The skill biased technological change in Turkish manufacturing industries

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THE SKILL BIASED TECHNOLOGICAL CHANGE IN TURKISH MANUFACTURING INDUSTRIES

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I. INTRODUCTION

The skill biased technological change (SBTC) hypothesis relates earnings inequality to the change in technology with the hypothesis that technology increases the relative demand for skilled labor. In this paper we will investigate the evidence of SBTC hypothesis for two digit level 9 sectors in Turkey between 1982-1998. This paper is, in fact, a replication of Betts (1997) with Turkish data. In the following section we will construct the theoretical basis for the econometric model. In the third section, we will deal with the database used in the study. In the fourth section we will survey the SUR estimation results.

II. THEORETICAL MODEL

Consider a five-input cost function, where *K* is capital, *B* is blue-collar workers (production workers), *W* is white-collar workers (non-production workers), *E* is energy inputs, and *M* is material inputs apart from energy.

In our paper we employ the translog cost function which expresses the natural logarithm of total cost as a function of the logarithm of factor prices (lnP_i) where i = 1,...,n, the logarithm of real output (*lnY*), and time (*t*) as a proxy for technological change:

$$\ln C = \alpha_0 + \alpha_Y \ln Y + \alpha_t t + \sum_{i=1}^{n} \alpha_i \ln P_i + \frac{1}{2}\gamma_{YY} (\ln Y)^2 + \frac{1}{2}\gamma_{Yt}\, t \,.\, \ln Y + \frac{1}{2}\gamma_{tt}\, t^2 +$$

$$\frac{1}{2}\sum_{i=1}^{n}\sum_{j=1}^{n}\gamma_{ij} \ln P_i \ln P_j + \sum_{i}^{n}\gamma_{iY} \ln P_i \ln Y + \sum_{i=1}^{n}\gamma_{it} t.\ln P_i \qquad (1)$$

In this formulation, the key parameters are the ones γ_{ij} , γ_{it}, and γ_{iY}, which measure the effect of changing relative factor prices, biased technological change, and scale effects on factor demands respectively. We would say that technology change is labor biased if $\gamma_{Wt}>0$ and $\gamma_{Bt}>0$ and we would say that technology is skill-biased if $\gamma_{Wt}>0$ and $\gamma_{Bt}<0$. In addition, for example, technical change which was capital-using would involve a coefficient γ_{Kt} which is positive.

In microeconomic theory, the Shepherd's lemma implies that $\partial C / \partial P_i$ is equal to conditional demand for input i, X_i . In logarithmic form $\frac{\partial \ln C}{\partial \ln P_i} = \frac{\partial C}{\partial P_i}\frac{P_i}{C}$. Substituting the result from Shepherd's lemma, we have $\frac{\partial \ln C}{\partial \ln P_i} = X_i \frac{P_i}{C} = S_i$, where S_i is the cost share of the i*th* input. From our translog cost function we have;

$$\frac{d \ln C}{d \ln P_i} = \frac{P_i X_i}{C} = S_i = \alpha_i + \sum_{j=1}^{n} \gamma_{ij} \ln P_j + \gamma_{iY} \ln Y + \gamma_{it} t \,, \tag{2}$$

where i=K, LW, LB, E, M

Here, K is index for Capital, LW for white color labor, LB for blue collar labor, E for energy input and finally M is for material input.

If we write these five factor cost share equations in the complete form, we get;

$$S_K = \alpha_K + \gamma_{K,K} \ln P_K + \gamma_{K,LB} \ln P_{LB} + \gamma_{K,LW} \ln P_{LW} + \gamma_{K,E} \ln P_E + \gamma_{K,M} \ln P_M + \gamma_{K,Y} \ln Y + \gamma_{K,t}\, t$$

$$S_{LW} = \alpha_{LW} + \gamma_{LW,K} \ln P_K + \gamma_{LW,LB} \ln P_{LB} + \gamma_{LW,LW} \ln P_{LW} + \gamma_{LW,E} \ln P_E + \gamma_{LW,M} \ln P_M + \gamma_{LW,Y} \ln Y + \gamma_{LW,t}\, t$$

$$S_{LB} = \alpha_{LB} + \gamma_{LB,K} \ln P_K + \gamma_{LB,LB} \ln P_{LB} + \gamma_{LB,LW} \ln P_{LW} + \gamma_{LB,E} \ln P_E + \gamma_{LB,M} \ln P_M + \gamma_{LB,Y} \ln Y + \gamma_{LB,t}\, t$$

$$S_E = \alpha_E + \gamma_{E,K} \ln P_K + \gamma_{E,LB} \ln P_{LB} + \gamma_{E,LW} \ln P_{LW} + \gamma_{E,E} \ln P_E + \gamma_{E,M} \ln P_M + \gamma_{E,Y} \ln Y + \gamma_{E,t}\, t$$

$$S_M = \alpha_M + \gamma_{M,K} \ln P_K + \gamma_{M,LB} \ln P_{LB} + \gamma_{M,LW} \ln P_{LW} + \gamma_{M,E} \ln P_E + \gamma_{M,M} \ln P_M + \gamma_{M,Y} \ln Y + \gamma_{M,t}\, t \tag{3}$$

In the absence of symmetry restrictions there are 40 parameters to estimate, eight in each of the five share equations. When the following 10 cross-equation symmetry conditions are imposed, the number of parameters drops to 30:

$$\gamma_{LW,K} = \gamma_{K,LW}\ ;\gamma_{LB,K} = \gamma_{K,LB}\ ;\ \gamma_{E,K} = \gamma_{K,E};\ \gamma_{LW,LB} = \gamma_{LB,LW};\ \gamma_{LW,E} = \gamma_{E,LW}$$
$$\gamma_{LB,E} = \gamma_{E,LB};\ \gamma_{M,K} = \gamma_{K,M};\ \gamma_{LW,M} = \gamma_{M,LW};\ \gamma_{LB,M} = \gamma_{M,LB};\ \gamma_{E,M} = \gamma_{M,E} \tag{4}$$

We know that, the underlying economic theory requires that this translog function be homogenous of degree 1 in input prices. That is, a proportional increase in all input prices must increase cost by the same proportion, holding output constant. If we take the total differential of the log of cost, holding Y and t constant in our formulation, we get following:

$$d\ln C = \sum_{i=1}^{n} \alpha_i (d\ln P_i) + \frac{1}{2}\sum_{i=1}^{n}\sum_{j=1}^{n}\gamma_{ij}(d\ln P_i)(d\ln P_j) + \sum_{i}(\gamma_{iY}\ln Y)d\ln P_i + \sum_{i=1}^{n}\gamma_{it}t.(d\ln P_i)$$

By assumption, $d\ln P_i$ is equal across all n inputs. Hence we can use a unique $d\ln\overline{P}$. This gives;

$$d\ln C = d\ln\overline{P}\sum_{i=1}^{n}\alpha_i + (d\ln\overline{P})^2\frac{1}{2}\sum_{i=1}^{n}\sum_{j=1}^{n}\gamma_{ij} + d\ln\overline{P}\sum_{i}^{n}\gamma_{iY}\ln Y + d\ln\overline{P}\sum_{i=1}^{n}\gamma_{it}t$$

In order for $\dfrac{d\ln C}{d\ln\overline{P}} = 1$, the following constraints on the parameters must hold:

$$\sum_{i}\alpha_i = 1,\ \sum_{i}\gamma_{iY} = 0,\ \sum_{i}\gamma_{it} = 0,\ \sum_{i=1}^{n}\sum_{j=1}^{n}\gamma_{ij} = 0$$

In our *KL(W,B)EM* framework, these homogeneity restrictions are:

(R1) $\alpha_K + \alpha_{LW} + \alpha_{LB} + \alpha_E + \alpha_M = 1$

(R2) $\gamma_{K,K} + \gamma_{K,LB} + \gamma_{K,LW} + \gamma_{K,E} + \gamma_{K,M} = 0$

(R3) $\gamma_{LW,K} + \gamma_{LW,LB} + \gamma_{LW,LW} + \gamma_{LW,E} + \gamma_{LW,M} = 0$

(R4) $\gamma_{LB,K} + \gamma_{LB,LB} + \gamma_{LB,LW} + \gamma_{LB,E} + \gamma_{LB,M} = 0$

(R5) $\gamma_{E,K} + \gamma_{E,LB} + \gamma_{E,LW} + \gamma_{E,E} + \gamma_{E,M} = 0$

(R6) $\gamma_{M,K} + \gamma_{M,LB} + \gamma_{M,LW} + \gamma_{M,E} + \gamma_{M,M} = 0$

(R7) $\gamma_{K,Y} + \gamma_{LW,Y} + \gamma_{LB,Y} + \gamma_{E,Y} + \gamma_{M,Y} = 0$

(R8) $\gamma_{K,t} + \gamma_{LW,t} + \gamma_{LB,t} + \gamma_{E,t} + \gamma_{M,t} = 0$ (5)

In our five equation symmetry-constrained translog model, if we impose the homogeneity restrictions (5) and delete the M share equation[1], we get the final model as follows[2]:

$$S_K = \alpha_K + \gamma_{K,K} \ln (P_K / P_M) + \gamma_{K,LB} \ln (P_{LB} / P_M) + \gamma_{K,LW} \ln(P_{LW} / P_M) + \gamma_{K,E} \ln(P_E / P_M) + \gamma_{K,Y} \ln Y + \gamma_{K,t}\, t$$

$$S_{LW} = \alpha_{LW} + \boldsymbol{\gamma_{K,LW}} \ln(P_K / P_M) + \gamma_{LW,LB} \ln(P_{LB} / P_M) + \gamma_{LW,LW} \ln(P_{LW} / P_M) + \gamma_{LW,E} \ln(P_E / P_M) + \gamma_{LW,Y} \ln Y + \gamma_{LW,t}\, t$$

$$S_{LB} = \alpha_{LB} + \boldsymbol{\gamma_{K,LB}} \ln(P_K / P_M) + \gamma_{LB,LB} \ln(P_{LB} / P_M) + \boldsymbol{\gamma_{LW,LB}} \ln(P_{LW} / P_M) + \gamma_{LB,E} \ln(P_E / P_M) + \gamma_{LB,Y} \ln Y + \gamma_{LB,t}\, t$$

$$S_E = \alpha_E + \boldsymbol{\gamma_{K,E}} \ln(P_K / P_M) + \boldsymbol{\gamma_{LB,E}} \ln(P_{LB} / P_M) + \boldsymbol{\gamma_{LW,E}} \ln(P_{LW} / P_M) + \gamma_{E,E} \ln(P_E / P_M) + \gamma_{E,Y} \ln Y + \gamma_{E,t}\, t \qquad (6)$$

Indirect estimates of the parameters in the omitted M share equation could then be obtained by rearranging the homogeneity restrictions (5) in term of the directly estimated parameters.

Following Berndt and Wood (1975), we estimate[3] the system of cost share equations using iterative seemingly unrelated regression (SUR). SUR is used to allow for both cross-equation restrictions and contemporaneous correlation between the share equations. Iteration is necessary to ensure invariance to which share equation is dropped.

III. DATA

We estimate the model separately for 9 Turkish manufacturing sectors in 2 digit ISIC level for the period 1982-1998. The data is aggregated using the 4 digit ISIC data for sectors. The data is obtained from SIS database. The covered sectors in two digit level are following ones;

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[1] Dropping M share equation is done as a cure for the singular disturbance covariance and residual cross-products matrices. A detailed reasoning for the deletion of M share equation can be found in Berndt (1991), pp. 472-473.

[2] Bold characters are representing symmetry constraints.

[3] The estimations were done in Stata 7.

ISIC2	Sector Description
31	Manufacture of food, beverages and tobacco
32	Textile, wearing apparel and leather industries
33	Manufacture of wood and wood products including furnish
34	Manufacture of paper- paper products, printing and publishing
35	Manufacture of chemicals and of chemical petroleum, coal, rubber and plastic products
36	Manufacture of non-metallic mineral products except products of petroleum and cool
37	Basic metal industries
38	Manufacture of fabricated metal products, machinery and equipment, transport equipment, professional and scientific and measuring and controlling equipment
39	Other manufacturing industries

Lack of data has caused to drop some subsectors in 4 digit level. One can find the all covered 4 digit sectors in the appendix.

For blue-color and white-color distinction between workers, we used production workers and non-production (administrative) workers data. Wages for production and administrative workers are divided by the number of each respective labor category forces and indexed in order to obtain a unit price of white-color and blue-color workers. For energy input, we used electricity proxy. The costs of electricity consumption is divided by amount of electricity consumed (measured by kWh) and indexed in order to obtain a unit price for energy input factor. For the unit price of Material inputs apart from energy, price deflator for material input provided by SIS is used. All necessary deflators were obtained from SIS series, as well.

An important difficulty of data has come from the capital stock side. There is no SIS Capital stock data that can be used for this kind of study. This part and calculation require a bit more details, that is why, we will look at this subject under a separate subtitle.

Capital Stock and User Cost of Capital

The user cost (or rental price) of capital is a measure of how much it costs using one unit of the services provided by that asset. More precisely, it includes the cost for financing the purchase of the capital good, its economic depreciation, the capital gains-losses due to asset price changes and the net burden due to the tax structure for business income.

A great deal of literature originated from the contributions of Jorgenson (1963) and Hall and Jorgenson (1967). Jorgenson and Griliches (1967) linked user cost and capital services measurement.

For the purposes of this paper, we used the formula of the user cost of capital following OECD (2001). This formula does not take into account those factors related to the tax treatment of business income. In its simplest form, it is expressed as[4],

$$\mu_t = q_t . (r_t + d_t) - (q_t - q_{t-1}) \qquad (7)$$

In the expression above, the user cost of capital of an asset μ_t , is the per-period cost of using the services of the asset. In the formula, q_t representing the market price of a new asset whereas d_t is the rate of depreciation and r_t is some measure of the cost of financial capital such as the market rate of interest.

The first term of the user cost expression, $q_t . (r_t + d_t)$ is to represent the cost of financing the asset. This term containing $q_t . r_t$, which is the opportunity cost of employing capital elsewhere than in production; that is, best forgone alternative, in economics language. For this purpose we have used market interest rate obtained from CBRT instead of r_t. Second term included in the first term of the above formula is, $q_t d_t$, which is the cost of depreciation or the loss in the value of the machine because it ages. The data collected by SIS containing only the total value of depreciation, that is, the total value of product of $q_t d_t$ with capital stock (K), unfortunately there is no collected data by SIS for depreciation rate, d_t[5] and Capital Stock (K).

The second term of the user cost expression ($q_t - q_{t-1}$) measures capital gains or losses, or revaluation of an asset. This term is for representing the change in value that corresponds to a rise or fall in the price of that asset, independent of the affects of ageing. Lastly, as we have noted before, the formula (7) abstracts from all effects of taxation.

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[4] OECD (2001), p.65.
[5] In this subject, we have talked and informed by experts from related department of SIS.

For q_t ,representing the market price of a new asset, Braun (2000) used physical capital deflator. Following Braun (2000)'s view, instead of q_t, we used *investment deflator* series provided by SPO. As for the depreciation rate, d_t, we employed the estimation results provided by Hobijn (2001) in U.S for respective sectors in two digit level. Using these proxies, we generated an index for user cost of capital, P_K. Since there is no data for Capital Stock, before stated total value of depreciation provided by SIS is employed as a proxy for capital stock.

IV. RESULTS OF MODEL ESTIMATION

Estimates of the model for an 9-industry aggregation of Turkish manufacturing appear in Table 1. At the bottom of the table appear probability values for various F tests. We used F test, since the sample size is very small (n=17). First appears Breush-Pagan test of independence. The BP test is a test of zero correlation; unfortunately, it relies on normality assumption. For all sectors, the null hypothesis that there is independence across the disturbance terms of share equations is rejected with either 0.05 or 0.01 level of significance. Therefore we can conclude that the disturbances are correlated across equations, we can use SUR regression. Second, a test for homotheticity of the cost functions, which implies $\gamma_{iY} = 0$, for all i, is rejected in 6 industries but accepted in 3 sectors which are Manufacture of food, beverages and tobacco (31), Manufacture of paper products (34), and Basic Metal industries (37). This finding suggest that studies of Turkish manufacturing should be quite careful in using simple production functions such as constant elasticity of substitution.

As for the sake of capturing the bias of technological change, the key parameters of interest are γ_{it} terms. For example, technical change which was capital-using would involve a coefficient γ_{Kt} which is positive. We first perform a test for Hicks-neutral technological change. This hypothesis entails the conditions $\gamma_{it} = 0$, for all i. As shown in Table1, in 8 of 9 industries the hypothesis is rejected with 0.05 level of significance, some industries even with 0.01. Therefore, we can conclude from our empirical investigation that, the technological change in Turkish manufacturing industry between 1982-1998 has mostly been highly nonneutral. Examination of the

γ_{it} terms reveals types of nonneutral technical change. In 6 of 9 industries there is negative coefficients for blue color workers, that is, 6 industries show biases away from blue-color workers. However, only for Manufacture of Wood and wood products (33) sector, the negative coefficient is statistically significant, in other 5 industries with negative coefficient for blue-color workers, the coefficients are not statistically significant. Similarly, in 7 of 9 sectors, the coefficients for white color workers are positive, however again only in one sector it is statistically significant.

For our model, the hypothesis of skill-neutral technological change can be stated formally as $\gamma_{Bt}= \gamma_{Wt}$. The bottom row of test results shows that this null hypothesis is rejected in all industries. This is an interesting finding of our study. This statistically indicates that, in all manufacturing industries of Turkey, there has been a skill neutral technological change. Although, in 5 sectors we observe that $\gamma_{Bt}< \gamma_{Wt}$, indicating that technical change has been biased in favor of nonproduction workers, unfortunately none of them are statistically significant results.

These findings do not suggest a skill biased technological change in Turkish manufacturing industry. In Manufacture of Wood sector (33), we see a positive coefficient for capital implying a capital biased technical change in this sector with a 0.05 level of significance. In the same sector, the coefficient of blue-color workers is also statistically negative implying that the technological change in Wood sector is away from blue-color workers to capital biased one. In Manufacture of Paper and paper products, printing and publishing sector (34), we observe again an capital biased technological change with 0.05 level of significance. This may reflect growing press & media industry and its increasing capital investments in Turkey. In contrast to these two sectors with a capital intensive technical change, estimations results suggest a statistically significant technical change away from capital for the manufacture of non-metallic mineral products sector (36) and other manufacturing sectors (39) other than included ones.

Table1. Estimation Results

	31	32	33	34	35	36	37	38	39
γ_{Kt}	0.0000297 (0.051464)	0.0001099 (0.069246)	0.0007432 (2.213222)*	0.0017452 (2.313055)*	-0.009541 (-0.93598)	-0.003922 (-4.88236)**	0.0011832 (0.310845)	-0.000876 (-0.46167)	-0.000684 (-4.58579)**
γ_{Bt}	-0.008012 (-1.18707)	-0.003961 (-0.60611)	-0.032183 (-2.41688)*	-0.011877 (-0.75555)	0.0126599 (0.944346)	0.0016741 (0.148575)	-0.012159 (-0.82593)	-0.011326 (-1.84895)***	0.0052564 (1.01215)
γ_{Wt}	0.0040129 (0.828034)	-0.023027 (-3.42362)**	0.0194278 (1.414392)	0.0071864 (0.438206)	-0.006517 (-0.8189)	0.014716 (1.367455)	0.0001398 (0.010123)	0.0108642 (1.855574)***	0.0040058 (0.807768)
γ_{Et}	0.00000568 (2.581818)*	0.00001 (2)*	0.0000318 (3.521595)**	0.0000321 (-0.97866)	0.0000069 (2.85124)**	-0.000023 (-1.48387)	0.0000168 (1.5)	0.00000152 (2.788991)**	-0.00001 (-3.81679)**
p values									
Breush-Pagan	0.0036**	0.0006**	0.0042**	0.0119*	0.0260*	0.0035**	0.0078**	0.0063**	0.0029**
Homotheticity	0.1908	0.0046**	0.0006**	0.0781	0.0119*	0.0000**	0.1309	0.0184*	0.0000**
Hicks neutral	0.0461*	0.0011**	0.0012**	0.1348	0.0042*	0.0000**	0.0631*	0.0093**	0.0000**
Skill neutral	0.2673	0.1132	0.0537	0.5526	0.1818	0.5553	0.6610	0.0585	0.8951

Note 1.
** means statistically significant at 0.05*
*** means statistically significant at 0.05*
**** means statistically significant at 0.1*

Note 2.
31 Manufacture of food, beverages and tobacco
32 Textile, wearing apparel and leather industries
33 Manufacture of wood and wood products including furnish
34 Manufacture of paper- paper products, printing and publishing
35 Manufacture of chemicals and of chemical petroleum, coal, rubber and plastic products
36 Manufacture of non-metallic mineral products except products of petroleum and cool
37 Basic metal industries
38 Manufacture of fabricated metal products, machinery and equipment, transport equipment, professional and scientific and measuring and controlling equipment
39 Other manufacturing industries

CONCLUSION

As a result of our study, it appears that nonneutral technical change has been the rule for Turkish manufacturing. In 8 of 9 industries, tests rejected the hypothesis of Hicks-neutral technical change. In addition, skill neutral technological change hypothesis is strongly rejected in all industries, however the results do not show a *statistically significant* skill biased technical change. In 5 of 9 sectors, we observe a statistically *insignificant* skill biased technological change hypothesis supporting coefficients. If we increase the level of significance to 0.1; then, in Manufacture of fabricated Metal product sector (38), we observe a statistically significant skill biased technical change with 0.1 level of significance. This can be reasonable since our sample size is really small meaning that power of our tests are low. If we look at the significant coefficients at either 0.05 or 0.01 level of significance, in 2 sectors (33 and 34) capital biased technological change is observed whereas in two (36 and 39), a technical change away from capital is seen.

However, we should remind from econometric theory that when the sample size is small as in our case, we may not have enough power to detect trends that are really present. Interpretation of estimation results in this case depends on the outcome: if we do find a statistically significant trend, then we may conclude that there is a real trend, just as we would with a larger sample, because we have found this trend even though low power made it hard to find. If we do not find a statistically significant trend, then we do not know if there is a trend or not, that is we can not make real conclusions. In our study, we can not find a statistically significant trend for skill biased technological change.

We would say that, the main finding of our study is the fact that there is no statistically significant support for skill biased technological change hypothesis for Turkish manufacturing sector between 1982 and 1998.

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APPENDIX

Sectors covered in 4 digit ISIC code system:

31 Manufacture of food, beverages and tobacco

3111 Slaughtering, preparing and preserving meat
3112 Manufacture of dairy products
3113 Canning and preserving of fruits and vegetables
3114 Canning, preserving and processing of fish, crustacca and similar foods
3115 Manufacture of vegetable and animal oils and fats
3116 Grain mill products
3117 Manufacture of bakery products
3118 Sugar factories and refineries
3119 Manufacture of cocoa, chocolate and sugar confectionery
3121 Manufacture of food products not elsewhere classified
3122 Manufacture of prepared animal feeds
3131 Distilling, rectifying and blending spirits
3132 Wine industries
3133 Malt liquors and malt
3134 Soft drinks and carbonated waters industries
3140 Tobacco manufactures

32 Textile, wearing apparel and leather industries

3211 Spinning, weaving and finishing textiles
3212 Manufacture of made-up textile goods except wearing apparel
3213 Knitting mills
3214 Manufacture of carpets and rugs
3215 Cordage, rope and twine industries
3219 Manufacture of textiles not elsewhere classified
3221 Manufacture of fur and leather products
3222 Manufacture of wearing apparel, except fur and leather
3231 Tanneries and leather finishing
3233 Manufacture of products of leather and leather substitutes, except footwear and wearing apparel
3240 Manufacture of footwear, except vulcanized or molded rubber or plastic footwear

33 Manufacture of wood and wood products including furnish

3311 Sawmills, planing and other wood mills
3320 Manufacture of furniture and fixtures, except primarily of metal

34 Manufacture of paper- paper products, printing and publishing

3411 Manufacture of pulp, paper and paperboard
3412 Manufacture of containers and boxes of paper and paperboard
3419 Manufacture of pulp, paper and paperboard articles n.e.c.
3421 Printing, publishing and allied industries

35 Manufacture of chemicals and of chemical petroleum, coal, rubber and plastic products

3511 Manufacture of basic industrial chemicals except fertilizers
3512 Manufacture of fertilizers and pesticides
3513 Manufacture of synthetic resins, plastic materials and man-made fibres except glass
3521 Manufacture of paints, varnishes and lacquers
3522 Manufacture of drugs and medicines

3523 Manufacture of soap and cleaning preparations, perfumes, cosmetics and other toilet preparations
3529 Manufacture of chemical products not elsewhere classified
3530 Petroleum refineries
3543 Compounded and blended lubricating oils and greases
3544 Liquid petroleum gas tubing
3551 Tyre and tube industries
3559 Manufacture of rubber products not elsewhere classified
3560 Manufacture of plastic products not elsewhere classified

36 Manufacture of non-metallic mineral products except products of petroleum and cool

3610 Manufacture of pottery, china and earthenware
3620 Manufacture of glass and glass products
3691 Manufacture of structural clay products
3692 Manufacture of cement, lime and plaster
3699 Manufacture of non-metallic mineral products n.e.c.

37 Basic metal industries

3710 Iron and steel basic industries
3720 Non-ferrous metal basic industries

38 Manufacture of fabricated metal products, machinery and equipment, transport equipment, professional and scientific and measuring and controlling equipment

3811 Manufacture of cutlery, hand tools and general hardware
3812 Manufacture of furniture and fixtures primarily of metal
3813 Manufacture of structural metal products
3819 Manufacture of fabricated metal products except machinery and equipment not elsewhere classified
3821 Manufacture of engines and turbines
3822 Manufacture of agricultural machinery and equipment
3823 Manufacture of metal and wood working machinery
3824 Manufacture of special industrial machinery and equipment except metal and wood working machinery
3825 Manufacture of office, computing and accounting machinery
3829 Machinery and equipment except electrical n.e.c.
3831 Manufacture of electrical industrial machinery and apparatus
3832 Manufacture of radio, television and communication equipment and apparatus
3833 Manufacture of electrical appliances and house wares
3839 Manufacture of electrical apparatus and supplies n.e.c.
3841 Ship building and repairing
3843 Manufacture of motor vehicles
3844 Manufacture of motorcycles and bicycles
3851 Manufacture of professional and scientific, and measuring and controlling equipment, n.e.c.
3852 Manufacture of photographic and optical goods
3854 Other

39 Other manufacturing industries

3901 Manufacture of jewellery and related articles
3909 Manufacturing industries not elsewhere classified