A model of take-off and fast growth in open economies.

Luciano Boggio

Istituto di Teoria economica e Metodi quantitativi

Università cattolica "Sacro Cuore"

Largo A. Gemelli 1, 20123 Milano

Abstract

This paper proposes a stylised (hence very partial) explanation of the experience of those economies, which, like the East Asian NIEs, managed to create an economic take-off, characterised by a rapid expansion of manufactured exports, and to maintain for many years a high and relatively stable rate of growth of the economy. The model is based on *three* main hypotheses. *Firstly*, growth rate differences across open economies depend on the different success of each country's firms in competing for (internal and) international market shares. In Section 2 a model is built, where many firms compete in a large market and each firm plans a growth of capacity equal to the expected growth of demand. A result of this model is that differences in growth depend on differences in costs of production. *Secondly*, during the take-off of an open economy, the advantage in costs of production are amplified over time by a Kaldorian process of cumulative causation. Its formalisation in Section 3 borrows some aspects of Beckerman's model and incorporates the model of Section 2. In this formalisation the growth rate of a competitive country continues to increase. *Thirdly*, to interpret also a phase of high but approximately constant growth rate the paper introduces what may be called "dynamic decreasing returns", by which beyond a certain point increasing the rate of growth of the economy gets more and more difficult. The introduction into the model of these "dynamic decreasing returns" generates a second equilibrium point, characterised by a positive relative price, high growth and stability.

Section 1. *Introduction.*

The "miracle" growth of East Asian newly industrialising economies (NIEs) in recent decades, as is well known, was characterised by a rapid expansion of manufactured exports. This feature has been considered important for at least two reasons. First, a newly industrialising economy must import a large amount of intermediate and capital goods, the bulk of which must normally be paid by the proceeds of exports. Second, facing external competition is a powerful remedy to the risk of slack and misallocation, two evils so widespread in the experience of inward-looking industrialisation [1].

In this paper we want to stress another, hardly noticed, reason why, in our opinion, openness and reliance on expansion of manufactured exports combined with cost competitiveness played a crucial role in the exceptional performance of these economies.

Let us consider a market with many firms and denote by s_{it} , $i = 1, 2, ..., v$, $t \in [0, \infty)$ the market share at time t of the *i-th* firm. Let us also assume that its long run market share, S_{it}, depends on the price and quality of its products relative to those of the other firms and the rate of growth of the actual share – if everything else but market shares remains constant in the market - moves in time towards its long run value; moreover, that these shares are not affected by a change in the rate of growth of the total market sales, g_{Dt}.

Let us suppose that at time 0 the actual market share of the *i-th* firm is much lower than its long run market share, S_{i0}. When $s_{i0} < S_{i0}$, for a while the *i-th* firm will increase its market share and the growth rate of its sales will be the equal to the growth rate of the total market sales, g_{Dt}, *plus that of its market share*.

This may be the case of a small or newly established firm having low production costs relative to the other firms and selling products of a quality similar to that of most competitors at a lower price. The higher growth rate of sales implies a higher growth rate of productive capacity, hence a higher investment rate. This in turn, be it financed by internal or by external sources, requires - *ceteris paribus* - a higher profit rate. Therefore - as we assert in our model of Section 2 - the price difference generating the market share increase should not cancel completely the positive profit differential the firm could have: the appropriate price should be that one which makes the growth of demand equal to that of capacity, thereby generating both higher growth and higher profit rate.

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[1] It should never be overlooked, however, that also in these economies the first steps in the way to their industrialisation were done under the shelter of protection from foreign imports and with the support of various form of subsidy.

In a developing country selling in an international market, normally this cost advantage can be obtained thanks to low wages, as soon as the technical level and productivity approach those of more industrialised countries.

According to the theory outlined above, outward-looking industrialisation offers to a developing country, gradually gaining a strong cost competitiveness in several markets, the possibility of increasing its market shares in very large markets and, by consequence, of expanding rapidly – by definition, more rapidly than its competitors - the demand for its products and its output (as well as having higher investment and profit rates) [2]. If this process affects a large part of the economy, it can offer an element of explanation of the fact that such a country grows faster than the other countries[3] (a further, most important element of explanation being of course the analysis of the causes of the strong and persistent cost competitiveness).

One possible objection is that the East Asian NIEs' imports have been growing more or less in line with their exports[4], as required by the long run equilibrium of the trade balance – normally a

[2] This aspect of our approach show a similarity to that of those authors - connected with UNCTAD - stressing "the profit-investment nexus" in the explanation of the performance of the East Asian NIEs. Cf. *Akyüz* and Gore (1996).

[3] In order to have an acceptable (though still very partial) element of explanation of the exceptional economic performance of the East Asian NIEs, we shall try to provide some support to the idea that a fast growth of the market share can persist for many years. Let us consider then the case of a market growing at the rate of 3% p.a. and of a set of firms belonging to a given country growing at the rate of 8% p.a., so that the country's share grows approximately at the rate of 5% p.a. After 27 years the initial share will be multiplied by a factor of approximately 3.7. Hence, if the initial share was 3%, after 27 years will be 11,1%, if it were 9%, it will become 33,3% and so on. These figures – and other similar we could produce - show that, when the initial share is small (though non-negligible), a rapid growth of the country's share can last for decades without generating a completely unrealistic final share. Notice further that the whole point we are trying to make is considerably strengthen by the observation that the East Asian NIEs were gradually shifting their export expansion to new sectors, moving up the technological ladder.

[4] This fact could also give rise to the objection that exports have been growing simply because of growing *inter-industry trade* , which by itself does not imply any change in market shares. However, if we look at the figures this objection can hardly stand up: between 1965 and 1999, the annual growth rate of exports by (the Republic of) Korea was 15.6% and for East Asia and the Pacific 10.1%, whilst for the total of world exports was 5.9%. Why so much inter-industry trade

necessary condition for the long run equilibrium of the balance of payments. Would that mean that those countries were losing competitiveness and market shares in certain sectors as much as they were gaining in others, so that the net effect on the growth of the economy was nil? It is well documented that, as the industrial base was built up and industries with more sophisticated technology successfully introduced, at first primary sectors and then manufacturing industries producing resource-based and low-skill labour intensive goods lost importance [5]. However, most imports, particularly when the fast growth was starting, were goods *not produced at home*, like most intermediate and capital goods: in these cases no loss of market share was involved.

A further possible objection is the following: if the firms of those countries had lower production costs relative to the other firms for products of a similar quality, also in the case they were producing for a (protected) domestic market they should have higher profit rates and, by consequence, higher investment rates and - supposing the same rate of technical progress - faster growth. As a reply, we shall remind that investment decisions depends not only on profit margins but also on expected demand increases. The growth rate of the expected demand for a given firm's products is the sum of the expected growth rate of the total market and of the expected growth rate of the firm's share. Whilst the growth rate of the total market requires the "creation" of additional demand expressed by potential buyers, the growth rate of the firm's share requires simply that *already existing* demand be shifted from the firm's competitors to the advantage of the firm itself. The latter, therefore, is a much less uncertain alternative, if a strong competitiveness supports it.

Clearly for the firms as a whole of a closed market the sum of the *actual* changes in market shares is zero and the sum of the expected changes cannot be much larger, whilst for the firms of a small open economy the expected gains in market shares can be very high, in every sector where a strong competitive position has been reached.

In Section 2 we shall first present a model embodying the idea that the growth rate of a small firm operating in a large market depends on its cost competitiveness and then the extension of this relationship from the micro- to the macro-level.

Building on such a basis, the paper tries first to model the phase of take-off, conceived as one of rapid increase in the rate of growth. To this end, we believe it essential to introduce a process of

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should have taken place in those countries? (Data from World Bank, 2001. East Asia and the Pacific region includes Japan, whose growth rate however was only 7.3%, so that the figure for the developing countries of the region must have been much higher than the average for the region.)

[5] Cf. *Akyüz* , Chang and Kozul-Wright, 1999, Table 4, p.14.

cumulative causation : in Section 3 we shall put forward a model of cumulative causation, inspired by Kaldor's theory and Beckerman's model. This model is based on the interaction between the growth-competitiveness relationship and the Verdoorn-Kaldor equation, supplemented by a wage equation which ensures that labour cost per unit of output decreases over time when productivity grows fast. This wage equation, by assuming away any effect on wages of changes in the excess demand for labour, is consistent with a surplus labour economy – as most developing countries are; and, by consequence, with the Kaldorian doctrine asserting than demand rather than factor supply determines growth.

By using the Verdoorn-Kaldor equation to explain the growth of productivity, this model tends to underplay other factors, like the "assimilation effort" stressed by Nelson and Pack (1999), that in the experience of the East Asian NIEs had an important role in fostering the growth of productivity.

It is also likely that some phenomena upon which Kaldor based his theory of increasing returns, in economies that are both at an early stage of industrialisation and open to the inflow from abroad of specialised services and high skill personnel, are less important. In these countries, however, embodied technical progress and, by consequence, the investment/output ratio are essential for improving productivity levels. Since this ratio is proportional to the growth of output, the Verdoorn-Kaldor equation in this context also looks sufficiently justified.

In this cumulative causation model, as in Beckerman's, the unique equilibrium solution is unstable and the unit production cost of a competitive country tends to zero, while the growth rate of the economy continues to increase. To avoid this unrealistic feature, we shall introduce what may be called "dynamic decreasing returns": beyond a certain point increasing the rate of growth of the economy gets more and more difficult. These difficulty concerns both the internal organisation of firms and their inter-sectoral co-ordination (the latter leading to rationing). Moreover, the possibility of making good for bottlenecks and factor shortages is inversely related to the growth rate. The introduction into the model of these "dynamic decreasing returns" generates a second equilibrium point, characterised by a positive unit production cost and a high, constant and stable growth rate, features required to approximate the actual behaviour of East Asian NIEs. (See Figure 1.)

As a conclusion of this introduction, we want to stress that, since all models are meant to represent aspects of *growing* economies, have been conceived accordingly and in case of a negative growth rate of output they might require that a "change of regime" be specified, throughout the paper the regions (of variables) corresponding to a negative growth rate of output will be considered only to make clearer the analytical aspects of the models.

Section 2. *Cost competitiveness and growth*[6].

The purpose of this Section is twofold. First, to build a microeconomic model in which many firms, each producing a different variety of the same good, compete in the same market and each firm plans a growth rate of capacity equal to the expected growth of demand. The former growth rate depends on the rate of profit, the latter on the expected rate of growth of the market and on that of the firm's share of it, as determined by price competition (non-price competition is excluded for the sake of simplicity). The equalisation of the planned growth of capacity and the expected growth of demand is achieved by means of an appropriate price. In such a model the rate of growth of the single firm depends on its cost of production: more precisely, differences across firms in the rate of growth correspond – *ceteris paribus* - to differences of the same sign in cost competitiveness.
Second, to use this microeconomic model as a basis for a macroeconomic growth model suited to small open economies.

2.1 *A microeconomic growth model.*

Let us consider a market in which many firms compete, each producing a different variety of the same good. There are v varieties and v firms. The growth of the productive capacity of the i-th firm, $i = 1, 2, ..., v,$ denoted by c_i , must be financed either by internal or by external sources and both possibilities normally depend on the rate of profit. Therefore we shall assume that the *planned* growth of capacity of the i-th firm is an increasing function – say, ϕ -of the rate of profit, r_i, which in turn depends on output price, P_i, unit production cost, u_i, and invested capital. Let us write these two relationships as[7]

$$\hat{c}_i = \phi(r_i) \quad , \varphi' > 0 , \varphi'' \leq 0, \ \varphi(0) = 0$$

$$r_i = \rho(P_i, u_i)$$

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[6] The model of this section follows Boggio (1996). The basic idea however can be traced back to Boggio (1974).

[7] For a generic variable x , being a differentiable function of time, $\frac{d \log x}{dt}$ will often be denoted either by $\hat{x}$ or by g_x .

where and ϕ and ρ are continuously differentiable functions. The partial derivatives of the latter are denoted by

$\rho_P > 0$ e $\rho_u < 0$

Hence

$$\hat{c}_i = \phi(\rho(P_i, u_i)) \quad (2.1)$$

As to the *expected* growth of demand for the product of a given firm, d_i, let us first recall that it can be expressed, without loss of generality, as

$$\hat{d}_i = \hat{s}_i + g_D$$

where s_i is the share of the market held by that firm and D is total market demand, $\hat{s}_i$ and g_D are their expected growth rates.

Let us consider a simplified model in which the changes in s_i depend only on the ratio between P_i and the average price of all varieties sold in the market, $A := \sum_{1}^{v}{}_j P_j s_j$. Precisely[8]

$$\hat{s}_i = -\sigma(P_i / A - 1)$$

where σ is a positive parameter, so that

$$\hat{d}_i = -\sigma(P_i / A - 1) + g_D \quad (2.2)$$

Assuming the equality between the current levels of demand and capacity, equating the expected growth of demand and that of capacity is the only policy avoiding either a waste of capacity – if it is going to exceed demand – or a waste of finance – when too low a price is going to generate an excess-demand.

This goal can be achieved by choosing an appropriate price.

To see this in a formal way, let us first write such a goal as

$$\phi(\rho(P_i, u_i)) = -\sigma(P_i / A - 1) + g_D \quad (2.3)$$

and assume that the single firm is too small to determine a significant change in both the average price A and the growth of total market demand, g_D. Then, for any given non-negative value of u_i, eq.(2.3) has a unique solution for $P_i > 0$[9], which means that the growth of demand and that of supply can be brought into equality by an appropriate price.

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[8] A more realistic, but too complex, model would make σ a decreasing function of s_i.

[9] For any $u_i \geq 0$, at $P_i = 0$, we have $\hat{d}_i > \hat{c}_i$, since

$$\rho(0, u_i) \leq 0, \text{ hence } \phi(\rho(0, u_i)) \leq 0 < \sigma + g_D \quad (2.4)$$

Hence for all $u_i \geq 0$ (2.3) defines implicitly a differentiable function F such that

$$P_i = F(u_i), \qquad F' = -(\phi'.\rho_P + \sigma/A)^{-1} (\phi'.\rho_u) > 0 \qquad (2.5)$$

Using (2.5) and the r.h.s. of (2.2) we get an expression for the "equilibrium" growth rate of the firm's output, g_i, i.e. a functional relationship between that rate and the unit cost [10]

$$g_i = -\sigma\left(F(u_i)/A - 1\right) + g_D \equiv H(u_i)\text{ , all } u_i \geq 0 \qquad (2.6)$$

The effect of a change in unit costs on g_i is given by:

$$H' = -\sigma F'/A < 0 \qquad (2.7)$$

Therefore, if we consider two firms differing only in their unit production costs, to such a difference corresponds a difference of equal sign in prices and a difference of opposite sign in growth rates. In less formal words, *differences across firms in cost competitiveness generate differences of the same sign in price competitiveness and in growth rates*.

The essence of what has been shown above can easily be grasped by observing Figure 2 , where $\hat{c}_i(P_i\,;\,u_i)$ is equivalent to $\varphi(\rho(P_i, u_i))$ for fixed u_i and $u_i^0 > u_i^1$ are two different values of u_i.

A higher price and a lower growth rate correspond to the higher cost level u_i^0 .

2.2. *A macroeconomic growth model of a small open economy.*

The microeconomic model just expounded can provide the basis for a macroeconomic model, if one of the basic assumptions of the former – a small share of the total market – can be preserved. This is possible if the macro-model is referred to a small open economy. Then, by assuming that:

i) only one good is produced in the world,

ii) a subset v_h , $h = 1, 2, \ldots K$, of the existing firms belongs to country h,

iii) all firms are described by the same functions and parameters,

the basis of the macro-model is simply given by the set of equations of Section 2.1, with the convenient additional restriction that all firms of the same country have the same unit cost of production:

$u_i = u_j$ for all $(i,j) \in v_h \otimes v_h$, $h = 1, 2, \ldots K$.

The existence of a (unique) solution then follows from the fact that the l.h.s. of (2.4) is increasing in P_i, whilst the r.h.s. side is decreasing.

[10] Function H is a one-to-one relationship from R_{++} to $(-\infty, H(0)]$. Hence H^{-1} is well-defined over the whole interval $(-\infty, H(0)]$. Notice that $H(0)$ is the maximum feasible growth rate of output, but is economically meaningless as are zero costs of production.

To this basis an equation determining the investments and one determining the level or the growth rate of consumption can easily be added. This would make it possible to formally express the trade balance, but for the main purposes of the paper this seems unnecessary[11].

It is also important to notice that, although in this macro-model no distinction is made between the share of the internal market and that of the external market, given the small country assumption is clear that the bulk of sales are *exports*.

To conclude the present section, let us state the main proposition as follows: if we consider two countries differing only in their unit production costs, to such a difference corresponds a difference of equal sign in prices and a difference of opposite sign in growth rates; in other words, *differences across countries in cost competitiveness generate differences of the same sign in price competitiveness and in growth rates*.

Notice also that this effect is proportional to σ, a crucial parameter for our purposes, because on one hand it measures the possibility of shifting firm's or country's market shares by differences in competitiveness, whilst on the other hand it is large in international markets with relatively small firms or countries.

Section 3. *Cumulative causation.*

3.1. *Kaldor's theory and Beckerman's model.*

To build a model of cumulative causation suited to small open economies, we shall use Kaldor's description of cumulative causation[12] and Beckerman's model, which – as Dixon and Thirlwall (1975, p.202, n. 1) noticed – "[…] bears many similarities to Kaldor's, and predates it […]".

The first step of Kaldor's description of cumulative causation, when referred to the growth of a national economy and not to that of a region, stresses the role of exports as main autonomous determinant of effective demand and, by consequence of the competitiveness in production costs vis-à-vis the foreign competitors[13]. A high (low) growth rate of exports induces a high (low) growth

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[11] However, by following the lines of Boggio (1996, pp.312-3), we could replicate a common feature of most East Asian NIEs: a negative trade balance during the take-off and positive later on.

[12] Cf. Kaldor, 1970 and 1971.

[13] "[T]he main autonomous factor governing both the level and the rate of growth of effective demand of an industrial country with a large share of exports in its total production and of imports

rate of output and - through the operation of increasing returns[14] – of productivity. If the behaviour of the wage rate does not offset this potential (dis)advantage, cost competitiveness will improve (deteriorate) and exports growth will further increase (decrease).

Beckerman's model (Beckerman, 1962) to some extent anticipates these views in a formalised way. As a counterpart to Kaldor's "first step", we find the assertion that "[…] a faster growth of exports will induce a faster growth of output […]"(p. 918) and the use of the rate of growth of exports as a proxy for the rate of growth of output. Its link with international competitiveness is in its first equation (*ibidem*), which , using the (slightly adapted[15]) notation of Section 2, can be written as:

$$g_x = -\sigma\left(P / A - 1\right) + g^* \qquad (3.1)$$

where g_x is the rate of growth of exports of the country considered[16].

The description of the cumulative process proceeds with an equation where the growth rate of productivity, g_o, is a linear function of the rate of growth of exports (a proxy for the rate of growth of output)

$$g_o = c + d\, g_x \qquad (3.2)$$

and an equation where the growth rate of the wage rate, g_w, is a linear function of the growth rate of productivity

$$g_w = m + n\, g_o \qquad (3.3)$$

where $m, n, c,$ and d are positive parameters and $n < 1$.

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in its consumption – writes Kaldor (1971, p.7) – is the external demand for its exports; and the main factor governing the latter is international competitiveness, which in turn depends on the level of its industrial costs relatively to other industrial exporters." What is been said here for an industrial country seems equally pertinent for a newly industrialising economy.

[14] As is well known, the notion of increasing returns Kaldor had in mind is much wider and powerful than the traditional one, based on static large scale economies. See for instance Kaldor, 1970, p. 340.

[15] In what follows, all indexes referring to a single firm or country or to the "world" will be avoided, whilst the "foreign" variables referring to the "world" will be denoted by a "*". For notational convenience, however, we shall keep the notation A for P^*.

[16] Notice that if the rate of growth of exports is replaced by the rate of growth of output – the two being considered equal – eq.(3.1) coincides with the demand side of the model of Section 2.

The last two equations will be maintained throughout the rest of the paper to describe the behaviour of wage and productivity in the single country considered, to be understood as (a stylised representation of) an East Asian NIE. As for the wage behaviour and the effect of increasing returns in the "world" – meaning mainly the industrialised countries –, since we do not want to assume that are the same as in the NIEs, we have chosen to assume that the foreign price *A* and the growth rate g^* are not only exogenous for the country considered (because it is small), but also constant[17].

Beckerman's last equation can be written as

$$g_P = g_w - g_o = m+(n-1)(c+d\,g_x) \qquad (3.4)$$

Eqs.(3.1) and (3.4) together, setting $M \equiv m+(n-1)c$ and $N \equiv (1-n)d > 0$, give,

$$g_P = M - N\,[-\sigma(P/A-1)+g^*] \qquad (3.5)$$

a differential equation in *P*, whose behaviour and the ensuing cumulative causation circle are described in section A.1 of the Appendix.

From now on we shall always assume

$$[M - N\,H(0)] < 0 \qquad (3.6)$$

i.e. that the exogenous effect on unit labour costs , *M*, are smaller in absolute value than those generated through increasing returns by the maximum feasible growth rate , $(-N\,H(0))$.

3.2. *Take-off and cumulative causation.*

In what follows, we shall, modify the structure of the previous cumulative causation model according to the results of Section 2. We consider the resulting model as a simple way of formalising a circle of cumulative causation focussing on competitiveness and increasing returns[18]. As to the relevance for the East Asian NIEs of the model of Section 2 and of the wage and productivity equations of the previous sub-section, we have argued it in Section 1.

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[17] Hence on the average in the "world" the growth rate of price – whatever its determination – is assumed to be zero, but another figure would not make any qualitative difference. (Beckerman 's paper is silent on this point.)

[18] We are also convinced that the resulting model will avoid some drawbacks of Beckerman's. Incorporating the supply side of production and a distributive variable are themselves two important improvements; moreover, they open the way, as we have seen, to the consideration of the balance of payments. (Criticisms to Beckerman's model on these points can be found in Caves, 1970 and Thirlwall and Dixon, 1979.)

Let us re-write the relevant equations of Section 2, modified according to the notational conventions stipulated in this section:

$-\sigma(P / A - 1) + g^* = \varphi(\rho(P, u))$

$P = F(u)$

$F' = -(\phi'.\rho_P + \sigma/A)^{-1} (\phi'.\rho_u) > 0$

$g = H(u) = \sigma + g^* - \sigma F(u)/A,$ all $u \geq 0$ (3.7)

$H' = -\sigma F'/A < 0$

and

$u = H^{-1}(g)$, all $g \leq H(0)$

Assuming that unit production costs are simply the ratio between the wage rate, w, and labour productivity, o, i.e.

$u = w/o$

from (3.2) and (3.3) we can write

$\hat{u} = M - N g$ (3.8a)

or

$\hat{u} = M - N H(u) = M - N [\sigma + g^* - \sigma F(u)/A]$ (3.8b)

a differential equation in u.

Since $\dfrac{d\hat{u}}{du} > 0$, a unique and unstable equilibrium exists[19]

$u^{\#} = H^{-1}(M/N) = F^{-1}\{ - [M - N(\sigma + g^*)] A/\sigma N \}$

As t diverges to $+\infty$ the unit production cost, if it is not equal to $u^{\#}$, either tends to zero (when $u < u^{\#}$) or increases without limit (when $u > u^{\#}$) (see Figures 3 and 4). The growth rate of output moves in the opposite direction tending either to $H(0)$ or to $-\infty$ [20].

[19] Recall that the domain of H^{-1} is $(-\infty, H(0)]$ and by (3.6) $M/N < H(0)$. Hence $M - N H(u) = 0$ defines an equilibrium.

[20] Notice also that if $F(u) = A$, then , in view of (3.8b),

$\hat{u} = M - N g^* < 0$

The unit production cost is decreasing even when the level of price, $F(u)$, is equal or slightly higher than the foreign one, due to the working of increasing returns. This helps understanding the formulation of the equilibrium price: for eq.(3.8b) to generate a constant path of price, the positive effect of g^* on increasing returns must be offset by $P > A$ and a certain loss of market share. Therefore, if we want to use the model of this section for our present purposes, concerning the

In Figures 3 and 4 the point-dot vertical line of abscissa *$(\sigma+g^*)\ A/\sigma$* [21] divides the positive half-plane into two regions: to the left (right) of it u is such that g > (<) 0. For reasons already explained, only the interval where $g > 0$ is relevant.

The model introduced in this sub-section, as we have seen, is characterised by the divergence to $+\infty$ or convergence to zero of unit cost of production and by the divergence to $-\infty$ or convergence (precisely, an endless increase) to *H(0)* – an economically meaningless solution - of growth rates. In spite of this unrealistic asymptotic features, *this model in our opinion is suitable to interpret the take-off of an open economy*, in particular – we believe – of an East Asian NIE.

For, a process of rapid increase of the growth rates of the economy, starting from a small positive rate, is captured by the model - as the arrows in Figures 3 and 4 try to represent - by the behaviour of g over an interval of u to the left of $u^{\#}$ and close to it, if $u^{\#} < [-\sigma(P/A-1)+g^*]$, or to the left of $[-\sigma(P/A-1)+g^*]$ and close to it in the opposite case.

3.3. *Dynamic decreasing returns and stable fast growth paths.*

The boundless divergence or convergence to *H(0)* of growth rates characterising the model of the previous sub-section, if it does not prevent its application for interpreting a phase of take-off, makes it unsuitable to interpret the case of economies, like the East Asian NIEs, that after a rapid take-off followed a growth path taking place at a high but approximately constant rate. A solution to this problem, advocated for Beckerman 's model by Balassa (1963) as soon as Beckerman 's paper appeared, could be to introduce the negative effect on growth of a gradual reduction of the excess supply of labour. However, we maintain that often this approach – though very much in line with the prevailing orthodoxy - is not the most correct and realistic. An alternative that we shall develop below is to introduce what may be called "dynamic decreasing returns": beyond a certain point increasing the rate of growth of the economy gets more and more difficult. These difficulty concerns both the internal organisation of firms and their inter-sectoral co-ordination (the latter leading to rationing). Moreover, the possibility of making good for bottlenecks and factor shortages is inversely related to the growth rate.

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application to the East Asian NIEs take-off and fast growth with rapid export expansion, only the interval where $P < A$ is relevant.

[21] $g = 0$ requires $\varphi(r) = 0$, hence $r = 0$, $u = P = (\sigma+g^*)\ A/\sigma$, which is the price annihilating $[-\sigma(P/A-1)+g^*]$.

We introduce the dynamic decreasing returns by adding to the l.h.s. of (3.8a) the term

$max\ [0\ ,\ Q\ g^2]$

Q positive but small. This implies, as it should, an effect of dynamic decreasing returns on unit production costs that is null for negative g, weak for small g and rapidly increasing with g. Hence:

$$\hat{u} = M - N\,g + max\ [0\ ,\ Q\ g^2] \qquad (3.9)$$

and using (3.7),

$$\hat{u} = M - N\,H(u) + max\ [0,\ Q\ (H(u))^2] \qquad (3.10)$$

As is proved in the Appendix and shown in Figures 5 and 6, when σ - a crucial parameter of our model, as we explained before - is sufficiently large, eq.(3.10) has two and only two equilibrium points, u_1 and u_2, one stable and the other unstable. A higher and positive growth rate, g_2 , corresponds to the stable one.

In this way, we have shown that the introduction of "dynamic decreasing returns" generates a second, economically meaningful (u_2>0), equilibrium point, characterised by a positive unit cost of production, high growth and stability. Therefore this final model can represent both the phase of take-off and that of an (approximately) constant growth rate, following the take-off.

Section 4. *Concluding remarks.*

In Section 1, after recalling the rapid expansion of manufactured exports in the experience of East Asian NIEs, we have stressed the importance of international cost competitiveness in fostering profits, investment and growth. The model of this paper, though having a potentially wider application, is a way of formally expressing this view.

This model has been built by combining a model of growth of a small open economy that takes cost competitiveness as given with equations determining the changes in competitiveness and adding what we have called "dynamic decreasing returns" (which capture the obstacles to the acceleration of the growth rate).

We believe that the take-off of a small open economy followed by a phase of an approximately constant high growth rate can be described and better understood by means of this model. To what extent it can contribute to the interpretation of the experience of the East Asian NIEs is a question more difficult to answer.

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Appendix

A.1.

Since $\frac{dg_P}{dP} = N\ \sigma/A > 0$, if $[M - N(\sigma + g^*)] < 0$, then a unique, economically meaningful equilibrium or rest point exists

$P^{\#} = - [M - N(\sigma + g^*)] A/\sigma N$

which is unstable. The price of output, if it is not equal to $P^{\#}$, either decreases, tending to zero as t tends to infinite (when $P < P^{\#}$) or increases without limit (when $P > P^{\#}$). The growth rate of exports (and output) moves in the opposite direction tending either to $(\sigma + g^*)$ or to $-\infty$.

A.2.

Let us start from the equations

$$\hat{u} = M - N g + \max[0, Q g^2] \qquad (3.9)$$

$$\hat{u} = M - N H(u) + \max[0, Q (H(u))^2] \qquad (3.10)$$

To study this differential equation in u, we define a function L by

$$L(g) = M - N g + Q g^2$$

A sufficiently small Q ensures

$$N^2 - 4QM > 0$$

so that the two roots of $L(g) = 0$, g_1 and g_2, are both real (with $g_1 < g_2$). Since $L'' > 0$, then $L'(g_1) < 0$ and $L'(g_2) > 0$.

For $g > 0$, eq. (3.9) coincides with $\hat{u} = L(g)$ and for $g < 0$, with $\hat{u} = M - N g$.

In the space $(\hat{u}, g)$ the equations $\hat{u} = L(g)$ and $\hat{u} = M - N g$ describe, respectively, a parabola and a straight line having in common the point $(M, 0)$and the slope $(-N)$ at that point (see Figures 5 and 6).

If $M>0$, the roots of the l.h.s. of (3.9) are g_1 and g_2 , which, because of the sign of the coefficients, are positive.(See Figure 5.)

The roots of the l.h.s. of (3.10) are those of $L(H(u))=0$, which, for σ sufficiently large, are well defined[22]:

$$u_1 = H^{-1}(g_1), u_2 = H^{-1}(g_2), u_1 > u_2.$$

They are the equilibria or rest points of (3.10). Since $L' (H')^{-1}$ is positive at u_1, negative at u_2, the latter is stable and the former unstable. As t tends to $+\infty$, for $u < u_1$, u tends to u_2 and for $g > g_1$, g tends to g_2.

Similar conclusions hold if $M<0$, although in this case $g_1 = M/N < 0$ (see Figure 6) and

$$\frac{d\hat{u}}{du}(u_1) = -N (H')^{-1} > 0.$$

A.3

[22] I.e. , since $H(0)$ increases with σ (see *A.3*) , $g_1 < g_2 < H(0)$.

$$\frac{\partial F}{\partial \sigma} = -(\phi\,'.\rho_P + \sigma/A)^{-1}\,(F(u)/A - 1)$$

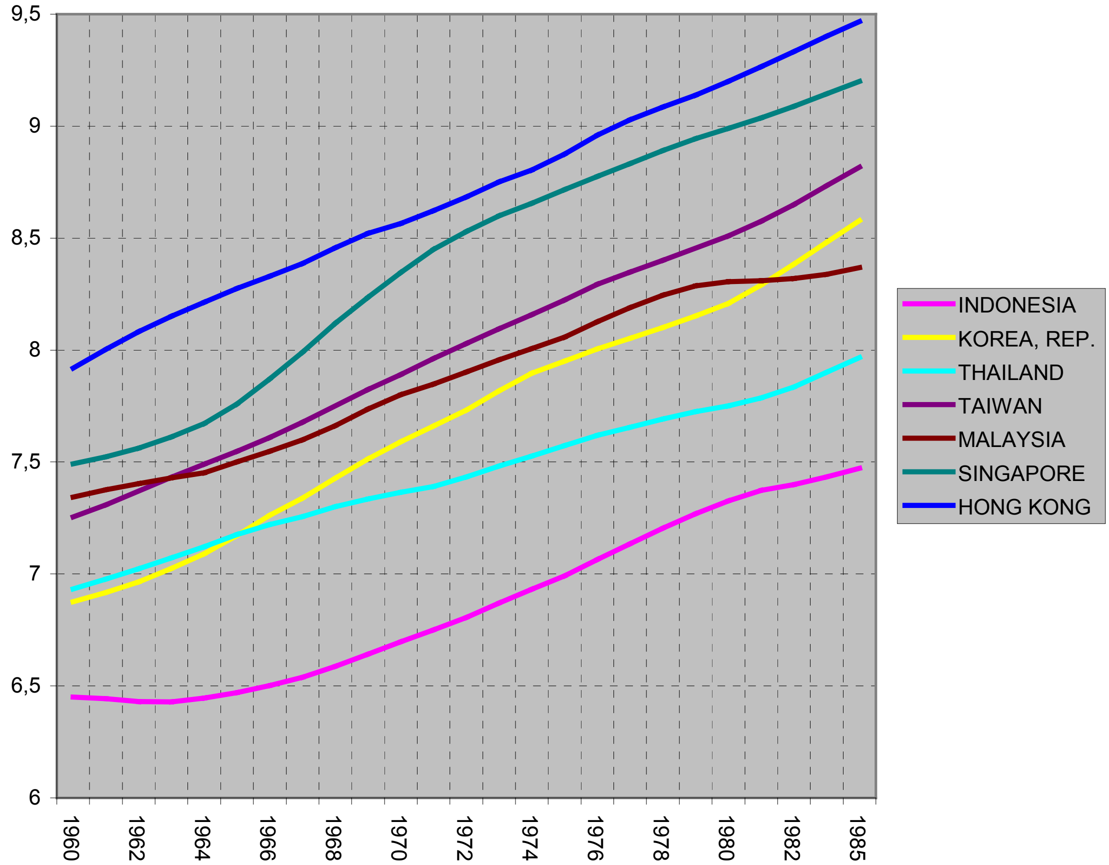
$$\frac{\partial g}{\partial \sigma} = -(F(u)/A - 1) - \left(\frac{\partial F}{\partial \sigma}\right)\sigma/A = -(F(u)/A - 1)[1 - (\phi\,'.\rho_P + \sigma/A)^{-1}\sigma/A] =$$

$$= -(F(u)/A - 1)[1 - (\phi\,'.\rho_P A/\sigma + 1)^{-1}]$$

At $u = 0$, we have $P \equiv F(u) < A$, hence

$$\frac{\partial g}{\partial \sigma} > 0.$$

Figure 1
East Asian NIEs: logarithms of per capita real income, five-years moving averages, 1960-1990.



Elaboration on Penn World Tables

Figure 2

Growth and competitiveness at the firm's level.

$u_i^0 > u_i^1$

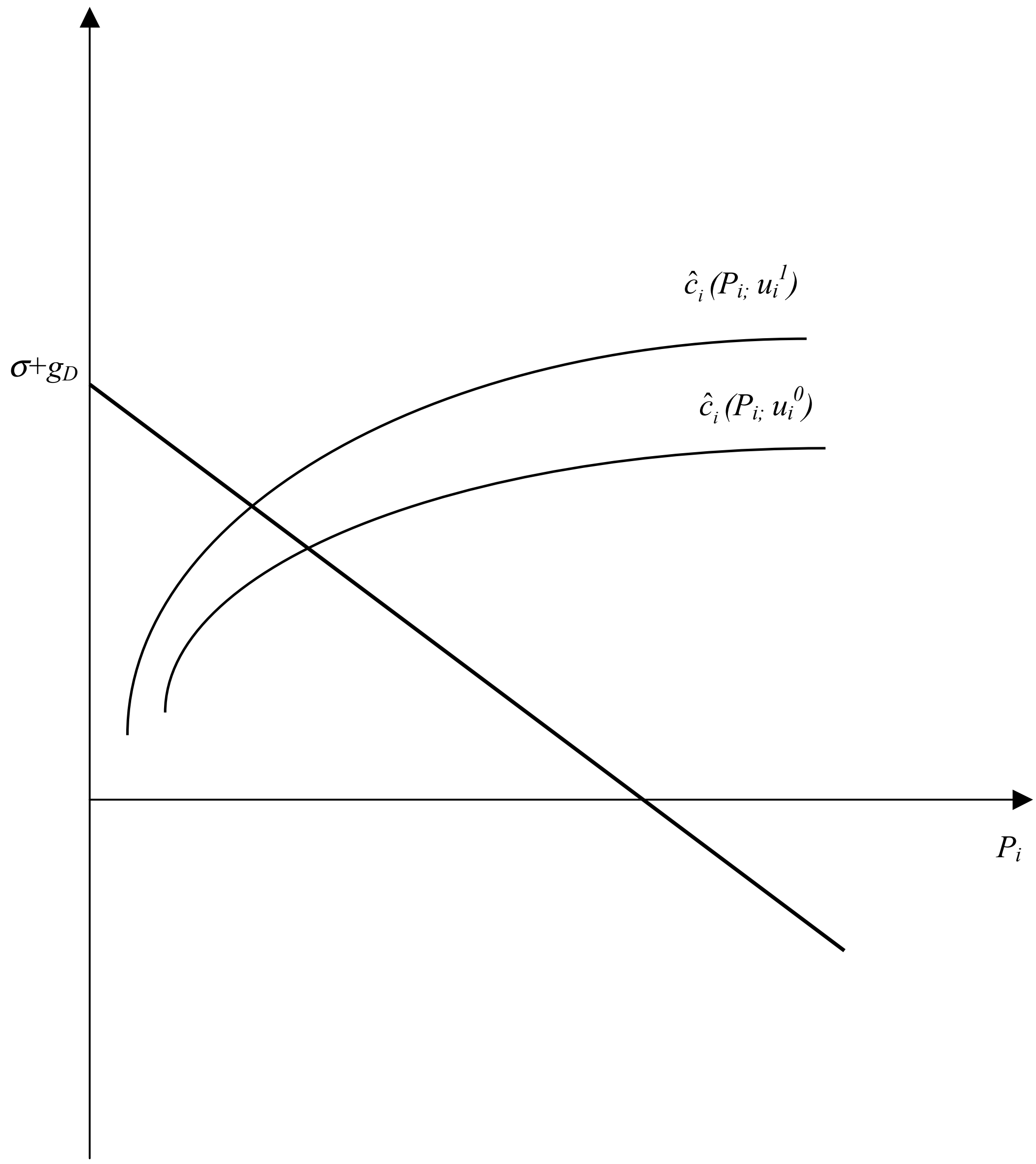


Figure 3

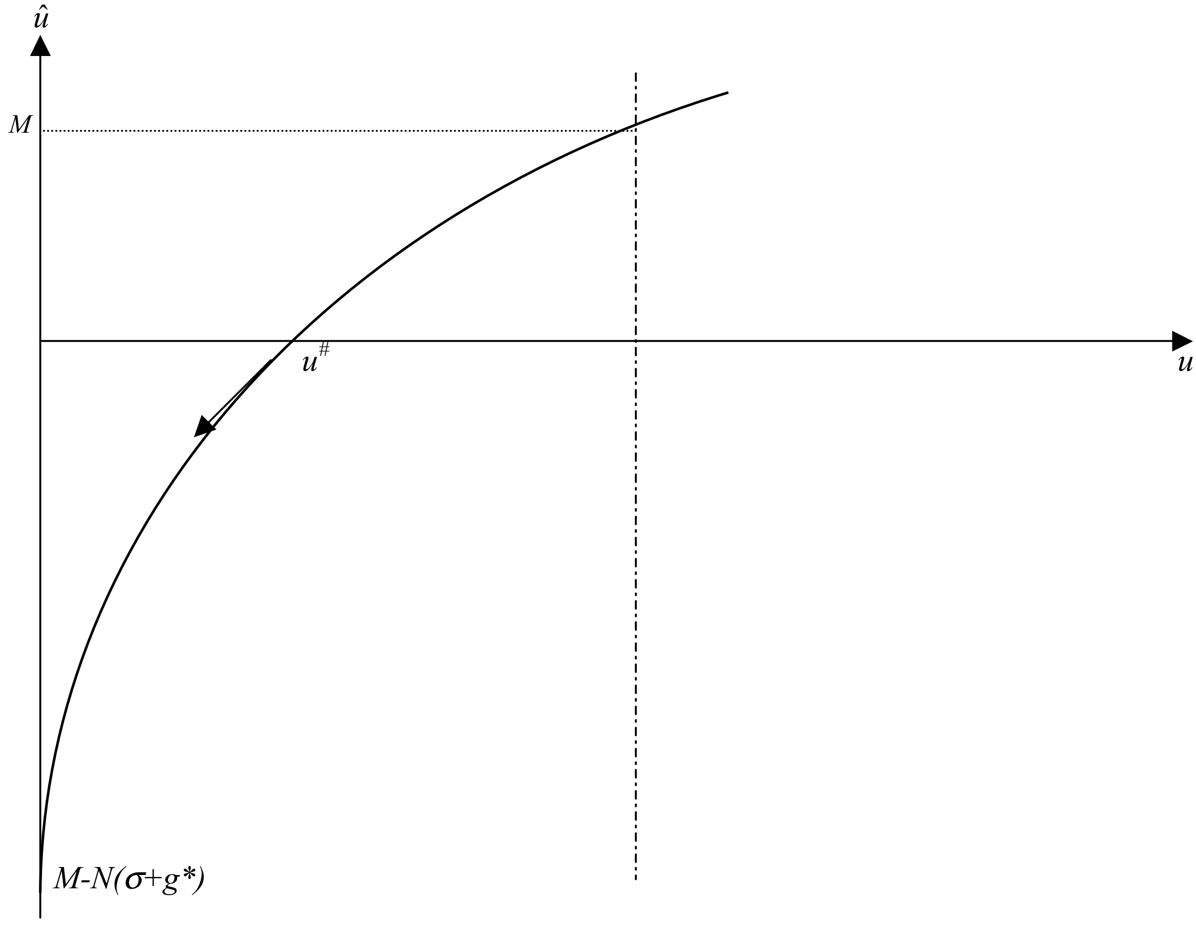


Figure 4

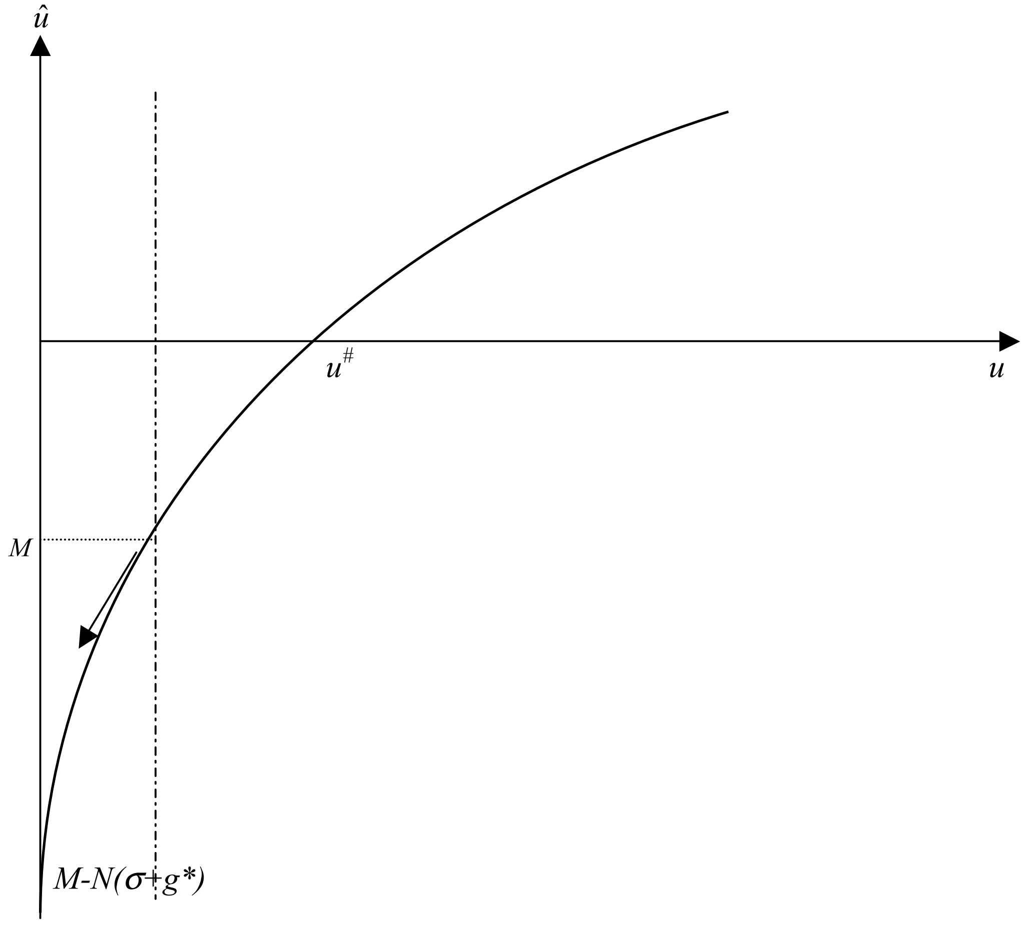


Figure 5

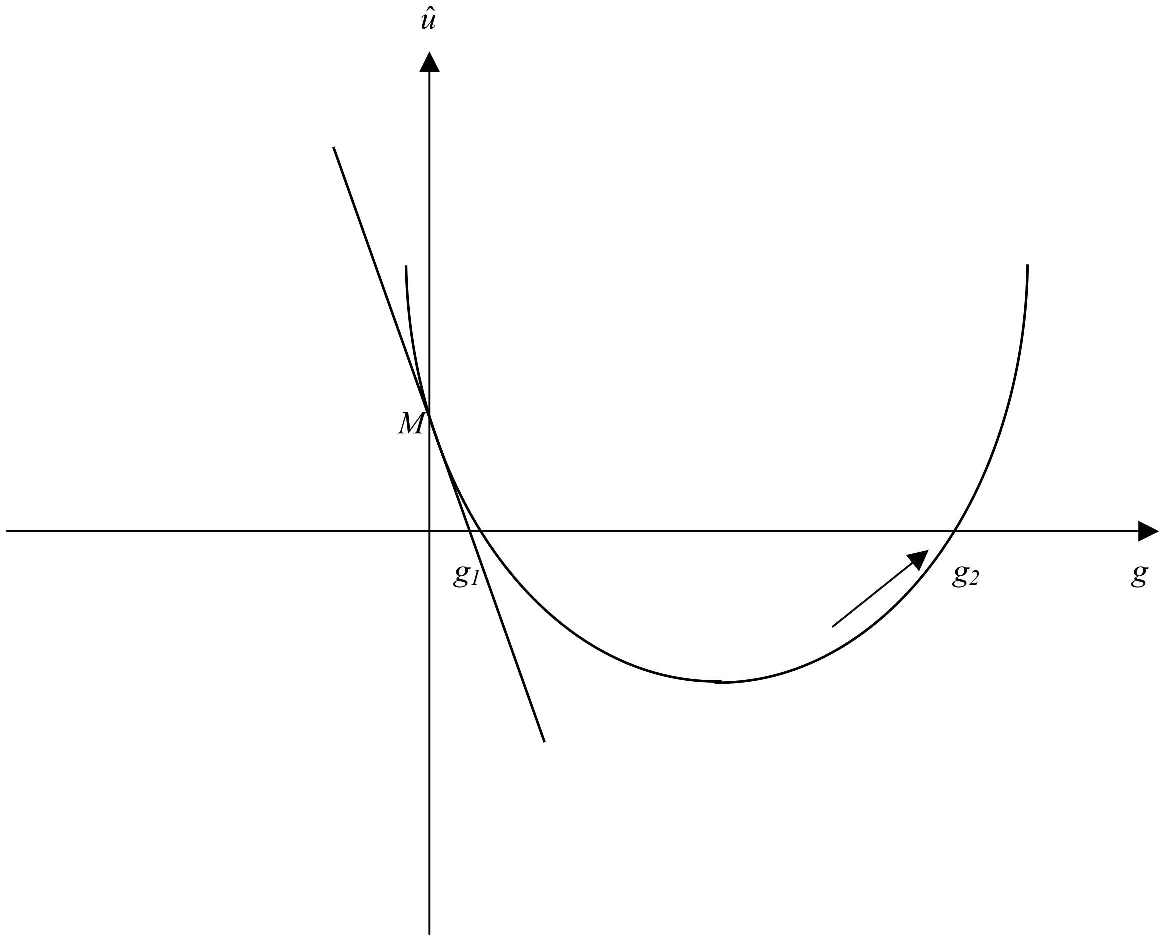


Figure 6