Under this specification, necessary and sufficient conditions for growth to be unambiguously unegalitarian or conversely egalitarian are found out; yet, necessary and sufficient conditions for growth to increase or decrease relative poverty are put forward. Notwithstanding the complexity of these conditions, it is worthwhile to stress here that they mainly depends on the relative extents of the price elasticities of the goods produced in the three sectors, and on the extents of the relative shares in GDP of the three sectors. For growth to be unambiguously egalitarian, or more specifically to observe a completely upward movement in the Lorenz curve, it is required that the share of the traditional sector in GDP does increase with growth; given that historically this pattern is not observed, it is difficult to sustain that growth may produce an unambiguous decrease in inequality. It is also stressed that this result is very sensitive to the assumption that the wage rate in the urban sector is only indexed on the price of the modern good; if, conversely, it is assumed that this wage may depend also on the price of basic agricultural goods, then a different conclusion applies. It is found that growth might be egalitarian, despite the fall in the GDP-share of the rural sector, whenever capital-labour is inelastic in the modern sector, since a fall in the profits rate is necessary in order to observe a drop in the income of the capitalist class, the richest one, with respect to the mean income in the population, given that the GDP share of the modern sector rises over time. This drop may be observed only if the elasticity of substitution in the modern sector is less than unity, since the wage-price ratio is increasing in the modern sector. Seemingly, sufficient and necessary conditions for growth to be either unambiguously unegalitarian, that is in order for the Lorenz curve to shift completely downward, or ambiguously unegalitarian, that is when Lorenz curves between two successive periods intersect, are supplied. This approach is used, finally, for assessing the impacts of economic growth on relative poverty as well. Although this last model lacks the microeconomic foundations largely employed in the literature surveyed in this paper, it is worthwhile to notice

its precious insight; it has the merit to highlight the ways in which dual economy models may be used to evaluate the relative role of economic growth and income distribution on the individual well-being. Taking into account general equilibrium effects and integrating them with the advances of the new growth theories, it is likely to be that dual economy tools may still deserve a central place in the explanation of why and whether some countries, areas, or regions observe increasing or constant poverty rates, despite experiencing significant growth rates.

5 Conclusions

In this paper we review a recent literature on dual economy models which adopts a modern approach integrating the basic features of those models with the advancements made by the new growth theories. Rather than assuming a wage exceeding the marginal product in the rural sector or independent of the labour demand in the modern one, this modern approach focuses on more commonly labour markets imperfections or on broadly market imperfections which carry over labour markets (for instance human capital market imperfections due to financial markets imperfections which carry over labour markets). We pay specific attention to the role of agents heterogeneity, market imperfections (financial, human capital and so forth), non-convexities in preference and production structure. We show that the classical conclusions of the dual settings are enriched and often modified by adding more microeconomic structure to the supply and the demand side of the economy. Under this approach, dual economy models turn to be yet useful theoretical tools to explain how the growth-inequality-poverty linkages enter the long-run development of the societies and powerful predictors of income spatial difference. In particular they are suitable to properly evaluate the theoretical channels driving the analysis of pro-poor growth and hence to study questions like who benefits, and how much, from economic growth, or yet whether and the extent to which income distribution does matter for shaping the impact of economic growth on individual poverty. We claim that these theoretical environments may fit not only the characteristics of the developing economies, but also the structural transformation of the developed societies, in which there are large areas of marginalized poor.

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