# EMPLOYMENT AND PRODUCTIVITY RELATIONSHIPS IN THE MANUFACTURING INDUSTRIES OF INDIA VIS-À-VIS SELECT DEVELOPED NATIONS

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**Abstract** *After World War II, the global economy has experienced unprecedented dimensions of industrial growth leading to a highly developed and diversified manufacturing industrial activity across these nations. These developments in the manufacturing sector over the last few decades have been quite phenomenal and have resulted in economic growth impelled by import substitution, export promotion, and acquisition of modern technological capabilities. However, all these developments have been over shadowed by a general failure of the industrial sector in generating adequate employment to absorb the increasing number of work force. In the developed nations, the proportion of labour engaged in the industrial sector has increased considerably, but periodically has been haunted by the problem of unemployment. In the developing nations also, the share of manufacturing employment in the aggregate employment has increased steadily. But, the growth rates over the years have not been sufficient enough to achieve a breakthrough in the structural patterns of employment. In this study, an attempt is made to comprehensively analyze the determinants of demand for labour in the manufacturing industries at three digit level disaggregation for India in comparison to selected developed nations during 1985-1986 to 2009-2010.*

**Keywords:** *Productivity, Labour Productivity, Manufacturing Industries, Employment in Manufacturing Industries*

## Productivity and Employment

Many economists have gone astray at this very point of labour market competition. From Adam Smith to Jean-Baptiste Say, John Stuart Mill to Alfred Marshall, all devised their precious doctrines of labour's disadvantage and exploitation. Their doctrines and theories in turn gave birth to the labour movement that commonly aims at replacing the competitive private property order with a political command system. In time they caused governments to restrict labour market competition and bestow legal privileges on workers' combinations and unions. Contemporary policies continue to reflect their nations and prejudices (Hans F Sennholz, 1985).

Self-employed people are much more aware of the direct relationship between productivity and income than employees. They are prepared to face declining incomes when personal productivity declines in advancing age. The physician or dentist who attends to fewer patients readily accepts the fact that his income may decline. The businessman knows that his profit will shrink when his output decreases. But his aging employees tend to forget it; they may expect a stream of raises and improvements until they choose to retire. Their costs continue to rise while their productivity declines, which makes them primary targets for unemployment. In other words, there are no employment contracts calling for wage cuts after age 40, 50, or 60, but there is a great deal of unemployment. It also explains why self-employed people generally continue to labour in their professions long after employees have retired. Government usually compounds the trend by imposing law and regulations that aim at benefiting elderly employees. But benefits exacted by force, merely raise employment costs and thereby disadvantage the intended beneficiaries even more (Hans F Sennholz, 1985).

## Industrialisation and Employment

Consumers acting on free markets may be responsible for fluctuations in wage rates. They may cause some to rise and others to fall and thereby reassign labour to various fields of production. Some rates may rise in reaction to rising consumer valuation and appreciation. Others may fall in response to declining consumer demand. But all such declines do not necessarily create mass unemployment unless wage rates are forcibly prevented from readjusting. Industries may shrink and vanish because of changing consumer aspirations and changing production technology. They may cut wage rates and reduce fringe benefits until labours prefer to seek other

employment. At the market rate of wages anyone willing to work can find employment and anyone looking for labour can fit it (Hans F Sennholz, 1985).

This brings us to an important question viz. why does employment growth lag behind the output growth in the process of industrialisation? Empirical evidences prove that the process of industrialisation has normally been accompanied by higher growth in productivity levels than growth in aggregate employment levels. Improvements in productivity have been associated with larger magnitudes of capital investments per employee, use of improved technology, higher productivity of labour due to better skill and human capital formation, higher wages, the movement of labour from traditional to modern industrial occupations etc. industrialisation, also has been accompanied by the replacement of labour intensive industries by modern capital incentive industries whose employment absorption levels, by and large have been quite low (Srinivas Y T, 1985).

## Economic Growth and Employment

In the following section we intend to examine the growth models which deal with the objective of promoting full employment through industrialisation. The pioneering growth models of Harrod (Harrod P F, 1939), Domar (Domar E D, 1946), Solow (Solow R M, 1965) and Swan (Swan T W, 1965) were originally meant to explore one important question viz., whether an advanced market economy can continue to save a fixed proportion of its national income and yet escape from the secular stagnation in economic growth arising due to lack of additional investment opportunities in the system. The models viewed population growth, as a beneficial factor to economic growth on the ground that it will generate new investment opportunities necessary to absorb a constant proportion of the growing GDP by way of additional consumption and can avoid secular stagnation. These models implicitly call for the assumption that the primary objective of the developing nations is to maximize per capita consumption and /or employment. Hence, they postulated investment growth as the key for achieving economic growth i.e. maximization of per capita income. Singer (Singer H, 1984) has modified Harrod's growth equation and applied it to the developing nations. From the results, he concluded that the growth of per capita national income was inversely proportional to the population growth. However, we do not find specific focus being given for the objective of employment generation in the early growth models.

The models developed by Nurkse (Nurkse R, 1953), Lewis (Lewis A W, 1954), Fie and Rains (Fie John, C H and G Ranis, 1964) promise simultaneous fulfillment of the objectives of output growth and employment growth. The developing economies are characterized with redundant labour in the agricultural sector with the marginal products often less than the prevailing product wage rate. The basic idea held by Lewis is that, if the redundant agricultural labour are transferred to the industrial sector by giving the wages equivalent to the prevailing agricultural wages, and if, the remaining workers on land do not increase their consumption levels, then due to the fact that the industrial sector will realise output at rates greater than or equal to the prevailing agricultural wages, the system will be able to increase aggregate employment without imposing the need for additional savings. An 'unlimited supply of labour' i.e. a perfectly elastic labour supply curve will then be available for the industrial sector at the subsistence wage rate, so long as the redundant labour exists in the system.

## Review of Literature

Vijay K Seth and Ashok K Seth (1991) in their study of the demand for labour in the Indian manufacturing industry during the period 1960 to 1984 have based an CES production function and estimated for four major industry groups and also for the aggregate manufacturing industry as a whole for three sub-periods 1960-65, 1966-75, and 1976-84 as also for the entire period 1960-84. Their analysis focused on aspects relating to shifts in pattern of demand for labour over the three sub periods representing three phases of industrialisation experienced by the Indian economy since independence. Sinha and Verma (1971) examined the changing structure of the employment towards more productive basis and more capital goods industries. Over the period of 1961 to 1966, the authors also found that there was a higher relative growth of employment in the organized sector and predicted there-fore an improvement in quality of employment.

Dholakia (1975) has tested the marginal productivity hypothesis that the wages paid in the Indian manufacturing industries did not reflect in the corresponding marginal productivity of labour at the two digit level industrial classification. On the whole the wages seemed to be lying below the marginal productivity of labour during the period 1946-64. Trends in employment and labour productivity for agriculture, industry and service sector industries for the period 1950 to 1969 was analyzed by Sethuraman (1974). He found that the rate of growth of employment in the service sector had lagged behind. At the same time a rapid increase in capital intensity together with higher levels of labour productivity were observed by him in industrial categories belonging to modern sector as compared with the industries in the traditional sector. Grilliches (1959), using labour demand function which allows for gradual adjustment of labour input to its equilibrium level, studied the demand for the U.S. farm workers covering the period 1911 to 1956. He found the elasticity of demand for labour with respect to real wage rate to be around -0.10 and the adjustment coefficient of labour and demand to be equal to

0.23. Goldar (1986), in a study of labour demand in Indian industries has derived labour demand function from the CES production function. He used the data from the ASI reports for 20 industries which accounted to 87 percent of the value added in total manufacturing in 1977. The empirical results have shown that output and real wages are the two major determinants of industrial employment. He also found that employment responded to changes in output and real wages only when there was a one year time lag.

## Estimation of Labour Demand Functions

The introduction of employment as a major independent policy objective immediately raises the question of the extent to which there exists a conflict between the employment objective and the output or the growth objective. If there exist two factors of production viz. abundant labour and scarce capital, the neo-classical production function analysis suggests that output is maximized when the productivity of the scare factor is maximized. There can be no conflict between current output and current employment. The CES production function is better suited for purpose of applied empirical research in employment growth models.

$$Q(t) = \gamma[\ \alpha\ (\ L_{(t)}\ )^{-p} + \beta\ (\ K_{(t)}\ )^{-p}\ ]^{-h\ .\ 1\ /\ p} \qquad (1)$$

where Q = Output or Gross Value Added (in US $)

t = the time – subscript or the year subscript

$\gamma$ = Efficiency parameters

$\alpha, \beta$ = Distribution parameters

h = Degree of homogeneity or scale parameter

L = All employees

P = Substitution parameters

K = Gross Fixed Capital (in US $)

The elasticity of substitution between labour and capital $\sigma$ is given by

$$\sigma = 1\ /\ 1 + P \text{ and also } P = 1 - \sigma\ /\ \sigma$$

The present analysis will also examine the nature of technical progress as to ascertain whether it has been one of labour saving or labour using. For this purpose the original CES production function is slightly modified by replacing the efficiency parameter $\gamma$, by separate labour augmenting factor ($\lambda$) and capital augmenting factor (k)

$$Q_{(t)} = [\ \alpha[e^{\lambda t}\ .\ L_{(t)}]^{-p} + \beta[e^{Kt}\ .\ K_{(t)}]^{-p}\ ]^{-p} \qquad (2)$$

where 'e' is the Naperial logarithmic base 2.718

$e^{\lambda t}\ .\ L_{(t)}$ is regarded as the efficiency of labour and $e^{Kt}\ .\ K_{(t)}$ is regarded as the efficiency of capital. The elasticity of substitution in the CES production function is given by:

$$\sigma = [1\ /\ 1 + P] \text{ and also } P = [1 - \sigma\ /\ \sigma] \qquad (3)$$

So assuming

$\lambda = K$ i.e. $e^{\lambda t} = e^{Kt}$ can be factored out and it takes the place of $\lambda$.

We can rewrite the equation (2) as

$$Q = [\alpha[e^{\lambda t}\ .\ L]^{(\sigma - 1\ /\ \sigma)} + \beta[e^{Kt}\ .\ K]^{(\sigma - 1\ /\ \sigma)}]^{h\ .\ (\sigma\ /\ \sigma - 1} \qquad (4)$$

In equation (4) we have substituted $(\sigma - 1\ /\ \sigma)$ for –P and for convenience the subscript 't' is omitted.

The marginal physical product of labour ($MPP_L$) is then equal to:

$$\Delta Q\ /\ \Delta L = h\ .\ \alpha.\ e^{\lambda t}[e^{\lambda t}\ .\ L\ ]^{-[1\ /\ \sigma]}\ .[Q][^{\sigma\ h\ -\ \sigma + 1\ /\ \sigma\ h]} \qquad (5)$$

Since profit maximization requires that marginal physical product of labour, should be equal to the product wage viz. the real wage, it can be written that $\Delta Q\ /\ \Delta L = W\ /\ P$ where 'W' is the wage paid in money terms or normal wage and 'P' is the price of output used as the money wage deflator to arrive at the real wage.

Solving equation (5) for 'L' we get

$$L = [w\ /\ p]^{-\sigma}\ .[\ (h\ .\ \alpha)\ ]^{\sigma}\ .\ e^{(\sigma\ -\ 1)\ \lambda t}.\ Q^{(\sigma h\ -\ \sigma + 1)\ /\ h} \qquad (6)$$

Calling (w / p) = w and expressing the equation in the logarithms, we get

$$LN\ (L) = -\ \sigma\ LN[w]\ .\ LN[\ (h\ .\ \alpha)]\ \sigma + (\sigma - 1)\ \lambda t] + [\sigma\ h\ -\ (\sigma - 1)\ /\ h]\ LN(Q)\ \ldots. \qquad (7)$$

For the purpose of estimation we call

$$LN[(h\ .\ \alpha)]\ \sigma = \alpha$$

$$(\sigma - 1)\ \lambda t = \beta 3$$

$$-\ \sigma = \beta 1$$

$$[\sigma\ h - (\sigma + 1)\ /\ h] = \beta 2$$

From this we arrive at the labour demand equation with some modification of equation (7), we get the estimating regression equation (8).

## Labour Demand Function–Model I

$$LN\ (L) = LN\ \alpha + \beta_1\ LN\ (W/L) + \beta_2\ LN\ (Q) + \beta_3\ (t) + \mu \qquad (8)$$

Thus the optimum labour demand is a function of

L = Labour, W/L = Real wage rate, Q = Output, t = time

We shall assume that the actual employment in terms of its quantity of labour has been optimally determined under competitive conditions, so that equation (8) could be used for estimating the model. This is a simplifying assumption in order to empirically estimate the labour demand in the Indian industrial sector. The $\beta 1$ coefficient is the elasticity of substitution between the two factor inputs labour and capital

i.e. σ. It measures the elasticity of labour demand with respect to real wage. Higher the magnitude of σ, the more are the adverse effects of a rise in real wage on employment. Alternatively it follows that more are the favorable effects of a fall in real wage in creating more employment. The coefficient β2 measures the elasticity of labour demand with respect to changes in the volume of output. Another variant of the labour demand function derived from the CES production function assumes, that there exists a lagged effect of the past year's employment on the current year's demand labour. The new estimating form incorporates the above assumption, in equation (8).

## Labour Demand Function - Model II

$$LN (L_t) = LN \alpha + \beta_1 LN (W/L)_t + \beta_2 LN (Q)_t + \beta_3 LN(L_{t-1}) + \mu \quad . \quad . \quad (9)$$

L = Labour in the current year

Q = Output or value added in the current year

W/L = Real wage rate in the current year

$L_{(t-1)}$ = Labour/ all employees with one year time lag

μ = random error

The coefficient of real wage, β1 is expected to fulfill the theoretical specification by assuming a negative sign. In a typical competitive market a profit maximization firm will reduce the employment if real wage increase. The coefficient β2 associated with the output is specified to assume a positive sign since output growth will result in increasing the employment. The β3 coefficient attached with the employment variable with one year lag would tend to assume a positive sign. This would support the condition that industries have a long run perspective while going for additional employment. The short–run elasticity of employment with respect to the real wage is given by β1 and the long-run elasticity of employment with respect to real wages by (β1/ 1-β3). Similarly, the short-run elasticity of employment with respect to output is given by β2 and the long-run elasticity of employment with respect to output by ( β2/ 1-β3). We expect the long-run elasticities to be higher in magnitude than the short-run ones.

## Results and Discussions

In this section, we present a summary of comparative analysis of manufacturing industries in India vis-à-vis selected developed nations with respect to the nature and characteristics of the factors determining labour demand in 24 three digit level manufacturing industries.

### Regression Estimates of Labour Demand Model-I

The wage rate coefficient emerged significant in 17 manufacturing industries in India. Of these, 16 of them assumed theoretically specified negative sign except the Machinery electric (383). These 16 industries included the beverages (313), the tobacco (314), the wearing apparel except footwear (322), the leather products (323), the wood products except furniture (331), the paper and products (341), the printing and publishing (342), the industrial chemicals (351), the other chemicals (352), the petroleum refineries (353), the miscellaneous petroleum and coal products (354), the rubber products (355), the non–ferrous metals (372), the machinery except electrical (382), the transport equipments (384), and the professional and scientific equipments (385). It appears that the labour demand in India's manufacturing industries has been quite sensitive to variations in the real wage rates. In India, the β2 coefficient associated with the output variable has satisfied the specified positive relationship in 21 industries except for the food products (311), the iron and steel (371) and the machinery electric (383). Of these 21 industries, β2 emerged statistically significant in 17 manufacturing industries. The output coefficient obtained comparatively higher magnitude in four manufacturing industries in India vis-à-vis the USA in the wood products except furniture (331), the industrial chemicals (351), the non–ferrous metals (372) and the transport equipments (384). A similar characteristic was obtained in the USA for industries engaged in the production of the wearing apparel except footwear (322), the leather products (323), the footwear except rubber or plastic (324), the printing and publishing (342), the fabricated metal products (381) and the professional and scientific equipments (385). It implies that an increase in the level of output in the aforesaid industries have generated additional employment.

In Australia, theoretically specified negative magnitudes characterized 70.83 percent of manufacturing industries. The $\beta_1$ was positive and less than one indicating increase in real wages leading to additional employment by less than proportionate rate in the industries manufacturing the machinery electric (383) in India and the fabricated metal products (381) industry in Australia. The output coefficient emerged positive and statistically significant in 14 out of 24 manufacturing industries in Australia. The $\beta_1$ coefficient which accounts for the influence of wage rate on employment has assumed positive but low value in the food products (311) industry of Japan. In Japan, eight manufacturing industries obtained theoretically specified negative value indicating reduction in employment level due to increase in the real wage rate. These industries include the leather products (323), the footwear except rubber or

plastic (324), the industrial chemicals (351), the other chemicals (352), the rubber products (355), the iron and steel (371), the non–ferrous metals (372) and the machinery except electrical (382). The elasticity of employment with respect to output growth has assumed positive and statistically significant values in 10 industries in the UK viz. the textiles (321), the wearing apparel except footwear (322), the footwear except rubber or plastic (324), the paper and products (341), the petroleum refineries (353), the miscellaneous petroleum and coal products (354), the plastic products (356), the iron and steel (371), the machinery electric (383) and the professional and scientific equipments (385) industry categories. The $\beta_3$ assumed negative values in the rubber products (355), the fabricated metal products (381) and the machinery electric (383) indicating that time rate of employment growth in these industries being retrogressive in nature.

In South Korea, the $\beta_1$ coefficient by being statistically significant has yielded support for the theoretical hypothesis by obtaining negative sign in 54.17 percent of manufacturing industries. The industries engaged in the manufacture of the printing and publishing (342), the miscellaneous petroleum and coal products (354) and the plastic products (356) of South Korea and the machinery electric (383) of India characterized positive and statistically significant magnitude for wage rate coefficient. It indicates that the aforesaid industries were operating in economies of scale during the study period which resulted in expansion of employment along with the increase in real wage rate. The output coefficient obtained positive and statistically significant values in for nine industries in South Korea viz. the food products (311), the textiles (321), the wearing apparel except footwear (322), the leather products (323), the footwear except rubber or plastic (324), the paper and products (341), the other chemicals (352), the fabricated metal products (381) and the machinery electric (383). The coefficient of time factor in obtained significant values in 19 industries in South Korea and outlined negative value by depicting the retrogressive effect of time on employment in 18 industries in South Korea.

## Regression Estimates of Labour Demand Model-II

The labour demand function derived from CES production function assumes that there exists a lagged effect of the past years employment on the current year demand for labour. In India, the $\beta_1$ obtained statistically significant and theoretically specified negative values in 70.33 industries viz. the food products (311), the beverages (313), the tobacco (314), the wearing apparel except footwear (322), the leather products (323), the footwear except rubber or plastic (324), the wood products except furniture (331), the paper and products (341), the printing and publishing (342), the industrial chemicals (351), the other chemicals (352), the petroleum refineries (353), the miscellaneous petroleum and coal products (354), the rubber products (355), the non–ferrous metals (372), the machinery except electrical (382) and the transport equipments (384). Similarly in the USA, 14 manufacturing industries obtained statistically significant and theoretically specified negative values in viz. the food products (311), the tobacco (314), the leather products(323), the footwear except rubber or plastic (324), the industrial chemicals (351), the other chemicals (352), the miscellaneous petroleum and coal products (354), the plastic products (356), the other non-metallic mineral products (369), the non–ferrous metals (372), the fabricated metal products (381), the machinery except electrical (382), the transport equipments (384) and the professional and scientific equipments (385). The output coefficient has satisfied the theoretical specification and emerged statistically significant in 18 manufacturing industries in India vis-à-vis 14 industries in the USA. Of the 18 industry categories in India, $\beta_2$ obtained values greater than unity depicting higher elasticity's in the non–ferrous metals (372), whereas in the USA, similar characteristics were observed in the leather products (323) and the professional and scientific equipments (385) industry categories. The $\beta_3$ coefficient of lagged labour variable has satisfied the "a priori" specification of the model in all the industries except the miscellaneous petroleum (354) and the rubber products (355) industry categories in India. The $\beta_3$ obtained significant magnitudes in 62.50 percent of industries in the USA. The numerical values of the coefficient suggests that the speed of adjustment in employment was quite high in the wearing apparel except footwear (322), the leather products (323), the footwear except rubber or plastic (324), the paper and products (341), the printing and publishing (342), the petroleum refineries (353), the iron and steel (371) and the machinery electric (383). The magnitudes of $\beta_3$ suggest that the speed of adjustment is low in India in comparison to the USA during the study period and the cost involved in bringing about short run labour market adjustments to be high in India than in the USA.

The wage rate coefficient has emerged statistically significant in nine manufacturing industries in Canada and has assumed a positive but magnitude of less than unity in eight manufacturing industries. Thus, increase in the real wage rate was retaliated by the industries through less than proportionate expansion in employment. A theoretically specified negative sign was obtained in Canada for the industries manufacturing viz. the wood products except furniture (331), the paper and products (341), the printing and publishing (342), the industrial chemicals (351), the other chemicals (352), the plastic products (356), the fabricated metal products (381) and the machinery except electrical (382). The $\beta_2$ emerged with statistically significant and positive magnitude in six industries in Canada and

obtained comparatively higher values in three manufacturing industries viz. the printing and publishing (342), the plastic products (356) and the fabricated metal products (381). The $\beta_3$ which measures the impact of employment in (t-1) period on the current year employment emerged significant in 14 industries in Canada vis-à-vis seven in India. T h e wage rate coefficient obtained theoretically specified negative and statistically significant value for 13 industries in Australia as compared to 17 in India. The $\beta_2$ emerged positive and statistically significant in 13 manufacturing industries in Australia vis-à-vis 17 in India. Of these 13 industries, a comparatively higher magnitude of output coefficient in the manufacturing industries of Australia was observed in the food products (311), the textiles (321), the footwear except rubber or plastic (324), the miscellaneous petroleum and coal products (354), the plastic products (356), the other non-metallic mineral products (369) and the iron and steel (371). The $\beta_3$ coefficient which measures the elasticity of change in current year employment due to the lagged effect of the employment in the previous year has satisfied the theoretical specification by assuming positive magnitudes for 13 manufacturing industries in Australia. It indicates a significant time lag influencing the speed adjustment in the actual labour demand in the concerned industries.

The coefficient of wage rate with respect to employment obtained statistically significant and theoretically specified negative values in eight manufacturing industries in Japan. These industries are characterized as the textiles (321), the leather products (323), the industrial chemicals (351), the rubber products (355), the iron and steel (371), the non–ferrous metals (372), the machinery except electrical (382) and the machinery electric (383). The hypothesis that employment growth is a positive function of output was found invalid in seven manufacturing industries in Japan and obtained well behaved regression estimates in six industries viz. the tobacco (314), the leather products (323), the footwear except rubber or plastic (324), the industrial chemicals (351), the iron and steel (371) and the non–ferrous metals (372). The wage rate coefficient for the manufacturing industries in the UK has assumed the specific negative sign and rendered empirical support for the underlying theory in 16 manufacturing industries. But, the industries like the beverages (313), the printing and publishing (342) and the non–ferrous metals (372) assumed positive sign depicting the increase in the absorption of labour in spite of wage hike during the study period. The output coefficient for the manufacturing industries in the UK has underlined a positive relationship and emerged statistically significant for 16 industries. The industries engaged in the manufacture of viz. the beverages (313), the tobacco (314) and the printing and publishing (342) assumed negative coefficient depicting non-absorption of labour with the increase in industrial output. Thus, in the UK, labour demand was found to be quite sensitive to variations in the wage rate and output in comparison to India.

The wage rate coefficient obtained theoretically specified negative values in 9 industries of South Korea. Of these industries, the miscellaneous petroleum and coal products (354) indicated more than proportionate expansion in the employment with increase in real wage rate. The elasticity of output with respect to employment emerged statistically significant in 11 industries in South Korea. A negative output coefficient was found causing retrogressions in employment growth for eight manufacturing industries in South Korea. Thus, it could be interpreted that both the nations under study had better output coefficient with respect to industrial employment.

## Concluding Observations

Among the 24 manufacturing industries, the present study clearly identifies the non-ferrous metals (372) as a well performing industry in India vis-à-vis the manufacturing industries of the select developed nations. On the whole, the industries engaged in the manufacture of viz., the beverages (313), the tobacco (314), the printing and publishing (342), the industrial chemicals (351), the other chemicals (352), the rubber products (355), the other non-metallic mineral products (369), the fabricated metal products (381), the machinery except electrical (382), the transport equipments (384) and the professional and scientific equipments (385) have emerged as predominant industries having sound economic fundamentals in terms of all aspects examined viz. output growth, factor productivity, scale of returns, factor substitution, total factor productivity and employment. In addition to the above industries, the study could also observe the following industries viz. the food products (311), the wearing apparel except footwear (322), the textiles (321), the leather products (323), paper and products (341), the petroleum refineries (353), the miscellaneous petroleum and coal products (354), the Iron and steel (371) and the machinery electric (383) also possessing requisite economic viability to emerge as major industries among 24 industry categories.

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