

Turkish Economic Review

www.kspjournals.org

Volume 7

September 2020

Issue 3

The allocation of time in public administrations subject to bribery in developing countries: The basic model of labour supply revisited

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Abstract. The purpose of this article is to revisit the basic model of labour supply taking into account the existence of corruption in public administrations in developing countries. The worker-consumer programme modified by the integration of bribery shows that at equilibrium, the optimal solution leads to a Marginal Rate of Substitution of leisure consumption equal to the real contractual wage rate plus the actual bribe rate. Because of the latter, the reserve wage is no longer an essential determinant for participating in the labour market. Corruption seems to amplify the substitution and income effects.

Keywords. Time allocation, Bribery-Marginal rate of consumption, Leisure substitution, Reserve wage, Substitution effect, Income effect.

JEL. G11, G17, C53, C58.

1. Introduction

In the allocation of time between work and leisure, it is assumed that goods purchased on the market are, like leisure, a direct source of utility. The consumption of a combination of goods and leisure under budgetary constraints enables the individual to achieve optimal utility. Criticism of this allocation of time has always focused on the time allocated to leisure. In this perspective, Mincer (1962) states that the distribution of time is not limited to a simple choice between work and leisure. The latter includes time spent on household production, particularly in the case of women. Household chores should therefore be distinguished from leisure. However, this distinction disappears in the more general formulation by Becker (Gronau, 1997) who, starting from the idea that leisure time does not in itself produce utility, thinks that goods are combined with leisure for the purpose of obtaining household goods.

Goods bought at the market are no longer a direct source of utility as in the work / leisure dichotomy, but rather, a factor of household production (Gronau, 1986). Concerning the household, Bourguignon (1984), Leuthold (1968) and Chiappori (1992) take into account the fact that each individual is immersed in a social context which affects his preferences and his modalities in decision making.

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Turkish Economic Review

In this regard, the work / leisure dichotomy pattern is enriched when we take into account the influence of family preferences. The choice analysis in the household is based on two approaches: the first assumes that individual preferences are transcended by those of the family (Gronau, 1977; Graham & Green, 1984). The satisfaction derived from the consumption of goods depends only on its total amount and not on the way in which it is distributed between individuals.

The second approach assumes that individuals have different preferences and make their decisions, either in isolation or through negotiation (Chiappori, 1988 and 1992). In any case, it appears that even when the neoclassical theory of labour supply takes into account the possibilities of domestic production and collective modalities, it turns out to be less satisfactory because it neglects the working time allocated to corruption in the public administrations of developing countries¹. On the one hand, we can define corrupt working time as the time during which an employee uses part of his contractual working time on his own account; and on the other hand the contractual (or legal) working time is understood as the working time stated in the contract which binds the employee to his employer, namely the State, in this case. From the above, it emerges that in the neoclassical theory of time allocation, the consumption of leisure – even if this term also includes household production – is the only alternative to wage contract work; there is no room for corrupt work.

The dual problem raised here is the following: how does an individual allocate his limited time between corrupt work, contract work and leisure? And, on the other hand, to what extent can this allocation of time enable him to remain in balance when a change in contractual salary occurs?

This study seems relevant insofar as it deepens the analysis of time allocation by offering a new light on the behaviour of the individual employee. It differs from previous work (Mincer, 1962; Becker, 1965) by the fact that it takes bribery into account in the allocation of time. The basic hypothesis is that corrupt labour can be partially or totally substituted for contract labour.

We will find that at equilibrium the marginal rate of substitution of leisure consumption is equal to the sum of the real contractual wage rate and the real bribery rate. Therefore, the decrease in the actual contractual salary can be offset by the increase in the bribery rate, thereby making it possible for the employee to remain in balance. In section 2, we will introduce the model. Section 3 discusses the limitations of the model and Section 4 concludes.

¹ Corruption is rampant in most public administrations in developing countries. See on this subject Cartier-Bresson (1992, 1998, 2000). Corruption does not plague the public administrations of these countries alone. However, the occurrence of this scourge is relatively high in comparison with the so-called developed countries.

2. The model

The presentation of this model is based on hypotheses and the resolution of the worker's programme.

2.1. The hypotheses of the model

Five hypotheses (H_1 , H_2 , H_3 , H_4 , H_5) underlie the model:

H1: Contractual or legal labour (h_ℓ) and corrupt labour (h_c) are substitutes and/or complements

The hypothesis is likely if the official has some discretionary power which enables him, when in a monopoly position, to reduce the supply of public services. He does this either by refusing to serve users normally, or by making them wait for a long time, thereby lengthening the duration of users in the queue. The user, bribe-giver, will shorten his time in the queue (Lui, 1985). In this way, the civil servant will compensate for a reduction in his legal working time by an increase in his corrupt working time and vice versa.

H2: The public sector labour market is transparent, and corruption is observable

This hypothesis is valid in a situation where an atomistic labour supply faces numerous bribe-givers so that the market for corruption becomes very competitive (Cartier-Bresson, 1998). The hypothesis also holds in a world where it is difficult to distinguish between bribe and tax as it was the case in the Philippines of Marcos or Zaire of Mobutu (Schleifer & Vishny, 1993).

However, given the illegal and reprehensible nature of corruption, it is generally kept secret (Schleifer & Vishny, 1993).

H3: Unions of civil-service workers depend on political power

The mode of expression widely used by unionists in order to establish the equality of relationships they have always fought for with employers is their capacity to go on strike, and therefore to disrupt work. This mode of expression is all the more virulent since the reason for the strike is the fall in nominal or real wages.

However, we assume that in nations where corruption is rampant, trade unions are subservient to the ruling party. So, the independence of these unions is artificial and even illusory. It would therefore not be surprising to see that these unions do not go on strike when there is a drastic drop in wages, a decrease which is to be offset by "bribing" public services.

H4: Legal work (h_ℓ) and corrupt work (h_c) are homogeneous. Therefore, the legal (W_ℓ) and corrupt (W_c) wage rates are unique.

This hypothesis reflects the fact that on each respective legal or corrupt labour market, civil servants sell perfectly identical job qualifications. Therefore, the consideration is also the same. There is no difference between the qualifications sold; so, the buyers (the State for legal work, and individual users for corrupt labour) are completely indifferent as concerns the seller's identity.

The hypothesis is nevertheless reductive in reality, the work of a medical doctor cannot be identified with that of the nurse, just as the work of a

Turkish Economic Review

university professor cannot be compared to the work of a primary school teacher, etc. The observable reality rather accounts for the heterogeneity of work. However, the hypothesis holds because it enables to simplify the complexity of the labour market reality.

H5: The civil-servant maximizes his objective-function under the constraint of his budget

The hypothesis expresses the rationality of the civil servant considered as a worker-consumer. As a result, his equilibrium as a consumer becomes his equilibrium as a provider of producer services. Its budgetary constraint equalizes the value $(PC)^2$ of the products he buys and that of the services he sells to his employer (contractual work) and to users (corrupt work), and its objective-function integrates, alongside the utility (C) of the former, "disutility" $(h = h_\ell + h_c)^3$ of the latter.

2.2. The worker's programme

The consumption / leisure dichotomy is represented using a utility function specific to each individual, namely $U(C, L)$, where C and L respectively denote the consumption of goods and that of leisure. Assuming that an individual has a total endowed time L_0 , the working time, expressed in hours for example, is then given by $h = L_0 - L$. This working time h can be broken down into legal and contractual working time (h_ℓ) and corrupt working time (h_c) , i.e. $h = h_\ell + h_c$.

It is generally assumed that an individual wishes to consume as much goods and leisure as possible, so his utility function increases with his two arguments, namely C and L . Moreover, this individual is likely to reach the same level of satisfaction with a lot of leisure and few goods, or little leisure and a lot of goods.

- Choices

If we denote by w the real hourly wage (the price of consumer goods C is normalized to 1), wage income amounts to $w.h$.

These real hourly wages w can be broken down into real legal and contractual hourly wages (w_ℓ) and real corruption hourly wages (w_c) , i.e. $w = w_\ell + w_c$. Consequently, salary income will correspond to $w_\ell.h_\ell + w_c.h_c$.

The single wages R represents all non-wage resources expressed in real terms.

The agent's budgetary constraint is expressed as follows:

$$C \leq wh + R \tag{1}$$

This constraint can also be written as follows:

$$C + wL \leq R_0 \equiv wL_0 + R \tag{2}$$

² P denotes the general price level and C a product representative of a set of products

³ The disutility of work t implies an effort and a sacrifice of leisure time

Turkish Economic Review

It is as if the agent has a potential income R_0 obtained by devoting all of his endowed time to work, and that he purchases leisure and consumer goods using this income. The consumption programme consists in choosing a couple (C, L) , respecting the budget constraint and maximizing its utility $U(C, L)$, i.e.:

$$\begin{aligned} \text{Max } U(C, L) \\ \text{SC: } C + wL \leq R_0 \equiv wL_0 + R \end{aligned} \quad (3)$$

The optimal solution (represented on figure 1) known as "interior", i.e. such as $0 < L < L_0$ et $C > 0$, is located at the point of tangency E between the budget line AB, of slope w , i.e. $w_\ell + w_c$, and an indifference curve (set of couples (C, L) for which the consumer obtains the same level of utility \bar{u} , such that $U(C, L) = \bar{u}$).

Thus, the optimal interior solution (C^*, L^*) is completely defined by the two equalities:

$$\frac{U_L(C^*, L^*)}{U_C(C^*, L^*)} = w = w_\ell + w_c \text{ and } C^* + wL^* = R_0 \quad (4)$$

This optimal solution specifies that the marginal rate of substitution between consumption and leisure, $\frac{U_L}{U_C}$ is equal to the real hourly wages, that is to say the sum of the real hourly legal and contractual wages (w_ℓ) and the real hourly corruption wages (w_c).

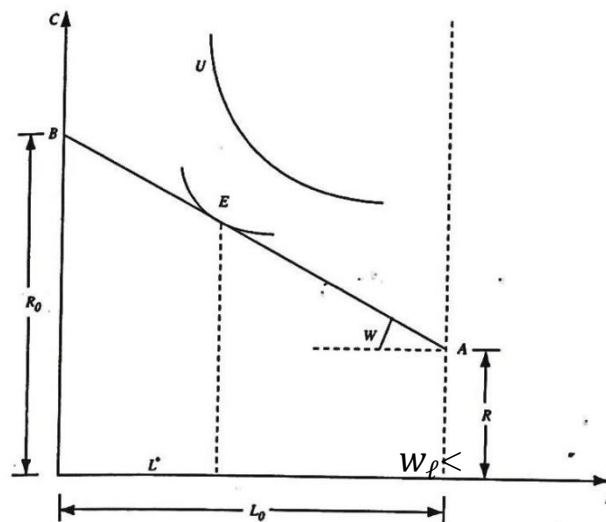


Figure 1. The consumption – leisure arbitrage

- The Reserve wage

For relation (A) to effectively describe the optimal solution to the consumer problem, point E must be located to the left of point A, otherwise the labour supply is zero ($L = L_0$). However, the convexity of the indifference curves implies that the marginal rate of substitution between consumption and leisure, i.e. $\frac{U_L}{U_C}$, decreases when we move to the right on

Turkish Economic Review

an indifference curve. As this marginal rate of substitution also represents the slope of the tangent to an indifference curve, an agent offers a strictly positive number of hours if the marginal rate of substitution at point A is less than the current legal contractual wage w_ℓ . However, the employee does not only earn w_ℓ , he also receives w_c . As a result, the employee actually earns two wages, one is contractual w_ℓ and the other is from corruption w_c .

The marginal rate of substitution at point A is called the reserve wage (minimum value of the hourly wage), it is therefore defined by:

$$w_A = \frac{U_L(R, L_0)}{U_c(R, L_0)} \quad (5)$$

According to the basic model of labour supply, assuming that the endowed time L_0 denotes an invariable physical quantity, the salary depends only on the shape of the function U at point A of the non-wage income value R . The reserve wages w_A determines the conditions for participating in the labour market. If the legal current wages w_ℓ are lower, the agent does not offer working hours, it is said that he does not participate in the labour market. We can show that if leisure is a normal good (i.e. a good whose consumption increases with income), an increase in non-wage income R increases the reserve wages and therefore has a disincentive effect on entry into the labour market.

The basic model only takes bribery into account on the labour market. In such a context, the wages w_A will no longer determine the conditions for participating in the labour market, because even this salary may be lower than the legal current wages w_ℓ and the agent will nevertheless participate in the labour market thanks to bribery on this market where besides winning w_ℓ , he will also win w_c , wages from bribery, i.e. finally $w_\ell + w_c$.

If leisure is a normal good, an increase in non-wage income r increases the reserve salary without disincentive effect on the labour market because of the expected gains w_c . The occurrence of corruption in the labour market therefore calls into question the labour market and the basic model of labour supply. Reserve wages are no longer an essential determinant of market participation conditions. We can therefore summarize the conditions for participating in the labour market as follows:

$$w_A = \frac{U_L(R_1 L_0)}{U_c(R_1 L_0)} < w_\ell \quad (6)$$

the agent participates in the labour market (basic model of labour supply)

$$w_A > w_\ell \quad (7)$$

the agent participates in the labour market (basic model of labour supply revised with hope of gaining from bribery in the labour markets).

$$w_A = w_\ell \quad (8)$$

Turkish Economic Review

the agent is indifferent whether or not to participate in the labour market. He may also not be indifferent and participate if there are expected wages from bribery

$$w_A = w_\ell + w_c \quad (9)$$

the agent is indifferent to participate or not in the labour market

$$w_A < w_\ell + w_c \quad (10)$$

the agent participates in the labour market (basic model revised with certain gains from bribery on the labour market)

$$w_A > w_\ell + w_c \quad (11)$$

non-participation in the labour market despite the assurance of wages from bribery in this market.

2.3. From theory to estimation

The relation (4) shows that the labour supply $h^* = L_0 - L^*$ depends on the wages $w^{(4)} = w_\ell + w_c$, non-wage income R and preferences specific to the individual considered. This link is the basic equation for estimating the empirical model. Many studies have been devoted to this problem (see Blundell & MaCurdy, 1999). A characteristic form of this basic equation is written as follows:

$$\log h = \alpha_w \log w + \alpha_R \log R + x \cdot \theta + \varepsilon$$

In this expression, \log represents the natural logarithm; h denotes the hours worked that we break down into h_ℓ contractual and legal working hours and h_c working hours devoted to corruption, in other words $h = h_\ell + h_c$; w the net hourly wages which we also break down into w_ℓ the legal contractual hourly wages and w_c the salary of corruption, in other words $w = w_\ell + w_c$; R is a measure of income other than current wages; x is a vector describing the individual characteristics or the control variables chosen. The coefficients θ , α_w (avec $\alpha_w = \alpha_{w_\ell} + \alpha_{w_c}$), et α_R are parameters to be estimated, while que h , w , R and x are observed. Finally, ε denotes a random term reflecting the individual heterogeneity not observed.

The use of logarithms makes it possible to interpret the coefficients α_w and α_{wR} as the wage elasticity and the income elasticity of labour supply.

2.4. Reserve salary and activity rate

A particularly important case is when, given our preferences, our earning potential in the labour market and the magnitude of our non-wage

⁴ Empirical models assume that $w = w_\ell$. Here we consider that $w = w_\ell + w_c$.

Turkish Economic Review

income, we decide to offer no hours of work. In this case, the labour supply is zero. We then enter the category of inactive population and say that we do not participate in the labour market. Conversely, if we decide to offer a positive quantity of work, we participate in the labour market and we are qualified as active. The basic model of labour supply assumes that a person is less motivated to participate in the labour market when his non-wage income is important and that the wage which he can claim is low. According to this model, for any salary proposal lower than our reserve salary, we prefer to allocate all of our available time to leisure rather than working even an hour. There is a limit to the basic model here. Indeed, as mentioned above, a proposal for a salary lower than the reserve salary gives rise to participation in the labour market when bribery affects this market. The worker participates in the labour market even if the salary proposal is lower than his reserve salary because he hopes (or rather is certain) to obtain substantial additional income at his workplace due to corruption which most often are higher than his initial salary proposal.

For a given working-age population, the proportion of those who participate in the labour market is called the activity rate (relating to the population considered). As a rule, the reserve salary increases with non-salary income. Consequently, any measure aimed at reducing these incomes and / or increasing net wages without taxes has a positive effect on the desire to participate in the labour market and must increase the participation rate. This principle and its consequence must be qualified.

Indeed, the desire to participate in the market can be independent of variations in non-wage income (and therefore the reserve salary) and in net wages without taxes. This desire to participate in the market will depend more on the corruption opportunities in this market. This means that regardless of the reserve wage level, an individual can participate in the market, as long as he hopes (or rather is certain) to have bribes at his workplace.

2.5. Substitution effect and income effect

Having decided to participate in the job market, how many hours will we work? According to the basic model, it depends on the difference between the hourly wage offered (legal contractual hourly wage) and our reserve salary. As an illustration, suppose that the proposed salary begins by being equal to the reserve salary and then increases indefinitely from this value. By definition when the proposed salary increases from this level of the reserve salary, the labour supply goes from a zero value to a positive value. There is a substitution effect which makes us replace a little leisure with an equal amount of work.

There is at least a limit of the basic model in the demonstration of this substitution effect.

Indeed, having decided to participate in the labour market, the number of working hours will not depend only on the difference between the hourly wage offered (w_ℓ) and our reserve salary (w_A). In a labour market

Turkish Economic Review

that is largely open to corruption, this difference will depend on the sum of the legal salary (w_ℓ) plus the salary for corrupt practices (w_c) and the reserve salary (w_A). Thus, by definition of the reserve salary, the proposed salary (w_ℓ) may not increase at this level, the labour supply will go from a zero value to a positive value due to taking into account the salary for hours of corruption (w_c). There is a substitution effect which makes us replace a little leisure with an amount equal to the sum of the contractual legal labour (h_ℓ) and the corrupt labour (h_c).

But, whatever the volume of working hours (h_ℓ and/or h_c), any increase in wages (w_ℓ and/or w_c) for this same volume increases our income. If leisure is a "normal" good – which means that its consumption increases with wealth (empirical studies tend to prove that this is the case for the vast majority of individuals) – this increase in income is accompanied by a desire to take more leisure time and, therefore, a desire to work less.

This phenomenon is called the income effect, and obviously it opposes the substitution effect.

According to the basic model, as long as the proposed wage (w_ℓ) is not too large compared to the reserve wage (w_A), the substitution effect dominates the income effect and the supply of labour increases with the hourly wage (w_ℓ). But it is possible that from a certain value of the latter, the income effect dominates the substitution effect. The labour supply then decreases with the proposed hourly wage (w_ℓ).

One can also note here one of the limits of the prediction of the basic model. Indeed, the proposed salary (w_ℓ) may be lower than the reserve salary (w_A) but so far the substitution effect will dominate the income effect due to the salary for hours of corruption (w_c) and labour supply will increase with the sum of legal (w_ℓ) and corrupt (w_c) wages. But it is also likely that from a certain value on this sum of wages ($w_\ell + w_c$), the income effect dominates the substitution effect.

The labour supply will no longer decrease only with the proposed hourly wage (w_ℓ) but rather with the sum of the contractual (w_ℓ) and corrupt (w_c) wages.

3. Limits of the model

3.1. The presence of independent unions can prevent the compensation / complementarity between w_c and w_ℓ

It is acknowledged that one of the major concerns of a trade union that is independent (of political power) is to obtain wages if not satisfactory, at least as high as possible. Unions can thus try to obtain direct wage increases by negotiating with employers, under the real or latent threat of strike.

The idea of a nominal or real wage cut is therefore not admissible for a union which can independently use legal means, notably the right to strike, to oppose this cut.

The famous controversy between Dunlop & Ross of (1944 and 1948) concerns the objectives and ultimately the nature of the union seen from a

Turkish Economic Review

standpoint where wages are privileged. To the thesis developed by Dunlop (1944) in his work: *Wage Determination under Trade Unions*, The Mac Millan Company 1944, responded with the thesis defended by Ross (1948) on: *Trade Union Wage policies*, University of California Press, 1948.

The position of Dunlop (1944) is simple; the union, which cares about the interests of its members, seeks not to obtain the maximum salary, which could be to the detriment of the number of people hired among its members, but the total income that all of them can achieve. Consequently, unions' actions in favor of high wages cannot be separated from positions taken in favor of employment, and more generally the wage policy of a union depends on the link between wages and a set of variables which affect production and employment: costs, product prices, profits perceived by employers. In this conception, the union is conceived as an economic agent.

Ross's (1948) position is opposite. In a famous formula, this author affirms that "*the union is a political agency operating in an economic environment*", whose leaders have as primary objective its survival and growth. We cannot therefore specify in advance the union's choices in terms of wages, it is first necessary to establish the decision-making process internal to the organization, which results from a quadruple confrontation of the leaders with the base, the employers, the government and other union leaders.

For Ross (1944), the maximization of an income cannot constitute the aim of the union, firstly because its purpose is political, secondly because the orientation of the wage policy will prove to be unstable, and in any case less sensitive to employment calculations.

However, a compromise has been found between these two conceptions, by authors such as Lester, Myers & Reynolds (1980). It consists in agreeing with Ross (1944) for the beginning and the general framework of the argument, and with Dunlop (1948) for the end. The tension between an economic logic and a political logic in the narrow sense does not disappear, it is seen as internal to the union.

3.2. In reality, the job market is heterogeneous. Consequently, there are several wage rates (w_ρ) and bribes (w_c).

The heterogeneity of the work makes one think of the multiplicity of wage rates (high, low, average, etc.) and not of the uniqueness of these rates.

Starting from the idea that wage cuts are not the same when moving from one group of employees to another. For example, consider two salary groups, one well paid, and the other poorly paid. If the latter endures a drop of 20% while the former faces a cut of 5%, the expected reactions of the 2 groups as concerns bribes in order to compensate for the drop in wages will be different.

To preserve their purchasing power, the poorly paid group will tend to receive more bribes than the other group. In general, it can be noticed that

Turkish Economic Review

the drop in salaries in the public service hardly affects (or does not affect at all) some professions, namely the army, the police and the gendarmerie who ensure social security or help maintain the ruling party in office.

However, in the countries where the laws are flouted, the sanctions absent, even these professions are engaged in bribery although their wages are relatively high. At this level there are grounds for thinking that individuals accept bribes not in order to compensate for lower wages, but simply out of financial greed. Tanzi (2000) will speak of corruption for necessity in the first and corruption for greed in the second.

3.3. The corruption market is opaque and corruption in particular is hardly visible

The compensation between w_C and w_L may not work when corruption is unobservable. We can then imagine an electronic detection system placed in each service (like the practices prevailing in modern supermarkets) allowing a central control to identify acts of corruption in the workplace. One can also control bribery by teaming up corrupt supervisors with honest officials.

However, these forms of control would only be justified if the marginal costs of eliminating corruption do not exceed the marginal benefits expected from the phenomenon (Becker, 1968; Becker & Stigler, 1974; Banfield, 1975). From another point of view, control can prove to be ineffective if civil servants develop survival strategies in the event of a drastic w_L decline, which in reality results in the perception of bribes (Ackerman, 1998).

Furthermore, despite the unobservable nature of corruption, control can prove to be ineffective if the controllers are themselves corruptible with, as a corollary, the establishment of forms of collusion between controllers - officials - hierarchy. In general, if the attitude of the disciplinary or justice council is characterized by corruption, four scenarios are possible:

1st case: The disciplinary council or the justice system ransoms the user and not the corrupt official. The latter is punished (fine, imprisonment, etc.).

2nd case: The disciplinary or justice council ransoms the corrupt official and not the user. There is no sanction.

3rd case: The disciplinary council or the justice system ransoms both the corrupt official and the user. The counselor asks them to agree to an amicable settlement. There is no sanction.

4th case: The corrupt official gives a very large ransom to justice. Justice asks the user not to continue the trial although he is obviously right. In return, the justice system can take part of the ransom obtained from the corrupt official and bribe the user for him to drop the trial.

4. Conclusion

Taking bribery into account changes the job supplier's programme of the basic model. Indeed, at the optimum, the marginal rate of substitution between consumption and leisure is no longer equal to the only legal hourly real wage (w_ℓ) but rather to the latter increased by the corrupt hourly real wage (w_c). In addition, the reserve wage (w_A) no longer appears to be the only determinant of participation in the labour market, corruption plays an equally important role.

The substitution effect no longer replaces a bit of leisure only with a quantity of legal work (h_ℓ) but also with a quantity of corrupt work (h_c). The desire to take more leisure time and, consequently, the desire to work less – the income effect – can no longer be ascribed to the mere increase in the statutory salary but also to an increase in bribery.

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